Towards an Architecture of Social Ecology

(Self-help and Sustainable Cities)

Thesis submitted in accordance with the requirements of the
University of Liverpool for the degree of Doctor of Philosophy
by

Karl Jeremy Hutchison.

February 1996

Acknowledgements

Thanks to:

Alison Cook and members of Green Anarchy Research and Design (GARD) at the University of Liverpool School of Architecture: Andy Brown, Richard Burnham, Frank Horton and Darren Ward.

Table of Contents

Introduction

This thesis looks at the contribution that professionals in architecture and planning can make in moving towards a 'sustainable society' by defining a broadly based brief for 'sustainable architecture'. The concept of sustainability acknowledges that the environmental debate has become global in scope. It remains however an undefined (and perhaps undefinable) term used by different groups in different ways. My initial premise is, then, that defining sustainable architecture goes beyond the development of quantitative techniques to which we tend to refer. In this thesis I isolate two main areas of concern:

• the city context of sustainable architecture;
• the radical critique of social, political and economic systems offered by political ecologists.

The former suggests that the efficiency of architecture as a technology must be considered within the context of the city, its efficiency and its social and economic problems and potentials. The latter suggests that technological efficiency may need to be considered within the context of moving towards a radical change in social, economic and political practice.

The Global Environmental Debate

In *Chapter One* I define the terms of the global environmental debate that provides a context for architecture and discuss the differences between 'environmentalism' and 'political ecologism'. Essentially environmentalists argue that sustainability can be achieved within existing capitalist growth systems but political ecologists disagree. Environmentalists typically argue that growth will raise 'standards of living' (material) globally thus reducing population pressures in developing countries and providing technological solutions to environmental dislocations. Political ecologists can be divided into two groups for the purpose of this thesis: social ecologists and deep greens. Both focus on Western levels of consumption and the problems of purely technological solutions (i.e. those that operate within present systems). Deep greens argue that ultimately there are natural limits to growth and thus postulate a society living frugally within the confines of these natural limits and in completely *self-sufficient* communities based on labour intensive production. Deep greens do not state these levels of consumption but imply lower levels than today in the West. This implies a need to completely alter our definition of the 'good life' and develop steady state economies. They also argue that such a society would be preferable to live in although rarely postulate a pragmatic means to achieve it other than almost religious conversion due to environmental dislocations. Deep greens are biocentric and at their most extreme propose draconian measures to reduce and control populations (in developing countries!) or impose limits. They tend to focus on human 'separation' from nature as the principal cause of environmental dislocation and postulate a return to living within 'natural laws'.

I develop, especially, the left anarchist tradition of 'social ecology' and note some characteristics that would shape architecture and landscape planning consistent with it's revolutionary aims. I discuss social ecology because it offers a radical critique of environmentalism but is, I argue, socially relevant and progressive unlike many 'deep green' philosophies. It is thus capable of developing an architectural and building response. Social ecologists concentrate on Western consumption as the critical environmental determinant as opposed to population growth or technological efficiency. They argue that social hierarchies, culminating in capitalism, are at the root of environmental exploitation. Hierarchies have resulted in human 'objectification' and the pursuit of growth as an end in itself. Ultimately sustainability depends on replacing hierarchical and domineering modes of thought in *human society* - it requires a cultural, social and political revolution that empowers and changes the way people think in hierarchical terms. A social ecological society would be based around creative autonomous individuals within a confederated direct democracy without private property. Our notion of abstracted labour would be replaced by more rotation. *It would contain creative self-governing citizens not passive consumers.* At this point anarchy and sustainability become inseparable and thus *sustainable architecture becomes anarchist architecture.* It should be noted that ultimately in an anarchist society there are no 'limits' but a continuing 'participatory evolution'. This is a critical difference with 'deep greens'. Further social ecologists support labour saving technologies and 'high' technology within an anarchist framework. Social ecology is humanistic and sees human management over nature as inevitable. Our social structures however can be changed so that we will manage nature sustainably. For social ecologists, while governments could potentially impose 'limits', the resulting society would be both totalitarian (anti-human) and destined to failure since ecological dislocations are rooted in human exploitation of humans. In response, social ecologists place an emphasis on developing direct participative democracy, greater self reliance (politically and in terms of production), and systems that communicate natural and industrial process. While political self-reliance is critical (control over life), *relative productive self-reliance* is a means to this end.

From a global point of view social ecologists address the West as a 'post scarcity' society where alternatives to material growth can and should now be developed. Developing countries as well as the environment are victims of capitalist growth economies and hierarchical trading patterns. Developing countries are not equally culpable in environmental destruction. Further population growth is a product of this exploitation and must ultimately be addressed by empowerment of the poor and the development of more self-reliant Western economies that do not exploit (not measures of population 'control'). For social ecologists the environmental argument that the present growth economy and global 'free markets' will eventually harmonise standards upwards is a myth. Rather they perpetuate poverty in, and environmental exploitation of, the South. Present systems perpetuate global divisions and maintain inequalities that drive growth. Focusing on the West is thus a critical concern of social ecologists. Unlike deep greens social ecologists will not impose on developing countries to stop industrialising. It should also be noted that by focusing on social divisions social ecologists intrinsically deal with social problems of today not the sustainability of an inequitable system. We must check that the problems of the poor today are not ignored in creating a sustainable society for the rich. Equality is an important aspect of any notion of development as well as possibly essential to sustainability. We must constantly remind ourselves of the utopian nature of the debate.

In *Chapter One* I note numerous *environmental* as well as *social ecological* reasons for more self-reliant Western economies in terms of, efficiency and encouraging efficient technological developments, bringing together cause and effect and reducing exploitation. I also note social problems and problems of alienation in wealthy societies based purely around growth and again suggest local political control and self-reliance as alternatives.

While deep greens postulate complete self-sufficiency and limits, social ecologists postulate political self-reliance, control over life and relative productive self-reliance (as a means to develop a less specialised more rounded populace able to take political control). This implies development of greater self-reliance at a variety of scales (national, regional and local). While the social ecological project is concerned with gradual empowerment of local groups, imposition from the top down for environmental benefit (including greater cost internalisation but free flow of ideas and consideration of trade as an exception rather than a rule) would facilitate change. Critically my arguments for greater self-reliance in *Chapter One* are not solely based on social ecology. As I develop this thesis I note other non-revolutionary benefits at a more local level. My aim is to develop connections between the social ecological and environmental perspectives.

Architecture and City Context (A Social Ecological Brief)

The social ecological revolutionary project involves empowering local populations *politically* with a consistency of means with ends. This changes any definition of sustainable architecture but cannot be *quantified*. A critical problem is that people may not want empowering in these terms. Many individuals and groups however do want empowering (for a variety of reasons) and it is these that this thesis attempts to facilitate in housing terms. Bookchin describes this as developing 'objective realities'. Clearly political decentralisation may conflict with uptake of environmental forms and technologies. Social ecologists advocate some of these technologies (biotics) since they empower and communicate process. Again, development means emphasising their immediate benefits and facilitating groups committed to some of the aims. The cost savings of environmental technologies and self-help will be important in this respect, along with building on and communicating deliberate lifestyle choices made by some groups.

Clearly architecture could play a critical technological role in enabling more productive self-reliant communities locally and increasing the attractiveness of such housing. Architectural process could also play a role in encouraging political decentralisation by empowering local people financially and in terms of skills. It can increase creative dialogue with our environment. Landscape design has similar potential as does planning at a larger scale involving city and regional self-reliance. Development of co-operative ownerships would also tend to social ecological forms. I thus go on to look at these issues in detail.

In *Chapter One* I note one predominant problem of social ecology in not addressing increasing environmental destruction today before an anarchist revolution. In response I argue that empowerment may be introduced within a context of implementing environmental techniques that in any case, as I go on to argue, can empower.

Environmental Cities

Criticisms of environmental building today can be made even if we accept the environmentalist framework that environmental dislocations can be addressed within our present capitalist growth systems. Research into the environmental impact of buildings has, for example, tended to concentrate on the most tangible and easily computed effects of buildings. Environmental architecture has become largely defined through these performance criteria that, at best for example, involve calculation of cradle-to-grave energy use for a building. While such methods are of undeniable value they are also, I suggest, limited and limiting. In particular they are:

• generalised indicators applied to specific design problems and involving specific occupants;
• devalued by ignoring quantitative city wide factors;
• abstracted from the social, political and economic context of the city in which they operate;
• removed from the problems and potentialities of implementing green techniques and the benefits of the fostering relationships between people and their environment (they are concerned with 'reduction of impact' as opposed to making 'positive contributions').

In chapters two to six I therefore analyse environmental measures in Western European (UK and Dutch) cities and their potential efficiency. I suggest suitable forms and techniques specific to the UK. Such measures include transport strategies, microclimate design, low energy building, low impact construction, food production in the city and its hinterland, ecological landscaping, water systems and recycling systems. The solutions proposed can be defined as environmental although I look at them in the broad terms of the city not the individual building. In the light of social ecology, I also develop their introduction of natural (and production) process into the city and their potential to empower local populations. I define these technologies as 'biotic' after Murray Bookchin. I also note some qualitative benefits of these technologies in terms of the health and livability of the city created. I therefore argue that these technologies can be seen as more 'positive contributions'. I note the practical benefits of increasing local user participation in many such environmental initiatives in terms of increased performance and 'fit'.

Having explored these technologies I define the *environmental* city as compact and mixed use technologically - i.e. the most efficient form. In *Chapter Two* I note the need for defragmented form accompanied by public transport developments to increase the efficiency of transportation systems. In chapters three, four and five I develop this notion and suggest that a dense mixed use fabric is potentially our most climatically appropriate and efficient form from the point of low energy design and utilisation of the existing 'energy capital' in the fabric. In *Chapter Six* I note that features that would seem to conflict with such forms - increased green space, city food production and water recycling systems, can actually be most effectively accommodated within the form proposed.

Social Ecological City Redefined
Following this analysis I am also able to *redefine* the *social ecological city* outlined in *Chapter One* technologically as compact and mixed use. I argue that the essential features of the social ecological city can be achieved within a dense city not the traditional anarchist utopia of bioregions. *I do this largely by looking at technological possibilities and potentials, separating productive and political self-reliance and discussing the city rather than the house as the principal self-reliant unit.* The political self-reliance demanded by social ecology I argue can be developed (and may be encouraged) within a dense urban form while 'sufficient productive self-reliance' can also be achieved to meet social ecological demands for a less specialised and creative population not committed to abstract labour. Neither can we ignore the revolutionary potential of the inner cities and its déclassé population and thus should deal with existing cities and their densities. Cities are, critically, social not parochial.

More Arguments for Dense Mixed-Use Cities and Greater Self-reliance
In *Chapter Seven* I go on to discuss the city as a social and economic entity today, that defines the spatial and socio/economic context for architectural and landscape projects. I note how it's form has developed around system reliance as opposed to self-reliance. It's *spatial fragmentation* and *monocultural environments* are a product of the capitalist division of labour, globalised markets, the attractions of dormitory suburban or rural living and the car. It has been emphasised by the desire of planners to separate functions for 'tidiness'. I note continuing trends in this direction in most European cities.

I describe how this spatial division in addition to its inefficiency in transport terms has tended to amplify the disempowerment of a system dependent population outlined in *Chapter One* and in this respect may amplify the ecological notion that consumption and growth have become our only means of expression. I describe the resulting inner city decay and poverty and suburban alienation again expanded from *Chapter One*. I note how implementation of the dense mixed use city described could in addition to being our most efficient form be more equitable, liveable and healthy. It would provide 'quality of life' by reducing local pollution, increasing road safety, providing vegetation and access to natural process within the city, providing better access to services denied at present to those without a car. It would increase the 'transparency' of the city (demonstrate process) and reduce the isolation of the poor trapped in inner cities and the better off in the suburbs. It may be seen as practically addressing the concept of 'development' as opposed to 'growth' or qualitative benefits as opposed to 'quantitative'. Such a form could be seen as a technological method to engineer a more efficient city but may also have positive benefits. It is a biotic technique. Ultimately however such form is dependent on development of a more self-reliant society.

In *Chapter Seven* I also note practical social and economic benefits of greater self-reliance in cities based on some of the problems of inner cities and suburbs today particularly northern industrial cities with high unemployment. I note the potential of local self-help initiatives in addressing the consequences of disempowerment of poorer inner city communities. I thus build on the notion of self-reliance as an economic, social and sustainable concept of 'development'. Today's cities are shaped around distant control process, capitalist ownership and the division of labour supported by technology. Self-reliant society would develop mixed use form while imposition of mixed use form and technologies discussed will enable self-reliance.

Environmental Implementation
In *Chapter Seven* I also look at some of the cities problems and potentials as the context into which the environmental techniques and forms discussed will be *implemented.* I note the derelict fabric and wasteland due to outward movement in many Northern industrial cities. Utilising these areas is important in terms of the energy embodied in the existing fabric but also in terms of the benefits of addressing people in their environments and dealing with the existing complexities of our cities not starting again outside the city. These are in addition to the energy issues of density (encouraged by focusing on the city) noted in chapters two to six. I add to the benefits of participation in chapters two to six in terms of fit and use of environmental measures. I note social and economic benefits of confidence and skill acquisition in inner city communities and the benefits of participatory methods that will closely fit participants and their districts. I also note the mistakes of previous top down city planning on green-field sites without participants and the problems of architectural determinism to achieve change. Finally I note that participation is essential in developing greater self-reliance and thus providing a real 'brief' for mixed use (efficient) cities. *Communities activated through self-help are more likely to develop more locally self-reliant communities politically and spatially.* Participative implementation process is now accepted by environmentalists as 'subsidiarity' and I believe that in this thesis I strengthen this case. Subsidiarity is seen as vital to environmental (or any other) implementation although imposition of regulations within a growth system would be the principal mechanism. *Environmental* implementation should thus involve participation within an environmental framework of the technologies and forms discussed. It should involve a supportive framework for local community businesses and co-operatives and develop local initiatives that employ local people and use local goods. It should focus resources on the inner cities, its people and fabric.

Social Ecological and Environmental Implementation
In *Chapter One* I note that the *social ecological project* is one of gradual political empowerment of déclassé groups. From a social ecological point of view, means and ends must be consistent - what people do not do for themselves they will never control. This demands the devolution of power and development through local groups and confederation. Critically as Bookchin recognises this means that the form and technologies of society and city must remain undefined and cannot be dictated. Political self-reliance is the ultimate aim. Bookchin however recognises the role of agitators (here planners and architects). They can develop forms that begin to explore those of an anarchist society. This, I argue, involves developing the existing fabric and necessitates developing forms of greater density than the decentralised anarchist utopia (which cannot be defined).

Bookchin foresees a slow revolutionary project building on existing 'objective realities' for local groups that tend towards self-reliance. *Here I argue that devolution could be encouraged from top down by emphasising the benefits of subsidiarity in environmental architecture and thus using the environmental agenda towards social ecological aims.* Social ecologists must develop the similarities of their city to the most efficient city form today. This involves emphasising benefits of biotic technologies that will be efficient but also empower. In short I argue that *sustainable architectural and planning strategy* should focus on increasing the mixture of uses and implementing biotic technologies in our existing fabric through developing locally led regeneration where possible. It should facilitate existing local initiatives based on utilising and developing appropriate 'objective realities'. It should focus on inner city local development where possible along with reducing the environmental and social impact of the suburbs on the inner city by increasing a mix of uses, group housing projects and public transport nodes. Development in both inner cities and suburbs should encourage organisational and spatial association and confederation.

Towards Self-help Housing Assistance and Top Down Supports
Having noted the benefits of focusing on local self-reliant action in the inner city (and suburbs) in *Chapter Seven* and the benefits of participation in environmental architecture (chapter's four and five) and landscape (*Chapter Six*) I go on to look specifically at self-help housing and participation in housing process. It is my contention that encouraging and developing self-help, or at least increasing participation in housing, landscape and planning can aid moves towards more sustainable cities. Such a conclusion leads to a need to redefine the role of architects, landscape architects and planners in terms of both a developing process consistent with social ecology and in terms of an developing an environmental framework for self-help and participation.

In *Chapter Eight* and *Chapter Nine* I critically appraise self-help and participative methods in housing today. In Chapter Eight I note forms of self-help housing and why they emerge to provide a basis on which to suggest initiatives that will fit existing realities. I also look at more benefits of self-help in terms of increasing housing provision, appropriateness, longevity, 'fit', expression and increased local responsibility (added to benefits already discussed). I note whether self-help housing moves towards anarchy or serves simply to entrench capitalism by for example allowing people to enter the market in housing. I look at how social ecological and environmental advocacy of self help imply expanding its remit beyond providing social housing. I look at co-operative ownership as a facilitator of self-help housing but also as an 'ideal' form of ownership in terms of environmental design potential, political decentralisation and providing control without equity gain. Co-operative ownership offers housing ownership that tends against commodification and is relevant to existing problems of 'ownership' (e.g. negative equity). Social ecology operates at a communal level not the individual. I also suggest that loose co-operative groups enable sharing of skills and grouped environmental design. This results in economies of scale. I therefore suggest that independent self-helpers are encouraged to combine into groups. I suggest financial, resource and lifestyle benefits that make this immediately attractive and suggest a proactive co-operative self-help policy.

My analyse of self-help, participative and co-operative examples of housing provision is based on the fact that they are practical approximations of ideal forms for the brief developed. All are responses to immediate problems and could be developed with reference to sustainability. *To develop appropriate supports for appropriate imperfect forms is an important environmental and social ecological aim.* In *Chapter Nine* I discuss specifically: Byker Housing, Newcastle; Liverpool Co-operatives; Self-build techniques particularly the Segal Method; N. J. Habraken's concept of support structures in the Netherlands; the SkillBuilding initiative; and particularly Dutch Co-housing. I supported this analysis with a six week visit to many Dutch examples. Successful completion I note depends on a balance of local and professional skills and knowledge and design and constructional systems that allow diversity within limits (cost restraints). I cannot make universal claims for self-help housing or participation but suggest that facilitation and development of self-help housing and participative methods will be an important factor in the development of more sustainable cities.

In concluding in *Chapter Ten* my aim is to develop possible methods of promoting and supporting environmental techniques within a self-help, preferably co-operative, framework and thus suggest practical methods of developing both the social ecological critique and the environmental benefits of self-help and participation within the context of the whole city. In the light of the examples discussed I suggest several applications based on the broad notion of 'support' policies to encourage co-operative participation in housing development and the implementation of the green technologies discussed (biotic) within a participative framework. These policies would involve planners, landscape architects, architects and municipal and central authorities. They would involve general city level policies and well targeted supports that consider specific groups aimed for and what features can best be developed. Generally they would:

- attempt to increase the number of self-help housing groups - by developing accessible financing packages, design and construction techniques (that maintain or increase environmental performance standards), and pro-active frameworks;
- provide accessible environmental support to individual self-helpers - by developing suitable construction techniques and literature - but attempting to encourage grouping;
- attempt to increase participation in housing design if not self-help - by developing 'support structures' with environmental specifications;
- attempt to devolve power - through developing and supporting co-operative ownership (preferably non-equity) and developing construction and training methods that facilitate skill acquisition;
- encourage take up of biotic technologies - through developing targeted measures and grants depending on payback periods and for example, developing city/municipal level forestry and recycling systems into which communities could plug;

• attempt to reduce spatial fragmentation - through mixed use structure planning, public transport initiatives and developing self-help that extends beyond housing production;
• increasing local environmental participation - through municipal participation initiatives, feedback initiatives and encouraging local environmental action.

They would include developing appropriate ownership options for the variety of potential participants, supporting even loose confederation of individual self-helpers to encourage group design, setting up city based educational and demonstrative resources (green centres), developing appropriate design methods and construction techniques that take into account environmental and self-help requirements, determining and applying regional whole house performance requirements and construction preferences, giving grants (possibly related to feedback) to encourage biotic measures, encouraging and supporting developments in co-housing, developing adaptable building forms and constructions. Municipal action might involve municipal or co-operative recycling centres to which groups can 'plug in', municipal urban forestry and agriculture programs again to which local groups and co-operative could contribute, setting up municipal feedback projects and local sustainable consultation groups to develop concepts, and developing mixed use structure plans. Such an 'enabling' approach, I suggest, would have the potential to make better use of public, individual and material resources.

Social Ecology, Environmentalism and Self-help/Participative Housing
The critique developed in my research leans heavily on that developed by the proponents of social ecology, particularly Murray Bookchin. Social ecology is a revolutionary movement although can simply be looked at in terms of improving democracy. Social ecology I argue, while radical, offers a realistic framework for city development that is not anti-technological and offers solutions to existing social problems. It provides a radical but realistic alternative to the distracting polemic between deep greens and environmentalists. My research contributes to social ecology by describing ways in which such an approach can be applied to the built environment by *developing appropriate initiatives*. Such an approach is informed by demands of the social ecological revolutionary project that means should be consistent with ends. It involves building on 'objective realities' of existing initiatives that tend towards the ideal.

Housing development is critical to developing political and greater productive self-reliance at a local level. Planning methods similarly at district and regional level. Architecture is a discipline where users and their environment interact and is an ideal discipline through which to develop a more politically and productively self-reliant population perhaps less dependent on material consumption. Encouraging self-help and developing supports to aid the successful completion of self-help projects is a way to develop local political control that for social ecologists will overcome commodity fetishism. It can help bridge the gap between abstract labour and home life that is seen as a principal problem in disempowerment (particularly within the environmental context of implementing mixed use structure plans). It involves the relationship of architect and user within the context of the remaking of the psyche (critical to the social ecological project). Developments must consider social and economic realities while modifying existing attitudes to hierarchy and consumption. They must tackle piecemeal the complexities of the city and it's population today and develop participatory process.

In this thesis I believe I collect enough evidence to demonstrate that increased participation of user clients, self-help process and co-operative ownership should be fundamental to any architectural and planning strategies that call themselves environmental. Architects who are developing sustainable projects should focus on a well thought out participatory design structure which can empower individuals, households or communities. Self-help processes offer utopian benefits (since they fit the social ecological revolutionary project), practical and social benefits in terms of cities (particularly in terms of housing provision) and more specific benefits in terms of operation of environmental systems (again particularly in housing). There are environmental reasons for expanding such initiatives to a certain extent and social ecologists should develop these connections. I have argued for example that self-help process and imposed biotic technologies can help democratise the city while environmental techniques are improved and better implemented through participation (and subsidiarity generally).

I suggest that any methodical approach to sustainable architecture should take into account the social ecologist's criticisms of the existing global context while implementing more environmentally benign technologies. This I argue has two practical implications, first implementing technologies (including city forms) consistent with more self-reliant and transparent cities and second supporting local self-reliant initiatives and expanding the realms of participative design.

Limitations and Potentials of Self-help Housing and Targeted Supports
The starting point of this thesis was to look at how architects, landscape architects and town planners could effectively contribute to creating sustainable cities. I set out with the premise that the physical

performance of a building is only one aspect of ecological architecture. Even in quantifiable terms the building must be considered in relation to those around it. The sources of many environmental problems are rooted below the level of quantifiable and analysable performance criteria. I argue that at least some of these problems are rooted within social structures, in particular within hierarchies and specialisations. In the sphere of producing and maintaining the built environment self-help, self-build or participation might begin to address environmental problems that are socially driven by breaking down hierarchies and specialisations to a greater or lesser extent. Critically I note the potential of housing development and architecture generally in creatively involving people in their own environments even if this does not extend to reducing 'abstract labour' or generating more self-reliant systems generally.

My intention is not to suggest that self-help housing (in any or all its manifestations) is the answer to environmental problems in the built environment. Self-help clearly cannot, even in all its forms transform the built environment. Only a certain proportion of the population today will be eligible, capable or want to design or build or oversee the building of their own house. There can be no guarantee that personal responsibility for housing will translate into environmental responsibility generally or demands for greater self-reliance. Further even communal self-build projects must answer to the political problems discussed in *Chapter Eight* that they may only extend commodification.

Self-help housing however provides a means for many people to obtain appropriate housing. It can also activate communities producing more self-reliant citizens capable of demanding and meeting their own needs locally. The development of environmental self-help or participative initiatives would produce housing that fits it's local climate and its users (at least it's initial users). Development of adaptable forms and construction methods can extend this notion. Environmental self-help initiatives could expand the debate of sustainable architecture, encompassing occupants and thus addressing critical relevant social issues. Self-help and participation provide a realistic opportunity by which to compliment the standardisation of current housing design and the reductionist tendencies of environmental design analyses. It can play an important role in developing more diverse and creative cities that is important in attempting to encourage the notion of qualitative development rather than quantitative growth.

If one accepts the social ecological premise that local control and decentralisation are valuable ingredients of a sustainable social structure, promoting diversity and individual responsibility, then the self-help movement is a sustainable movement. I have however also analysed the implications of self-help as it currently exists and suggested means by which the overall efficiency of self-help housing itself and the performance of the houses produced might be improved. I have suggested some additions to housing policy which might extend and develop the most appropriate self-build opportunities.

In conclusion I suggest an environmental framework be laid over the top of policies encouraging local control. Philosophically this introduces problems. There is an inherent conflict between local control and an imposed framework. Of course the framework need not be imposed and I suggested various means by which education might inform without imposition. Further imposing this framework may in certain cases be a means of empowering. Ultimately the balance of energy saving (that can empower) against value output (largely in terms of user satisfaction) or financial saving today must be made intuitively. Well targeted supports can however improve efficiency of self-help housing and develop towards more direct democracy by utilising existing reasons for self-help and facilitating biotic techniques that develop existing reasons, demonstrate process and reduce costs and external reliance. General city scale supports to increase, for example, mixture of uses and city forestry will also be important.

BLANK IN ORIGINAL

Chapter One:

Green Positions and the Sustainable Society of Social Ecology

Introduction

In this chapter I outline some fundamental arguments of the global environmental debate with reference to the distinctions between 'environmentalists' and 'greens'. For political ecologists (greens) if every city was developed around public transport and every building was energy efficient and constructed from recycled materials this would *ultimately* not have any effect on environmental dislocations. Reduced consumption and a steady state economy are essential. Defined in this way green architecture and the city must encourage a move towards overcoming our growth ethic not simply reduce its technical impact. A critical question remains as to the level of consumption we can achieve sustainability for any projected reduced global population (i.e. what steady state is in line with absorptive and regenerative capacities of the biosphere). The effect of increased global population before reductions is also important. Further we must note whether our most immediate concerns differ from ultimate aims. Finally, given the utopian nature of the debate and the fact that catastrophes outside our control can occur at any time, we must ask whether social problems today are more important concerns and whether they are linked to environmental concerns.

I isolate social ecology as a third strand in the debate based on a left anarchist tradition. Social ecology, I argue, offers a radical critique that goes beyond the narrow confines of environmentalism while at the same time being applicable to our existing context. Social ecology does not place humans within 'limits of nature' of 'equal worth' with other species but is 'humanist' and 'managerial'. Neither is social ecology anti-technological but sees technological efficiency as secondary to its 'social matrix'. Critically it sees environmental dislocations as driven by social hierarchies. As a radical movement social ecology proposes an alternative form of society and postulates the means by which it can be developed. It thus sets a context for city planning and architectural design. Social ecology supports direct political participation in the community as essential to developing both sustainability and intra-generational equity. In these terms, green architecture becomes defined through its contribution to the creation of more self-reliant, creative, self-governing citizens (not passive consumers) and its introduction of natural (and production) process. These are in addition to, and more important than, the generally accepted best environmental measure of 'total ecological load' within the city hinterland. Social ecology has a tendency to spatially dispersed decentralisation that I criticise under *Ecotopia* in this chapter and in future chapters within the context of present physical fabric and it's potential for self-reliance if not self-sufficiency.

In summary social ecology is developed around several precepts:

• 'humanism' is the reason for interest in global environmental problems;
• social problems today (intra-generational) are important in their own right;
• ecological dislocations have social origins based on hierarchy and the dehumanisation of people and thus exploitation of nature;
• 'limits to growth' exist for present hierarchical systems;
• scarcity today, is however, largely a product of distribution and Western consumption patterns developed on the back of exploitative trade patterns;
• a 'free' society can 'extend 'natural limits';
• humans (second nature) must intervene and manage first nature;
• Marxism as a revolutionary project was capitalistic in its objectification of humanity based on the materialist notion of 'scarcity' that implies nature is a dead body of exploitable resource and maintained 'workers' as 'tools' of production;
• technology exists within a social framework (or matrix) and will facilitate sustainability if it operates within a direct democracy;
• thus concepts of 'high', 'intermediate', 'solar', 'small-scale' and 'large scale' technologies are subverted by the role of technology in an emancipatory society developed around human subjectivity notion of the 'good life' not instrumental definitions of material gain;
• the 'post-scarcity' nature of Western countries provides possibilities for freedom.

Social ecology is revolutionary and utopian but is founded on social divisions. Addressing these problems can be seen as progressive and offers a new definition of green architecture. Social ecology advocates:

• the development of a non-hierarchical social matrix based on the equality of unequals and around autonomous individuals within confederated directly democratic units (but not self-sufficient);
• the use of 'biotechnic' technologies (including decentralised cities) that introduce natural (and production) process into the city;
• a general not particularistic revolutionary project (see *1.9.2. Remaking Society - The Social Ecological Project*).

Starting this thesis with a look at global environmental issues has raised more problems than can be 'solved' here or elsewhere. What such an introduction can do however is give perspective to the development of architecture within the city. It enables a coherent brief to be developed in response to tendencies for green architecture to be tokenistic, ignore social issues, and concentrate on technological solutions that perhaps 'fix' nothing.

1.1. Environmental Dislocations

It is now generally accepted that the last 2 decades have seen the rise of environmental problems from regional to planetary scale and scope. The spreading deserts and shrinking forests of the 70's were joined by 'acid rain', the 'ozone hole' and the threat of 'global warming' in the 80's. In March 1994 the Bracknell-based Hadley Centre published the first results of the most sophisticated model yet devised to measure climate change.[1] It estimated climate change at 0.2°C a decade. This acknowledged conservative estimate represents the fastest warming of the Earth since the last Ice Age 10000 years ago. Today's green debate is based on the global nature of environmental concerns that extend beyond conservation and 'saving the whale'. Bookchin notes "Ecologically, humanity is faced with major climatic changes, rising levels of pollution, and new, environmentally induced illness. Terrible human tragedies in the form of hunger, famine, and malnutrition are claiming millions of lives annually. An incalculable number of animal and plant species face extinction as a result of deforestation and lumbering activities and acid rain. The global changes that are degrading the natural environment, and may eventually render it uninhabitable for complex life forms, have an almost geographical massiveness, and they may be occurring at a pace that verges on the catastrophic for many plant and animal species."[2]

While it may have been hoped that planetary changes would have moved the ecology movement to the foreground of social thought and added new insight into social organisation, this has generally not been the case and the ecology movement has broken into several often contradictory factions. Dobson differentiates principally between environmentalism and ecologism. "Ecologism seeks radically to call into question a whole series of political, economic and social practices in a way that environmentalism does not."[3] Fundamentally, ecologism takes seriously the universal condition of the *finitude of the planet* and asks what kinds of political, economic and social practices are both possible and desirable within that framework. Care of the environment needs a fundamental change in our relation to it. Dobson argues that while most post-industrial futures revolve around high-growth, high-technology, expanding services, greater leisure and satisfaction conceived in material terms; ecologism's post industrial society questions growth and technology and suggests that the good-life will involve more work and fewer material objects. Environmentalism on the other hand is a managerial approach to the environment within the context of present political and economic practices. Environmentalists typically believe that technological measures will solve problems they create and will not subscribe to the need for frugal living. Dobson notes in addition that groups such as Greenpeace and Friends of the Earth are not ecological. Greenpeace concentrate on specific forms of direct action while Friends of the Earth concentrate on expert lobbying. While many of their members might individually subscribe to the necessity of radical changes the organisations do not explicitly do so.

As I will note this broad distinction between ecologism and environmentalism does not cover all the views in the environmental debate. Social ecology for example is 'managerial' and humanistic but revolutionary. It recognises social problems of today in their own right.

1.2. Primary Determinants - Population, Technology and Consumption

Harrison notes that in 1950 there were 2.5 billion people on the globe, by 1970 the figure was 3.7 billion and by 1992 the figure had reached 5.4 billion as a product principally of population growth in the

[1] Polly Ghazi, 'Heat is on to stop the slow thaw', *The Observer*, 26 March 1995.
[2] Murray Bookchin, *Remaking Society*, Black Rose Books, Montreal, 1989. p159
[3] Andrew Dobson, *Green Political Thought*, Harper Collins, 1990.

South.[4] This rise has been accompanied by a consumer revolution of mass affluence in the North in the last 4 decades that has spread to East Asia and is now reaching an expanding middle class in the South. Harrison argues that this conjunction is no coincidence; environmental problems are the outcome of 'population' and 'consumption' explosions. Technology is a third critical determinant since for each unit we consume we are using too many resources and emitting too much pollution.[5]

Harrison explores the relationship between population (the number of people), consumption (the amount each person consumes) and technology (*how many resources are used and how much waste produced to meet consumption needs* or impact per unit of consumption) and their consequences for pollution emission and resource use.[6] He attempts to quantify the extent to which environmental problems *globally* are the fault of consumption levels, population growth and forms of technology and which can be most effectively addressed. He refers to these factors as 'primary determinants' or 'proximate factors' that operate directly on the environment where:

I (environmental impact) = P * C * T

As primary determinants population, consumption and technology are at the centre of the green debate. They have different relative effects depending on specifics of time and space and the form of impact. It should also be noted that population, consumption and technology are interlinked and affected by other factors, variously stressed by different groups in the environmental debate. These include poverty, inequality, democracy, 'development', market freedom, land ownership and women's rights. Green, environmental (or anti-environmentalist) positions can be defined by:

• perceived determinants of population growth, consumption levels and forms of technology;
• whether or not 'limits to growth' exist (due to pollution emission or resource use) and thus critically whether consumption must be addressed;
• priorities for addressing the problems globally (since determinant factors vary globally);
• ethical values of why we should address global environmental problems.

Population

World population increase is now 97 million per year. It is expected to grow to 8.5 billion by 2025 and could pass 10 billion by 2050. It may rise to 11.5 billion before levelling off.[7] Since growth in the West has stabilised, measures to control population growth are clearly intended for the South where over the next century and a half, it is estimated, 98% of population growth will be concentrated. For every extra person in Northern countries there will be sixty in the South.[8]

Harrison argues, that population initiatives may be the most promising avenue to reduce environmental impact. Clearly, in addition, if one day we face an absolute ceiling on the output of pollutants then lower population will mean 'higher individual rations'. Given serious efforts and at an annual equivalent to about three days of military spending argues Harrison we could bring the population total for 2050 down to the low UN projection of 8 billion.[9] After that he continues world population could fall. To accomplish a population peak at lowest current estimates however "We are not talking about coercion or about low quality programmes to throw contraceptives at the problem. These approaches do not work: they abuse women's rights, spread distrust and actually slow down the spread of family planning."[10] Rather he argues for a combination of measures including the extension of women's rights to property, credit, jobs, equal pay and power and equalising female education and literacy. He also argues for improved maternal and child health to reduce infant mortality and give parents confidence in their childrens survival. These elements will reduce increases slowly by themselves but universal access to good-quality family planning would also be required. Other indirect factors that could reduce population growth argues Harrison include ending absolute poverty, improved distribution of land and other assets, a more just economic order and better democracy and local control.

It should be noted however that even if accomplished, this peak population is far in excess of today's. We would still be faced with a considerable increase in world population increasing pressure on what many believe to be an already overloaded system. Harrison points out that in the 1980's efforts to address population growth were in any case minimal with Western governments blaming home based recession

[4] Paul Harrison, 'Analysis' in John Vidal (ed.), 'earth', *the Guardian*, June 1992.
[5] ibid. p323
[6] ibid. p323
[7] ibid. p323
[8] ibid. p271
[9] ibid. p330
[10] ibid. p328

for failure to provide support for initiatives. Further if these drastic levels of population growth are, partly at least, the product of poverty (i.e. inequality globally), it should be noted that many argue that divisions between North and South are actually *continuing to grow* due to western exploitation (see *1.4.5. Limits to Growth and Trade).*

Many alternative views exist on reducing population growth. These include extremes of non-interference with natural diseases such as AIDS, 'population control', and cutting aid. On the left reducing inequality through tackling neo-colonialism and unfair global trading systems is postulated. More conventionally continued industrial economic growth to 'decrease poverty' is seen as a solution.

Population growth is clearly important and requires action. Harrison describes pragmatic measures within existing systems. Greens and social ecologists would criticise the right wing race for industrialisation to reduce population growth as flawed because the GDP of developing countries is going down not up with current policies and because ultimately 'limits to growth' exist despite action on population (see *1.4. Greens and the Limits to Growth*). Social ecologists would emphasise conflicts of addressing inequality through present trading systems that rely on exploitation to increase Western consumption. Adjusting debt and increasing aid that is not tied to trade are essential mechanisms to increase equity.

Consumption

Harrison argues that at present and in the near future excess consumption in the rich countries bears the main blame for damage to global commons. The average person in a developed country emits roughly twenty times more water and climate pollutants than their counterpart in the South. Hence the 57.5 million population growth in the North expected during the 1990's will pollute the globe more than the expected extra 911 million Southerners".[11] In his contribution to 'earth' Eduardo Galleano points out that the richest 6% of humanity consumes a third of all the energy and a third of all the natural resources consumed in the world and that one North American consumes as much as 50 Haitian's.[12] In 1991 developed countries generated 91% of the worlds industrial waste, 93% of its industrial effluents and 95% of its hazardous waste. They were responsible for 87 per cent of the world's chloro-fluorocarbon emissions and 74 per cent of carbon dioxide. Since we make up 22% of world population per person figures are even more glaring.[13] The following table clearly illustrates some of the divergence in 'wealth' and consumption of so called 'developing' and 'developed' countries.

Developed World	*Developing World*
• 25% of world population	• 75% of population
• 80% of consumption of energy	• 20% of consumption
• 90% of automobiles	• 10% of automobiles
• 70% of fossil fuels	• 30% of fossil fuels
• 85% of consumption of chemical production	• 15% of consumption
• Average US citizen uses 12 000 tonnes of coal (equivalent) a year	• Average Ethiopian consumes 55lbs of coal (equivalent) a year
• 86% of world industry	• 14% of world industry
• 5 countries control 60% of industry	• 44 least developed countries 0.21% of industry
• 4% interest on foreign dept	• 17% interest on foreign dept
• 500 million earn over $20 000 a year	• 3 billion earn under $500 a year
• Water use 350-1 000 litres per day	• Water use 20-40 litres per day
	• 40 countries poorer than in 1980
•250 000 die on roads a year	• 100 million affected by famine in 1990

Developed World: North America, Western Europe, Eastern Europe, Japan, Australia.
Developing World: Latin America/Caribbean, Africa, Asia.

Fig. 1.1. Divergence in 'wealth' and consumption of so called 'developing' and 'developed' countries[14]

[11] ibid. p324
[12] Eduardo Galleano, 'View from the South', in John Vidal (ed.), 'earth', *the Guardian*, June 1992.
[13] Paul Harrison, *The Third Revolution*, Penguin Books, 1992. p256
[14] Eduardo Galleano, 'View from the South', in John Vidal (ed.), 'earth', *the Guardian*, June 1992.

Dobson points out that US per capita energy consumption is 2.5 times the European average as well as thousands of times that of many developing countries.[15] The rich are quantitatively more damaging - they are more mobile, heat bigger homes and purchase more short life consumer goods. Such distinctions apply within the 'developed' and 'developing' countries as well as between 'developed' and 'developing' worlds.

Population and Consumption

Harrison argues however that in future years the combination of population and increased consumption in the South will be of a greater importance. He notes that in the 21st Century southerners will outnumber northerners by nine to one. Even at *modest consumption levels* argues Harrison population growth is a problem. By the year 2000 "developing countries will account for 60 per cent of fertiliser use, and by 2025, for 44 per cent of carbon dioxide output from fossil fuels."[16] While changes over time are a critical factor the West will, per person, continue to consume more for the foreseeable future (along with Japan and Newly Industrialised Countries). Later I look at left-green critiques of global trading patterns that continue to favour the West thus preventing development in the South that they argue could address population growth.

Problems of Consumption

Pessimistically Harrison argues that there is little hope of reducing the average person's consumption over the next half century "The poorest one billion must increase their consumption. The middle three billion will not rest with the odd radio, bicycle or fridge they now have. They will go on aiming for the western dream - including cars. The richest billion will not readily renounce even part of their affluence. Threats to the pocket are the stuff of which election defeats are made."[17] Consumption per person, he argues is likely to at least double. The impact of population and consumption is already high, but by 2050 it could increase by four times.[18] Increase in the wealth of developing countries, Eastern Europe and China must be considered (although colonialism will undoubtedly control this). Television; consumerism's Trojan horse, multiplies material wants directly through advertising and indirectly through 'soap opera life-styles'. Many Third World television programmes are imports from America, the richest consumer society in the world.

Harrison notes further how "Dematerialization is something of a mirage. The proportion of material goods to total spending may well be falling in many western countries. But incomes are rising, and Westerners own more material possessions of more kinds than ever before".[19] Yesterday's luxuries have become today's expectations or *needs* - electric light, refrigerators, indoor taps showers and toilets irrespective of their environmental impact. Later, I discuss the green concept of *needs* and *wants* and the distinction between them in dealing with consumption - material, energy, food, and conspicuous consumption.

The problems of addressing consumption are clearly many. Material consumption and conspicuous consumption have largely become the means by which we define ourselves. Seabrook notes that it has become a *self defeating addiction driven by big business through advertising, changing styles and disempowerment.*[20] Such problems lead Harrison to suggest that addressing technology and population is the most promising approach at *present*. This critique is pragmatic and aimed at immediate potentials within existing structures (it is environmentalist).

The trade patterns that have produced and maintain wealth differentials are an important factor for greens. They have produced a position in which some have become accustomed to wealth at levels not achievable by all. While we cannot dismiss the desire of developing nations to industrialise greens would attempt to demonstrate that it cannot be in their own interests given the restrictive stranglehold of the West if not the future of the planet. In the West consumption can be reduced *because* of abundance and would be accompanied by greater self-reliance (see *1.4.5. Limits to Growth and Trade*).

Technology

Technology as defined by Harrison involves resources used and pollution emitted to meet consumption needs (for example insulation does not change need for heat but reduces *consumption of energy* to produce that heat).[21] Population growth and increased consumption both clearly increase impact (even if

[15] Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990.
[16] Paul Harrison, *The Third Revolution*, Penguin Books, 1992. p324
[17] ibid. p323
[18] ibid. p323
[19] ibid. p277
[20] Jeremy Seabrook, *The Myth of the Market: Promises and Illusions*, Green Books, Bideford, 1990.
[21] Paul Harrison, *The Third Revolution*, Penguin Books, 1992. p237

some on the right see population increase and consumption driven by industrial growth as unlimited and essential to human colonisation of other planets!). Technology change is however more complicated since in theory it can increase or reduce present impact. Harrison describes how "An increase in technical armoury sometimes increases environmental impact, sometimes decreases it. When throwaway cans replaced reusable bottles, technology change increased environmental impact. When fuel efficiency in cars was increased impact was reduced [impact per Kilometre)."[22] Often technology change does both "The coal-burning steam engine reduced deforestation: but kick-started the era of acid rain and global warming."[23] *Technology may also perhaps increase waste carrying capacity (fertilisation of open seas to increase uptake of CO_2) or develop alternative resources.* This is a critical point that I will return to after discussing green 'limits to growth'. Harrison notes further that technology change as with population but unlike addressing consumption can have a large impact over a relatively short period. It can be noted that *institutional techniques* - capitalism, markets, free trade or protectionism, political systems affect levels of consumption. The potential of technology to reduce impact and extend carrying capacities or to remove problems to other areas often multiplying their effect; its potential to defeat 'limits to growth', and its potential if not driven by capitalist market economics (change in institutional techniques) provide the crux of the debate I go on to discuss. I return to the subject of technology having referred to the green 'limits to growth' theory.

Population, Consumption and Technology
As noted effects of population, consumption and technology are related; changes in consumption (wealth) can lead to changes in population growth and vice versa, changes in consumption may lead to changes in technology. One argument for continued growth by environmentalists is that it drives the development of more efficient technologies generally and enables transference of these technologies from developed to developing countries. Harrison's recognition of the impact of Western consumption despite our wealth and supposed 'technological superiority' suggests the case for economic growth encouraging development of solutions *per se* remains to be proven. Neither is 'technology transfer' to developing countries such a 'spontaneous' process.[24]

1.3. Possible Positions

Although there are a myriad of pro- and anti-environmentalist views that are often eclectic, here, I suggest the following basic positions can be defined:

• Cornucopians on the right wing argue that technology driven by free market capitalism will provide for all in the future and continually defeat 'limits to growth'. Population growth can increase to help colonise the galaxy by providing needed labour.
• Promethean environmentalists and left environmentalists see a need for efficient technology but argue that this can, or will only, be developed within the existing structures of capitalist society that has been demonstrated to be robust and stable enough. Promethean Environmentalists may advocate some protectionism and government restrictions to free trade based on accounting for externalities but tend to see salvation in technological solutions (and perhaps reducing population through equity).
• Radical greens generally argue that there are 'limits to growth' and therefore that there is a need to reduce consumption in the West due to intrinsic problems of technological solutions. There are however numerous variations broadly divided into:

Deep greens include: soft deep ecologists, 'anti-humanist anarchists', harsh deep ecologists or 'primitivists' and authoritarian greens. They variously suggest population 'control' and living within 'natural limits'. They may equate humans as of equal worth to other species or as of secondary importance to GAIA and blame all people for environmental destruction. Frugal living will be based on an almost religious view of nature.
Social ecologists or humanist eco-anarchists see limits to growth of capitalism and are also critical of capitalist markets and their resulting intra-generational inequalities. They note however unlimited human capacities and technologies developing within a new political order based on non-hierarchical society and management of nature.

---
[22] ibid. p237
[23] ibid. p237
[24] Glenn Albrecht, 'Ethics, Anarchy and Sustainable Development', in Tom Cahill (ed.), *Anarchist Studies*, Autumn 1994.

Martin Lewis defines the predominant green ideology as left-liberal ecocentrism with *"decentralisation and local autonomy; a simpler, smaller scale, face-to face life closer to nature; labor-intensive modes of production; a de-emphasis on material things; individual self-sufficiency...; and cultural diversity"*.[25] He also defines eco-feminist and eco-Marxist positions.[26] I now discuss the 'limits to growth' thesis that forms the core of humanist and antihumanist political ecologist positions.

1.4. Greens and the Limits to Growth Position

The foundation stone of green politics is that a finite earth places 'natural' limits on economic and population growth. The earth has a limited carrying capacity for (population), productive capacity (for resources) and absorbent capacity (for pollution). Dobson argues that it is the 'limits to growth' thesis and the conclusions drawn from it that divides light-green from dark-green; green consumerist strategies from those that question the roots of existing society.[27] The guiding principles of 'sustainability' and 'finitude', and the careful negotiation of Utopia that they demand forces greens to question consumerist strategies of 'environmental responsibility' (environmentalists see growth and responsibility as developing solutions to 'limits'). Greens argue that, while we have become removed from contact with the earth in our everyday lives, all 'wealth' still derives from it.

In the initial Club of Rome's Report *The Limits to Growth*, published in 1972, five points of concern were outlined: accelerating industrialisation output, rapid population growth, widespread malnutrition, depletion of non-renewable resources, deteriorating environment.[28] The study used a simple computer model to project trends in population, resource use, food production, industrial output and pollution. If business continued as usual (no major change in physical, economic or social relationships) it would lead to catastrophic collapse of population around 2025. Several more optimistic scenarios had similar results. One scenario avoided catastrophe. It involved stabilising population at 1970 levels and huge reductions in resource use and pollution per unit of gross national product.[29]

The researchers concluded that the application of technological solutions (broadly understood as solutions formulated substantially within the bounds of the present, economic, social and political practices) alone have prolonged the period of population and industrial growth, but have not removed the ultimate limits to that growth. Garrett Hardin has defined a 'technological solution' as: "one that requires only a change in the techniques of the natural sciences, demanding little or nothing in the way of change in human values or ideas of morality".[30] Technological *gadgets* simply shift the problem around and will not bring about sustainable societies.[31] If technology change is not a solution then there is a need for more profound changes in social thought and practice. Dobson notes that this means abandoning a Promethean (in this context, technological) attempt to overcome 'limits to growth' but returning instead to a 'simpler' existence.[32] This would involve changing the concept of 'growth' as simply based on 'material' consumption. Later however I discuss whether certain technologies have intrinsic characteristics that can empower people and thus change a growth system (see *1.7. The Social Matrix of Technology*).

Two other points bear on this conclusion. Firstly the report also noted that growth aimed at and achieved by some industrialised and industrialising societies has an exponential character. The exponential character of growth refers to the fact that a constant percentage growth (in throughput) is based on an increasing base figure. P. Ekins notes "3% growth means doubling rate of production and consumption every twenty-five years".[33] Greens argue that such an indicator produces a false sense of security and that the production of waste and pollution associated with this growth will reach limits sooner rather than later. Secondly the report noted that problems of growth interact - solving one may exacerbate or cause other problems. This implies that we need to confront the complexity of the global system as a whole. Greens believe that solutions must, above all, be conservative (of resources) due to the fundamental problem of lack of knowledge. An example is the cocktail of chemicals now around that are a problem in

---

[25] O'Riordan quoted in Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p85
[26] Martin Lewis, *Green Delusions*, Duke University Press, 1992.
[27] Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p73
[28] D. H. Meadows, D. L. Meadows, J. Randers and W. Behrens III, *The Limits to Growth*, Pan, London, 1983. p21
[29] Paul Harrison, *The Third Revolution*, Penguin Books, 1992. p17
[30] D. H. Meadows, D. L. Meadows, J. Randers and W. Behrens III, *The Limits to Growth*, Pan, London, 1983. p150
[31] ibid. p141
[32] Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p77
[33] P. Ekins (ed.), *The Living Economy*, Routledge and Kegan Paul, London, 1986. p9

terms of pollution. It is implied that it is impossible to know enough and thus a hands off approach must be taken.

Dobson notes that political ecologists (greens) will stress that consumption of material goods by individuals (in advanced industrial countries) should be reduced and replaced by a simpler life style. Following precautionary principles most greens argue we must reduce population, increase technological efficiency (through internalisation of costs) and develop other measures of personal fulfilment to replace consumption. Population reductions and technology sufficiency cannot achieve sustainability alone. To support their case greens argue that *human needs are not best satisfied by continual economic growth* (see *1.4.6. Other Green Critiques*).

In summary greens argue that technological methods cannot help realise the impossible dream of infinite growth in a finite system. In this they believe they have science on their side - the first and second laws of thermo-dynamics. They note that the exponential nature of that growth both founds its unsustainability and suggests that limits may become visible soon; and the immense complexity of the system means that our present efforts are superficial or counterproductive. While the limits to growth notion is the 'practical' reason for a sustainable society greens also present social and ethical reasons for the necessity of a sustainable society (see *1.4.6. Other Green Critiques*).

1.4.1. Consumption and the Sustainable Society

The limits to growth thesis demands restrictions to economies. Environmentalism, on the other hand, involves the notion that growth will encourage technological change, reduce population and overcome limits. The former involves restriction of the components of what Herman Daly refers to as 'throughput'.[34] These are resource depletion, production, consumption and waste. Dobson notes that resource depletion, production, and waste are founded on *existence and persistence of consumption*.[35] A low-energy strategy is a low consumption economy - we can do more with less but are better doing less with less.

Ultimately the limits to growth thesis demands the creation of reduced *steady state economies* (constant throughput). The level of throughput globally should be equal to the global carrying capacity. This level will depend on population numbers and technological development (also the form of consumption). Neo-classical economics sees nature as a subsystem of the economy while steady state economics sees the economy as a subsystem of the globe. The question remains as to what level of limited throughput is critical. Most greens would argue it is below present Western levels. They would give evidence of present global degradation but could also note that Western development is based on colonialism and neo-colonialism and thus is above the carrying capacity of Western countries (given present technological levels). Irvine and Ponton, note that expansion of Western consumption levels to everyone globally would require 130 times the world output of 1979.[36] It should also be noted that stability of limited economies would demand either similar throughput of different local economies or equality of a global one. Irvine and Ponton note that *if there are limits to supply then limiting differentials between people is as essential as limiting economic growth.*[37]

Reduced Western consumption is then a feature of a green sustainable society. In reducing levels, as noted, greens face a seemingly impossible task - they call into question the major aspiration of most of the Western (and global) population. We have developed an addiction to the market that is our principle means of definition. This is continually driven by advertising and fashion encouraging mass consumption and thus mass production, depletion and waste.[38] In this context the green movement needs to assert that a society of less consumption would be more pleasurable to live in. Greens thus stress benefits of a less materialistic society (see *1.4.6. Other Green Critiques*). Both deep greens and social ecologists distinguish *quality* and *quantity* - replacing (or sacrificing) material satisfactions with social ones. Social ecologists do this through the notion of 'freedom' while deep greens use 'spiritualism'. These are also discussed in more detail below. It should be noted that our present definition of wealth (GNP) encourages *throughput* of *anything*.

For greens the differentiation of quality is accompanied by a distinction of *needs* and *wants*. Needs are "essential to our survival and to civilised human existence".[39] This differentiation establishes a general

---

[34] Herman Daly in P. Ekins (ed.), *The Living Economy*, Routledge and Kegan Paul, London, 1986. p13
[35] Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p89
[36] S. Irvine and A. Ponton, *A Green Manifesto: Policies for a Green Future*, Macdonald Optima, London, 1988. p25
[37] ibid. p80
[38] Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p91
[39] ibid. p92

notion but does not allow us to determine which goods are applicable to each category. Further, it presupposes that fundamental human needs are finite and classifiable not that they are historically and culturally mediated. Ekins argues that fundamental human needs are constant but the form or the means by which these are satisfied changes.[40] Again this does not solve the basic problem. Basic needs we could perhaps classify satisfiers are another matter.

A steady state economy may theoretically be one global or many local economies. For reasons given under *1.4.5. Limits to Growth and Trade* however most greens stress local trade. They also note efficiencies and reduced dependence of greater self-reliance. Under *1.4.6. Other Green Critiques* I note the green case that increased self-reliance is a means of replacing material consumption with other means of 'personal fulfilment'.

1.4.2. Technology and the Sustainable Society

The 'limits to growth' thesis is based around the inadequacy of technical solutions. Greens argue that they must be placed in a context with population and consumption, that they often tend to have hidden effects, and that ultimately they cannot overcome limits to a growth system.

Harrison reports that in 1988 the average western car was using 26% less petrol than in 1973. But the number of cars rose by 58% and each one was driving further.[41] Increased population and consumption turned the technology gain into a net loss. Total petrol use went up by 17%. This was during a period of two huge oil price rises. Further, general energy efficiency grew in most parts of the world over the 1973 - 87 period yet because of population and consumption growth, world energy use grew by 20 per cent.

Technologies designed to solve problems often give rise to more (fossil fuels, dams, nuclear power, CFC substitutes, catalytic converters). I have noted how the coal-burning steam engine reduced deforestation (in the developed world) but kick-started the era of acid rain and global warming. Chemical fertilisers reduced the area of land needed to grow a given amount of food but increased pollution of waterways, further freed farming from labour and produced a fossil fuel dependent industry. It should also be noted that the agricultural and industrial revolutions were in response to resource crises. Today's is a crisis of pollution and degradation. It is the environments waste carrying capacity that seems to be of greatest concern and many attempts to increase productive capacity such as fossil fuel and fertiliser use have led to the waste carrying capacity being exceeded.

The energy efficient car provides a good example of the technological problem. If road building remains a priority it conflicts with increasing efficiency. Further increased fuel efficiency per car per kilometre tends to increase the attractiveness of cars in terms of economy increasing sales of cars and distances travelled (within an economic system that does not account for the external costs of car use in fuel prices). Even if they are 'environmentally friendly models' environmental impact is increased. Inefficient city transport systems are thus supported. Harrison refers to these arguments as 'Running down the escalator'.[42] In addition cars come with more added extras, more automatic transmissions, more heavy safety equipment, and *catalytic converters* - all of which add to fuel consumption. It should also be noted that the problems of the car are also social.

In addition adaption has rarely been smooth. 'Solving' a problem needs first perception of the problem, then understanding of causes, development of technologies and widespread application. The problem is not solved simply by some clever invention. A technology will only be widely adopted if it is acceptable to most users. It must work socially as well as technically. It must fit in with the users' economic and social circumstances - and move towards more environmental awareness. Further readiness to act does not necessarily follow the perception of the problem, politics intervenes . Frequently costs of new technologies are external to a persons own property, they fall on other people, other species, other generations. The relative strengths of those concerned are important here (see *1.4.35 Limits to Growth and Trade*).

---

[40] P. Ekins (ed.), *The Living Economy*, Routledge and Kegan Paul, London, 1986.
[41] Paul Harrison, *The Third Revolution*, Penguin Books, 1992. p280
[42] ibid. p281

Thus while technology change is needed greens argue it is no panacea. A 'softening' of technology or systems cannot be looked at in abstraction, it must consider the system into which it is introduced and if appropriate move towards changing the assumptions on which those systems are based. As a consequence of technological change it is often suggested today that the West is cleaning up it's own act in response to rising public awareness. We are however consuming more and polluting more despite 'efficient' technologies. Such arguments back up the green position of *less first.*

Dobson uses O'Riordan in distinguishing between technocentrics and ecocentrics. Both start from the idea that the environment is being degraded at an unacceptable rate. Technocentrism argues O'Riordan involves the "arrogant assumption that man is supremely able to control events to suit his purposes".[43] This is an 'environmental' position and in opposition to the 'limits to growth' report that the complexity of the processes involved prevents such understanding and control. On the other hand "Ecocentrism preaches the virtues of reverence, humility, responsibility, and care; it argues for low impact technology; it decries bigness and impersonability in all its forms (but especially in the city); and demands a code of behaviour that seeks permanence and stability based upon ecological principles of diversity and homeostasis".[44] For Ekins the reconceptualisation of the nature and value of work is another principal pillar of the green economic and social framework.[45] Political ecologists see value in work over and above paid employment. Greens do not visualise a work free future of automation because:

• it pays no heed to sustainability,
• unemployment creates an underclass while leisure industries cannot take up all the production slack,
• the leisure industry is consumer orientated.

Above all most greens see value in work itself. In addition they see it becoming a more standard requirement: with more people and fewer resources the capital/labour ratio must rise again. Greens also note that at present while there is unemployment there are many 'excluded sectors' (the home, caring for relatives, and the informal economy). If these areas are recognised an alternative to continued growth to reduce unemployment is given. The deep green view of work is a major problem in the attractiveness of the sustainable society and is connected to their view on technology. Using microprocessors allowing machines to do unhealthy, unpleasant and dangerous jobs goes against the principle of labour intensive production. Social ecologists such as Bookchin are less concerned with labour intensive production but note how labour today has become abstract labour time.[46] A social ecological society would be one of increased leisure. Solutions to consumption would be based on reducing repetitive work carried out simply for money and linking work and home.

The green sustainable society is often seen as a return to a pre-technological age although as Dobson notes that this is far to simplistic.[47] Certainly greens are always sceptical of the techno-fix and are critical of 19th and 20th Century technology. They prefer reducing consumption levels to improving technological efficiency (recycling etc.). Environmentalists put faith in such technologies within the present economic system, greens do not. Amongst greens technological optimism is reserved for the decentralising potential of new technologies especially modern communications. The sustainable society however does generally envisage more labour intensive process. In this respect, as I will expand later, social ecologists differ from greens. Bookchin emphasises the irrelevance of technology per-se to social ecologists.[48] Technological development works within a 'social matrix'. In a social matrix of capitalism efficient technologies will not prevent destruction but in an anarchist society labour saving technologies will be used and 'limits to growth' extended.

1.4.3. Limits to Growth and Population

Reducing consumption through reducing global populations is a highly contentious issue in green politics and divides greens on the political right from social ecologists on the left. I have noted that population growth today is largely a problem in (if not of) the developing world. Population in many Western countries is almost stable.

According to Dobson it is a specific aspect of *green* thought that even present population levels are two high let alone predicted future levels. Irvine and Ponton put a sustainable UK population at 30 million in

---

[43] O'Riordan quoted in Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p85
[44] ibid. p85
[45] Paul Ekins(ed.), *The Living Economy*, Routledge and Kegan Paul, London, 1986 p97
[46] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p224 - 232
[47] Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p98
[48] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p224 - 232

line with the Green Party Manifesto.[49] Bunyard and Morgan-Grenville estimate that the UK could support 55 million if it's inhabitants were all vegetarians. Populations in a sustainable society would fit 'bioregions' (see *1.8. Ecotopia - The Sustainable Society of Social Ecology*). Edward Goldsmith has put the global level at 3500 million which means loosing approximately 1500 million.[50] The hugely controversial Green question is of course how to loose 1500 million people globally. The Earth First! group has suggested that AIDS should be allowed to run its course. Garrett Hardin's lifeboat notion that if there is enough room for ten people in a lifeboat of eleven then one should be thrown out (read as third world population) is rare in the green movement but has caused alarm amongst many such as Bookchin.[51] Immigration control advocation is a more evident and equally dangerous notion of green development. Pressure will clearly be increased with environmental catastrophes. The left has been at battle with Malthus since his *Essay on the Principle of Population* in 1792 arguing alternatively to the notion of population control that starvation is due to unequal distribution. Social ecological ideas are based on the differential consumption of the North/South divide and the exploitative nature of Western controlled trading systems. These systems they argue drive population growth that is a symptom not a cause.

Harrison notes proposed non-coercive measures to address population growth.[52] As described he puts practical emphasis on reducing growth to the low UN projection of 8 billion after which he argues it will fall. He argues that these measures will aid in producing sustainable development in developing countries by enabling increased consumption and thus improved technologies. Social ecologists emphasise that fair trade based on Western self-reliance would do this and that reducing Western consumption developed through colonialism is the priority. For some environmentalists reducing population growth globally through a variety of means will increase global wealth thus reducing the impact of poverty and further reducing population. This strategy may be inconsistent with a no growth sustainable society. Harrison notes however how the immediate effect of population stabilisation (if non-coercive measure are implemented) may be dramatic.

1.4.4. Limits to Growth and Energy

If reduced consumption rather than more technological devices is the answer to the problems raised by the absolute scarcity of resources, then the same applies to energy. Energy is a resource and at present is mostly unrenewable. It should be noted that available non-renewable resource levels will be lower than absolute levels due to increasing costs of extraction and because it will take more energy to get resources than can be gained from them. The problem of energy is however, to a large degree, one of global pollution with regard to greenhouse gases. Technological methods of reducing pollution from non-renewable energy sources are prone to problems of increasing impact in other areas.

Two solutions are thus proposed by greens - renewable energy and conservation. Again conservation is seen as preferable. Renewable energy sources (wind, barrages, solar) are seen as limitless, relatively benign, (and in many cases suitable to decentralised form). They are not however totally benign. Irvine and Ponton note in addition that "Dreams of powering the current lifestyles of the industrialised countries from alternative energy sources are illusory."[53] Again the major focus is on reducing production which means reduced consumption. The distinction between *needs* and *wants* is important given reduced capacity of renewable sources. Environmentalists would see technological capacity meeting *wants* and overcoming pollution problems (for example energy from hydrogen)

1.4.5. Limits to Growth and Trade

For various reasons the green position of reduced consumption is accompanied by increased economic independence and self-reliance. If we must consume less we must also trade less. The Green position on global trade can be looked at in terms of; criticism of today's forms within a growth economy, and the alternatives proposed in a steady state sustainable economy. Free trade is seen as problem since at present it encourages growth in the West at the expense of developing countries but also because global trade has intrinsic inefficiencies. Further, for social ecologists in particular, free trade is a misnomer that is applied to trading systems that continually favour the West. They argue that it is critical to the inequality of distribution that should be addressed by fair protections not by abolishing protections.

---

[49] S. Irvine and A. Ponton, *A Green Manifesto: Policies for a Green Future*, MacDonald Optima, London, 1988. p22
[50] Edward Goldsmith in Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p94
[51] M. Bookchin and D. Foreman, *Defending the Earth*, South End Press, Boston, Massachusetts, 1991.
[52] Paul Harrison, *The Third Revolution*, Penguin, London, 1992.
[53] S. Irvine and A. Ponton, *A Green Manifesto: Policies for a Green Future*, MacDonald Optima, London, 1988. p53

The Myth of Free Trade

Problems arise with discussion of trade since many social and environmental commentators argue contrary to popular belief, that global trade has, and continues to be, far from 'free'.[54] The global trading system, for many, is biased towards the West. Examples of exploitation based around Western restrictions to free trade include:

• 'development' of the West based on colonialism, state protection and military power (not free trade);[55]
• the problems of third world dept due to finance borrowed to industrialise after the exploitation of colonialism;[56]
• 'development' of newly industrialised countries (NIC's) also using protectionism;[57]
• Western tariffs on trade of 'processed goods' but not raw materials;[58]
• the use of intellectual property rights and patents to protect Western ideas and particularly biotechnologies that are often based on developing countries raw materials that are not protected (often based on biodiversity that exported farming techniques are destroying);[59]
• the provision of aid by the West linked to trade often of arms sales;[60]
• power of the West and transnational corporations (TNC's) used in 'free' markets to dictate terms to developing countries.[61]

Chomsky describes how the World Bank now estimates that protectionist measures of the industrial countries (keeping pace with free market rhetoric) reduce the national income of the South by twice the amount of the official 'development assistance'.[62] He argues that Western powers call for liberalisation when it is in their interest and enhanced protection when that is in their interest.[63] Intellectual property rights are 'new themes' where protection is in Western interest. Patents and software protection argue Chomsky enable TNC's to monopolise new technology. In general each wealthy country advocates a mixture of liberalisation and protection.

Critically, for greens, spuriously 'free' trade systems (under the guise of encouraging 'third world' development) have been used by the West to increase consumption (at the expense of developing countries) *beyond levels achievable by all.* For Chomsky the South has been assigned a service role; to provide resources, cheap labour markets and a location for export of pollution.[64] Chomsky notes how systems, initiated through colonialism and violence, now favour large Western owned TNC's that are also removed from any electoral control. Trade systems are deepening the already abject poverty and environmental degradation in which more than a billion people live.[65] By maintaining poverty these systems are, it is argued by left Greens, the root cause of population growth while in our current grow or die economy they are geared to externalising environmental cost and thus exploitative of resources and polluting. Given such a system increased 'throughput' cannot be equated to growth in the South (thus reducing poverty and population growth) since existing power in markets continually favours the West. Social ecologists see exploitation of existing systems of global trade as a critical mechanism of scarcity. Such scarcity is usually attributed to nature or climate that for social ecologists is a socially neutral scape-goat. Importantly these doctrines seem so deeply rooted in institutional structures to allow serious challenge.

For social ecologists trade patterns must be altered to encourage equity. Polarisation of the free trade debate argues Daly is common but problematic.[66] Rather the debate is between the kind of regulations that are to be instituted and what goals are legitimate. By restricting trade in 'ideas' and allowing free trade of selected 'goods', trade is inequitable and in direct opposition to the green ideal that would allow ideas to flow since they can promote efficient technological development without problems of transportation and swapping goods.[67]

---

[54] Noam Chomsky, *Year 501; The Conquest Continues*, Verso, London, 1993 and Susan George, 'Dept', in John Vidal (ed.), 'earth', *the Guardian*, June 1992.
[55] Noam Chomsky, *Year 501; The Conquest Continues*, Verso, London, 1993.
[56] Susan George, 'Dept', in John Vidal (ed.), 'earth', *the Guardian*, June 1992.
[57] Noam Chomsky, *Year 501; The Conquest Continues*, Verso, London, 1993.
[58] Kevin Watkins, in John Vidal (ed.), 'earth', *the Guardian*, June 1992.
[59] Eduardo Galleano, 'View from the South', in John Vidal (ed.), 'earth', *the Guardian*, June 1992.
[60] Tony German, 'The hand that feeds itself', *Environmental Guardian*, Friday February 11, 1994.
[61] Sara Parkin, Rainforest Economy, *Resurgence*, March/April 1994.
[62] Noam Chomsky, *Year 501; The Conquest Continues*, Verso, London, 1993.
[63] ibid. p94
[64] ibid. p33
[65] Stuart Wallis, 'Springing the poverty trap', *Environmental Guardian*, September 25 1992.
[66] Herman E. Daly, 'The Perils of Free Trade', *Resurgence*, March/April 1994.
[67] Herman E. Daly, 'The Perils of Free Trade', *Resurgence*, March/April 1994.

Power in Markets
Like most other Greens Sara Parkin does not deny the need for trade. She notes however the progress of the market has meant that cities selling more goods from further afield have taken over from market towns selling local goods.[68] The 'free' markets of today, argues Parkin, in any commodity are dominated by the fact that the buyer or seller with the most power (control of supply and demand) gets the 'best' price. Parkin argues that Adam Smiths 'invisible hand' controlling supply and demand is rendered insignificant by power.[69] In theory as goods become scarce, prices rise and people are attracted to producing them. If they are in excess supply, then prices drop and so does production. This is the mechanism that ensures that the range of goods on offer met the needs of society at a reasonable price. She quotes Etzioni "power is so pervasive in the economy that...for all intent and purposes there are no transactions among equals".[70] Parkin uses, as an example, the use of power of Western countries to dictate how third world countries should restructure their economies and export commodities in return for deals over debt repayments or renewed aid.[71] Free markets concludes Parkin are only beneficial to all parties if markets are local (small scale). At present power free markets stands in opposition to equitable distribution. As Bookchin has noted at the same time a lack of 'ties' (social, cultural) other than monetary has meant there is no control of competitive selling (discussed below).[72] He stresses the lack of social restrictions to profit as the principle concern. This has extended to lack of democratic control. The problem is not trade but competitive trade by remote organisations.

International Free Trade by Comparative Advantage and Specialisation
Greens are critical of the goal of free trade based on international specialisation according to comparative advantage that is the cornerstone of the recently concluded GATT (General Agreement on Tariffs and Trade) and NAFTA (North American Free Trade Agreement). Daly notes that the concept of comparative advantage in which the free trade position is grounded was explicitly formulated by David Ricardo in the early 19th Century.[73] Ricardo observed that different countries with different technologies, customs and resources will incur different costs when they make the same products. If nations specialise in the area in which they have comparative advantage and trade freely in others everyone will benefit. This theory was included in the chapter on trade states in Agenda 21 (agreed by 150 nations at the Earth Summit). It stated "an open trading system which leads to the distribution of global production in accordance of comparative advantage is of benefit to all trading partners".[74]

Parkin notes the myth of this utopia of mutual and equitable benefit.[75] For example a country that specialises in coffee (dictated by Western power as above) cannot be compared to one trading in computers. The potential economic spin off from the later is enormous with opportunities to add value, research and development and related production processes. Furthermore if trade is to be mutually beneficial gains must not be offset by higher liabilities. After specialisation, nations are no longer 'free' not to trade and that loss of independence can be a liability. The resulting specialisation also involves reduction in the range of occupational choice. Daly notes that if Uruguay was limited to trade of goods to its 'comparative advantage' it would limit its citizens to being cowboys or shepherds. Diversity argues Daly may reduce per capita availability of commodities but is essential to community (stability). For greens this notion of specialisation leads to 'disempowerment' of all. Greens argue that this is a social problem even in rich countries (see *1.4.6. Other Green Critiques*) where growth compensates but it is felt particularly in poorer countries since they have less power in the market and do not have the potential of benefiting from added value goods.

Environmental Problems of Global Trade
By encouraging global trade, free markets can also introduce new inefficiencies. Contrary to the implications of comparative advantage, more than half international trade involves swapping of essentially the same goods.[76] For example, Americans import Danish 'sugar cookies' and Danes import American 'sugar cookies'. Exchanging recipes would clearly be more efficient (knowledge international but production of goods as local). Daly notes how the cost of international transportation can largely offset economic benefits to all. Further pollution costs are not factor in price. In short trade today *is* subsidised to be inefficient.[77]

---

68 Sara Parkin, 'Market Madness', *Environmental Guardian*, September 25 1992.
69 Sara Parkin, 'Rainforest Economy', *Resurgence*, March/April 1994.
70 ibid.
71 ibid.
72 Murray Bookchin for example 'From Saints to Sellers', *The Ecology of Freedom*, Black Rose Books, 1991. p193
73 Herman E. Daly, 'The Perils of Free Trade', *Resurgence*, March/April 1994.
74 Sara Parkin, 'Rainforest Economy', *Resurgence*, March/April 1994.
75 ibid.
76 ibid.
77 Herman E. Daly, 'The Perils of Free Trade', *Resurgence*, March/April 1994.

Externalities and Free Trade
A predominant green criticism of free global trade today is the ability it gives the West to exploit the labour and environment of 'distant lands'. Costs are internalised if a manufacturer pays for the disposal of waste and raises prices to cover them. Cost are external if off-loaded onto people as labour (low wages, poor working conditions) or on their environment (over-exploitation of resources, low-quality living conditions and pollution from uncontrolled wastes). Economists at present argues Daly rightly urge nations to internalise domestic costs into prices (to a degree) but then urge nations to trade freely with other countries that do not. International trade increases competition. Competition can reduce costs in two ways by increasing efficiencies or by lowering standards (externalising costs). Profit maximising firms in competition will do the latter if they can get away with it. Free trade between North and South today enables then to do so.

While countries in the West have internal laws to prevent such exploitation (social and environmental standards) their are no analogous international bodies - thus free international trade encourages industries to shift production (capital) to countries with lower standards of cost internalisation. Capital today can and will go wherever it can to get the best return (Daly notes this is also contrary to the rules of comparative advantage as discussed by Ricardo). If firms are able to locate their capital internationally it will go to where it can obtain the 'best' deal for services of people and environment (low production costs). Daly distinguishes between protecting inefficient firms from competition and protecting full price costing from standard lowering international competition.

A corporation in today's 'free' markets is able to buy *labour* in low wage markets and sell its products in high wage high-income markets. Daly describes how the bigger the free trade area the less accountable will any large footloose corporation be to local or national communities and the less it will have to pay those where it can cheaply manufacture its products. The larger the market the longer a corporation can avoid the logic of Henry Ford who pointed out that he had to pay his workers enough to buy his cars. Daly argues "That is why transnational corporations like free global trade and why workers and environmentalists do not."[78] The result is the acceleration of production at human as well as environmental expense and the removal of cause and effect since exploitation is of Southern workers and their environments. While jobs are created in the south (and removed from the North) they are provided at an expense to the country in environmental and economic terms compared to if they were self-reliant.

Free Trade and Limits to Growth
By increasing world production the traditional economists view is that growth will solve distributional and environmental problems eventually by creating the funds to 'clean up' the damage and universally harmonise standards upwards. This principle is based on an economic analysis today that sees the economy as a system of which nature is a part and one that can be replaced (i.e. no limits). For Greens *limits* exist because nature is a closed system within which economies are growing. For Greens the regenerative and assimilative capacities of the biosphere cannot support even the current levels of resource consumption, much less the manifold increase required to generalise the higher standards world-wide. We cannot out grow poverty universally harmonising standards upwards.

For Daly sustainable development must thus be development without growth. He argues that an economy that is steady in scale can continue to develop greater capacity to generate human wants by increasing the efficiency of resource use, by improving social institutions. It is based on qualitative not quantitative changes. Daly argues that free trade is beneficial in encouraging *growth* of *throughput* but not *development*.[79] Firstly as noted free trade today enables a country to exceed its domestic regenerative and absorptive limits. It can import those capacities. Secondly by spatially separating the costs and benefits of environmental exploitation, international trade has made them harder to compare thus encouraging economies to overshoot their capacities. The larger the free trade area the longer a country can defeat 'limits'. Thirdly with free trade based on comparative advantage wastes are disposed of where cheapest with present technologies and prices. Internalisation would, alternatively, encourage technological development, for example, in dealing with toxins or redesigning of processes to avoid their production. Fourthly given the exploitative relationships discussed greater Western self-reliance would enable developing countries to 'develop' and increase throughput in 'developing' countries thus addressing poverty.

---

[78] ibid.
[79] ibid.

As noted, free trade lowers standards of efficiency due to transport and exchange of similar goods. It prevents distributive equity since it favours powerful corporations. It removes already slight political control of representational democracy enabling corporations to maximise profit without redistribution and concentrating power in a few hands enabling capitalist classes to increase their profits at the expense of the poor and the environment. Specialisation reduces community and it's social ties to growth. Global trade also tends to increases wants.

Self-reliance not Self-sufficiency

Dobson defines *self-sufficiency* as a state of absolute economic independence but *self-reliance* as a state of relative independence.[80] Galtung argues that self reliance means to "produce what you need using your own resources, internalising the challenge this involves, growing with the challenges, neither giving the most challenging tasks (positive externalities) to somebody else on whom you become dependent, nor exporting negative externalities to someone else to whom you do damage and who may become dependent on you."[81] Trade is then something to be carried out as an exception rather than a rule. Most greens recognise that trade must inevitably take place. There are goods and services that cannot be generated or provided locally or regionally. Ekins notes however that self-reliance is one of three pillars to the ecological political framework (along with theories of need and reconceptualization of work).[82]

Conclusion

Critically in terms of limits to growth the trade patterns of the last 500 years have enabled consumption in the West to exceed that obtainable by all and thus presents the problem of reducing these levels. Essentially today's Western consumption levels are based on exploitation of a global 'free' trade myth (selective protectionism). Such exploitation is maintained due to the distance of cause from effect and an addiction to material growth that has become our predominant locus of expression (see *1.4.6. Other Green Critiques*). Free trade maintains Western growth at the expense of developing countries. The resulting inequality is a problem in its own right and in terms of developing stable sustainable systems.

A steady state economy involves a constant sustainable level of consumption or throughput (that enables development without growth). Theoretically this could be seen as one global economy or as many local ones but in either case would involve not exceeding regenerative and absorbtive *limits* (assuming they are definable). Both would also demand greater equality. The green notion of internalised bioregions is aimed at addressing the 'arbitrary' nature of national boundaries in supply terms. The ultimate bio-region is however the globe and the green sustainable society could be envisaged as such. While the global bio-region could theoretically be based on global specialisation with free flow of ideas and goods, this falls foul of problems of inefficiencies of a global system (swapping goods) and problems of comparative advantage i.e. specialisation resulting in disempowerment and inefficiencies such monocultures (see *Chapter Six*).

The green case for reduced consumption is thus backed by that of less trade. Simply the green rule is to start by thinking about doing without (reduced consumption), producing things for yourself (including housing) and then using multiple short economic linkages (domestic production for domestic markets). If trade is to take place greens argue that production for basic *needs* (food, clothing, shelter, energy, health, education) should be carried out within a country (ideally a bioregion). Such a system is energy efficient and enables people to attain security by being able to meet most of their needs near to where they live. It would ensure that free trade is not allowed to govern a countries affairs at risk of environmental and social disaster. Political control of corporate freedom is also removed by 'free trade'. Daly quotes John Maynard Keynes to isolate an alternative "I sympathise, therefore, with those who would minimise, rather than those who would maximise, economic entanglement between nations. Ideas, knowledge, art, hospitality, travel - these are the things that should of their nature be international. But let goods be homespun whenever it is reasonably and conveniently possible; and above all, let finance be primarily national." Such a view is against most contemporary notions of the benefits of global free trade to countries of both North and South!

Green economic practice would thus be based around protectionism to establish sustainable bases to domestic economies and throwing people back onto their own resources. Theoretically (since pollution is global), without trade between countries, a country would also be also forced to pay the environmental and resource cost of consumption and develop appropriate technologies. Internalising may also help reduce consumption by bringing cause and effect together (nest fowling would be less likely). This

---

[80] Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p105

[81] Johan Galtung in P. Ekins (ed.), *The Living Economy*, Routledge and Kegan Paul, London, 1986. p101

[82] Paul Ekins(ed.), *The Living Economy*, Routledge and Kegan Paul, London, 1986 p97

relationship is above all one of responsibility - the more responsible we feel the more we are likely to protect.

If the West is thrown back on its own resources it must consume within those resource limits (renewable and unrenewable). If it cannot export pollution it must pollute only within regenerative capacities. Developing countries could increase throughput within their boundaries not provide goods for the West. Problems clearly arise due to the global nature of atmospheric and water pollution but also the global nature of resource distribution even given organisation of society in 'bioregions' (see *1.8. Ecotopia - The Sustainable Society of Social Ecology*). A question that arises is whether development of a global steady state is more likely than regional steady state economies? Since greens are concerned with 'dematerialisation' based on greater self reliance the later is the ultimate aim (see *1.4.6. Other Green Critiques*). They may also argue that the removal of people from the land reducing contact with 'natural limits' increases consumption.

Greens and Environmentalists
Again positions on trade separate environmentalists and greens. Those on the right believe that free flow of goods will increase *throughput* and growth enabling environmental measures to be paid for with increases in wealth. Daly agrees that free trade increases throughput but argues this is throughput for a minority and that this throughput has 'limits'. Trade should thus be restricted. The Brundtland report (environmentalist) supports 'free' trade since it argues protectionism breeds conflict. Gro Harlem Brundtland argued that protectionism as one of the aspects of confrontation between North and South wiping out any semblance of international goodwill.[83]

Summary
Trade (particularly global 'free' trade) is viewed with suspicion by advocates of the limits to growth thesis on several grounds:

• global 'free' trade *today* encourages 'throughput' and 'growth' by enabling a country to exceed its domestic regenerative and absorptive limits by importing resources and exporting pollution;
• outlawing export of pollution and forcing internalisation of pollution disposal costs would create incentives to efficient technological development;
• global trade today also removes cause from effect in terms of consumption in the West and our appreciation of its social and environmental consequences in the developing world (nest fowling would reduce our tendency to pollute);
• 'free' trade reduces democratic control over corporations and enables them to use power in the market to increase profits;
• the concept of global specialisation replaces self-*determination by dependence and* reliance on one or two products for export that can render economies vulnerable;
• specialisation economises life.

Although trade today must be placed in the context of our growth ethic it has several inherent inefficiencies. It helps to turn wants into needs (for ever increasing variety of global produce). It is also wasteful of resources in transport especially with the same goods in different countries being swapped or goods being exported and then imported again for consumption. Specialisation based on comparative advantage creates inefficiencies such as monocultures (see *Chapter Six*) and destruction of community. Much criticism is also aimed at the fact that free markets today are not 'free' because they are dictated to by power (built up by initially by force) and utilise selective protectionism to increase Western growth. Pollution costs of fuel are also external. Including pollution costs of fuel in price would encourage more local markets. The efficiency of local more mixed use and less specialised farming is discussed in *Chapter Six*.

A combination of; propaganda to hide the unacceptable, a populace deskilled and thus addicted to wealth and removed from consequences, and a political system allowing no fundamental choice between parties, mean that western governments and corporations remain unchallenged and free to coerce foreign economies and exploit the environment. Global free trade is the culmination of capitalist divisions in search of increased production. Ultimately free trade today limits efforts to redistribute income more equally, undermines progressive social programs, and keeps people from democratically controlling their economic lives.[84] Chomsky describes how the minimal conditions for functioning democracy have been removed so that each person is becoming an isolated receptacle of propaganda helpless in the face of the private sector whose rights and power are beyond challenge. We are being deprived of organisation and

---

[83] Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p106
[84] Noam Chomsky, *Year 501; The Conquest Continues*, Verso, 1993.

interchange, the prerequisite for constructive thinking and social action. It is these factors that are used to develop the notion of benefits of a more self-reliant society that I discuss next.

1.4.6. Other Green Critiques

Greens have other social and economic criticisms of growth. Such criticisms are used to argue that a sustainable society would be preferable to live in. They note that:

- capitalism requires perpetual unemployment and poverty (a Marxist critique);
- despite growth in the West there is 'poverty of welfare' and 'poverty of wealth';
- society is homogenised by our addiction to growth (lack of human subjectivity);
- we have become disempowered by capitalist divisions;
- capitalist disempowerment has problematic effects both in the South and North;
- dependence applies at a local level (housing) in the North;

The basic green case that Western consumption must be reduced is addressed by distinguishing material growth from development. Greens argue that progress in health and welfare can be maintained within a steady state economy. Cadman and Payne note "the very notion of *development* in its widest sense has been subverted, and consequently debased, by a preoccupation with *growth*, as though it were not a means to an end (greater welfare and well-being in a safer world), but an end in itself.[85] They summarise the green case when they note "this preoccupation with growth has created unprecedented affluence for a relative few, but left hundreds of millions to exist in relative or absolute poverty. Even for the fortunate minority, it is questionable whether their sense of welfare, well being or safety have increased in proportion to their affluence. Furthermore, growth without international and national redistribution can only increase the alienation and desperation of those excluded from its benefits, creating a dangerous legacy for the future".[86]

In addition to the reasons for greater local trade and self-reliance to accompany reduced growth given above criticisms of the existing *economic* and *social* context are given as reasons why a society based on reduced consumption and local self-reliance may be *more rewarding*. These problems have ultimately been caused by divisions of land, labour, and power that have enabled increased production for the West. For greens if we do not internalise our economies we will continue to 'overconsume' but 'overconsuming' cannot meet our 'desires'. Daly notes that growth is accelerating environmental costs faster than the benefits of production thus making us poorer not richer.[87]

Worship of Markets

Greens attribute our 'addiction to growth' to developments in market exchange of goods that is a deeply rooted mechanism in all societies. Fernand Braudel is quoted in Seabrook "Wherever it may be, a town is inseparable from certain realities and processes, certain regular and recurring features. Where there is a town, there will be a division of labour, and where there is a marked division of labour, there will be a town. No town is without a market, and there can be no regional or national markets without towns. One hears a great deal about the role of the town in the development and diversification of consumption, but very little about the extremely important fact that even the humblest town dweller must of necessity obtain his food supply through the market: the town, in other words, *generalises* the market into a widespread phenomenon."[88] Markets are then, universal mechanisms for answering human need (buying and selling). They are said to represent the most 'natural' means of matching human desires with the means of satisfying them. Today however it is clear that the idea of has gone beyond that of a mechanism for exchange of local goods. The market has become the object of a quasi-religious cult. We seek to express who we are through our purchases. What was an important aspect of all cultures has become the universalised focus of world culture.[89] Seabrook argues that "In this reversal of humanity and the market, it becomes our business to appease the autonomous workings of an economic system, very much as so-called primitive societies seek to appease nature, in order to ensure that the crops flourish or the monsoon breaks at the appointed time."[90] For greens economic performance has come to be the only measure by which all social, moral and spiritual well being is judged.

---

[85] David Cadman and Geoffrey Payne, 'Conclusions and new beginnings', conclusions to David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
[86] ibid.
[87] Herman E. Daly, 'The Perils of Free Trade', *Resurgence*, March/April 1994.
[88] Jeremy Seabrook, *The Myth of the Market: Promises and Illusions*, Green Books, Bideford, 1990. p10
[89] ibid. p11
[90] ibid. p12

For Seabrook the consequences of *worship* of the market has been, *the destruction of the poor and their environments* "the ostensibly independent countries of an older empire were locked into subordination to patterns of development required by the West for maintenance of its miracle...poverty, hunger, avoidable disease and death in the Third World became the daily tribute to those omnivorous, indeed cannibalistic, processes."[91]

Economisation of Capitalism
Capitalism is defined as an economic system under which the means of production and distribution are owned by a relatively small section of society which runs them at its own discretion for private profit. Thus there is always a propertyless class of those who exist by sale of their labour power. Free trade has no necessary connection with capitalism that can include monopolies and state protectionism against foreign trade. Most greens root today's environmental problems in capitalist divisions of land, labour and power.[92] The culmination of these is seen to be GATT.[93]

Bookchin traces the 'economisation' of society to Capitalism. Capitalism "reflects the authentic economisation of society, and of the 'social question' itself, by an economy that has absorbed every cultural, ethical, and psychological issue into a material system of needs and technics".[94] By economising the totality of life, capitalism 'economised' the 'social question,' the structures of freedom, and the revolutionary subject. Freedom is now completely entangled with economics, a liberated life with the notion of 'scarce resources,' and utopia with technics.[95] Attempts to green capitalism, to make it ecological are doomed by the very nature of the system. We cannot blame population problems when capitalist systems would destroy us anyway.

For Bookchin the market relationship (in capitalism) has reduced individual relationships to those of buyers and sellers, replaced mutualistic networks, separated home and place of production and thus town and country have been thrown into opposition. He argues that capitalism broke down *cultural restraints* although appreciates that many of these were parochial and intimidatory. Bookchin notes how the rivalries of grow-or-die economics and the chaos of the marketplace have percolated into affecting personal and community relations. This invasion is reflected by the often unadorned egotism, consumerism, careerism, mutual suspicion, and highly transitory form of human intercourse. Accumulation to undermine, buy out, or otherwise absorb or outwit a competitor is a condition for existence in the capitalist economic order. For Bookchin capitalism has changed the classical notion of 'living well' by fostering fear of material scarcity and establishing quantitative criteria for the 'good life'. In equating 'living well' with living affluently, capitalism has made it extremely difficult to demonstrate that freedom is more closely identified with personal autonomy than with affluence, with empowerment over life rather than empowerment over 'things'.[96] As I will note later Bookchin offers a critique that can be applied to the West precisely due to material abundance. He attributes material growth to the emergence of human hierarchies with capitalism as the latest manifestation.

Capitalism Not addressing Poverty (Marxist Critique)
For Seabrook poverty remains essential to the workings of capitalism (ownership by the few). Capitalism maintains a competitive system - capitalist market economies produce 'poverty' that appears to have its remedy in the plethora of commodities and services which are their reason for existence. For greens unemployment is a constant feature of the capitalist division of labour. In criticising capitalism greens and Marxists find common cause. To the *inner limits* (economical cycles and unfair distribution of Marxist criticisms with wealth generated through exploitation of workers) of capitalism are added *external limits*. For social ecologists such as Bookchin however the solely 'material' nature of the Marxist critique makes it as culpable in environmental destruction (and human exploitation) as Capitalism.

Poverty of Welfare and 'Poverty' of Wealth
A fundamental green argument is that material gain through growth is self-defeating. For greens the consequences of the blind following of growth through capitalist market economies are not limited to 'developing' countries. Poverty in the West however usually takes a different form. In the West Seabrook argues the lived experience of contemporary unemployment and modernised poverty is not assuaged by welfare but aggravated by a context of insistent and aggressive images of plenty by a culture that constantly advertises its desire to shower its bounty upon the people.[97] Clearly welfare cannot be

[91] ibid. p16
[92] George Monbiot, 'Lament for the common people', in 'Changes', *The Guardian*, June 1994.
[93] Paul Ekins, 'Rise of the larger lout', *Environmental Guardian*, September 25 1992.
[94] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montreal, 1991. p216
[95] ibid. p217
[96] ibid. p261
[97] Jeremy Seabrook, *The Myth of the Market: Promises and Illusions*, Green Books, Bideford, 1990. p19

compared to poverty in developing countries. For Seabrook however the problem of welfare dependence is not its inefficiency or the ill will of custodians and administrators but the fact that dependence on welfare is dependence on money - for the poor the last penny is accounted for before it reaches their hands, for shelter, food, heating and clothing. Seabrook argues "The sense of impotence in the presence of money all used up in advance is what makes welfare an unfree experience. In societies in which *freedom* is increasingly reduced to the meaning of *freedom to spend*, it is only to be expected that the poor will feel their liberties curtailed to the point of violent constriction. The poor, more than anyone else, feel the limitations of lives in which all human abilities are in the process of being superseded by the supreme ability to go shopping."[98]

Further, that no such remedy exists "is demonstrated by the continued dissatisfactions and impoverishment's even among the richest and most favoured."[99] If 'freedom' begins and ends with disposable income no individual can gain enough money to purchase them all. When everything is for sale we want everything but still want for so many things. Seabrook continues "the market-place, it seems, is less of a monument to the infinite elasticity of desire than to all the needs that must remain unfulfilled because they cannot be assuaged in this, the only permitted locus of human expression. Commodity substitution for our deepest yearnings is a profanation of our humanity; and this, if we have ears to listen, is what the poor of both *North* and *South*, are trying to say".[100]

Homogenisation of Society

Another feature of the green critique is that commodity substitution serves to homogenise society in contrast to the conventional notion of the 'diversity' of the market. For Seabrook one of the great paradoxes of our individual society is that the exaltation of the individual must seek its fulfilment through what are essentially mass markets. People's individuality is actually impaired by the fact that they read the same newspapers, see the same television programmes, eat the same foods, dress in the same fashions, and worship the same shadowy creatures promoted by show business. The ideology of individualism not only denies the social and collective but also denies the individual. It has produced a denaturing of human consociation at levels of life that deeply affront every human sensibility.[101] Bookchin notes a homogenisation of social life under capitalism as akin to the homogenisation of ecosystems. Domination of human by human and nature by human reduces diversity in both fields. He sees it as a myth that our society is more complex than earlier ones. The complexity is strictly technical complexity not cultural (complexity of society is one reason why anarchic societies are said to be unrealistic).[102] Meanwhile our therapies attempt to adjust organic beings to inorganic conditions rather as environmentalism attempts to green the capitalist system. For Bookchin it is this individuality or human subjectivity to which we are striving. He notes that the most basic precepts of ecology are concern for balance, a harmonious development toward greater differentiation, and ultimately, the evolution of greater subjectivity and consciousness. They stand radically at odds with an economy that homogenises society, nature and the individual, and that divides human against human, and society against nature with a ferocity that must ultimately tear down the planet.

Freedom of choice (within the market) has become a rallying cry in the West. In fact however these free choices land on the same identical products, services, purchases, television programmes and items of food. Is it more that the people have been delivered to the goods rather than the goods to the people. Our sensibilities have been fashioned in such a way that all our felt longings and absences correspond to exactly what is available for money. This can be referred to as an enclosure of tastes. It can also be noted that fashion encourages continuous replacement of goods. People throw out clothes, kitchens, furniture, cameras, computers, long before they are warn out or bust, because more fashionable or more efficient products have appeared.

Disempowerment

For greens our dependence on the market is a reflection of the disempowerment of capitalism. Seabrook uses the food industry in the *West* as a specific case of how we have also become disempowered by overt reliance on exchange. For Seabrook the level of competence at which recent government advice on food hygiene is tendered suggests "a population seriously de-skilled and disarmed in dealing with what is sometimes referred to as 'our complex society', despite the stark simplicity of its fundamental processes".[103] The food industry and the vaunted sophistication of food technology, are a measure of the distance we have travelled in the denatured way of life which we are expected to believe represents the

[98] ibid. p31
[99] ibid. p23
[100] ibid. p35
[101] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, 1991.
[102] ibid.
[103] Jeremy Seabrook, *The Myth of the Market: Promises and Illusions*, Green Books, Bideford, 1990. p58

highest freedoms. Basic nutrition must be filtered through ever more elaborate structures in order to add value to it; not so that we may have greater choice, *not to relieve our labour and save precious time*, but so that the profits of vast food conglomerates may be sustained at the level to which they have become accustomed".[104]

The food and cosmetics industries both illuminate the warping of basic human needs by technological processes and forms of marketing that have become autonomous and disarticulated from their ostensible purposes - those of nourishment and cleanliness. They must like all others go on growing and expanding, thus, while the market for basic nutritious foodstuffs is soon saturated, we have a huge variety of permutations in the composition of ready-made foods. Sainsbury's boasts of three hundred new products a year.[105] Adding value to our food has the primary consequence of extraction of nutrients. Some of these may be convenient to the busy consumer. Many see the diminution in trouble to prepare food as a blow for equality but Seabrook asks why a man should disdain a role in so central an activity as food preparation.

Ignorance of Origins
Seabrook notes then that for 'information rich' societies we remain hugely ignorant of simple issues. The advertising industry "contrary to its own claims that it teaches and informs, is in the business of the creation of an ignorance that is functionally essential in the consumer economies of the West. For one thing, its insistence upon the value and desirability of the commodity or service spirits away all concern with its origin, content, the suffering involved in its production and the consequences of its sale."[106] Billions are devoted not to telling us dangers and drawbacks of a purchase but to its desirability, its indispensability. The market process has moved away from 'honest provider and informed consumer' (within a social matrix) towards searching for any way to get people to part with their money.

Dependence on Money
Greens note that as we become more dependent on money we become more disempowered without it. Seabrook notes, for example, how "as people become increasingly dependent upon money to save time, they begin to surrender control, lose skill and power over their immediate environment. Purchasing power, in this context, becomes a substitute for other powers, abilities and capacities; it destroys know-how, wipes out memory, cripples self reliance".[107] Galleano argues that people live to work to consume.[108] They consume time saving technologies. Machines however, created to save time or to pass the time, simply seize control of time (see the use of the car in *Chapter Two*). Again such wealth is self-defeating.

Difficulty of Change
Critically neither can we conceive of change or loss of what we have. Seabrook argues that if we find ourselves disarmed and impotent in the presence of some of the consequences (the destruction of nature, upon which all economic systems rest, the depletion of resources, the poisoning of the earth) this is partly because "it is no easy task to dismantle and desacralize that which for so long has been the repository of our faith and the source of all hope".[109] Fear binds us to the now unlikely hope that growth can continue forever - no matter the deformed and cancerous tissue it may generate or the deaths of numberless invisible 'others' (separated by distance and culture).

Dependence at a Local Level (Housing)
Dependence created by the division of labour, power and land are relevant to local environments. Morris argues "We separate the producer from the consumer, the farmer from the kitchen, the power plant from the appliance, the dump site from the garbage can, the banker from the borrower and depositor, and inevitably the government from the citizenry. Development becomes a process by which we separate authority and responsibility, where those who make decisions are not affected by those decisions."[110] Conventional development creates dependence. Twentieth century local economies throughout the industrialised world had largely become dependent on outside employers to organise their work, to outside suppliers to supply their needs (for food, energy, clothing, shelter, entertainment and so forth), and on outside agencies to provide for their health and welfare and to remove their waste. With sustained

104 ibid. p56
105 ibid. p57
106 ibid. p21
107 ibid. p58
108 Eduardo Galleano, 'View from the South', in John Vidal (ed.), 'earth', *the Guardian*, June 1992.
109 Jeremy Seabrook, *The Myth of the Market: Promises and Illusions*, Green Books, 1990.
110 T. Elkin, D. McLaren, M. Hillman. *Reviving the City, Towards sustainable urban development*, Friends of the Earth, 1991.

economic growth and full employment this had little impact but economic and social vulnerability are clear in our cities today (discussed in *Chapter Seven* and *Chapter Eight*).

In the West it may be argued that the process of *urban dependence* is closely linked to local environmental degradation. If residents lack the power they need to improve their environment and the environmental capital stock of their locality (clean air, water, soil, green spaces and vegetation) is not under their control they can be exploited and degraded by the direct actions and geographic externalities of others. The extreme example of this is by multinational companies pollution, global exploitation of resources including regional and local exploitation of labour. How participation in architectural process can address this disempowerment is the central theme of this thesis.

Conclusion
Seabrook argues that the heart of the green critique of growth is the wasteful effort to sell more and more things to people, the need for which had previously not occurred to them? Not only does this process hasten the depletion of world resources, but it also crushes and stifles the human resources which people have deployed in living successful and self-reliant lives, without some of the excesses which have suddenly become indispensable. The violence that this profound manipulation may do to human beings does not appear in the market place, "but perhaps is to be counted in the toll of wounded and damaged people who express their pain and anger only through the statistics of social breakdown, crime and psychiatric and emotional illness."[111] *"For a time, the poor might have hoped that the patterns of development initiated in the West could one day deliver them from their poverty. They were not to know either the inner desolation created by that version of wealth, or that the method of its production was never designed for their emancipation, but were, rather, calculated to lead them into dependency; a dependency which is similar to that set up in individuals attached to the life-support system of money which rules the life of the rich."*[112]

It is perhaps necessary to summarise here the green critique of today's free trade, global trade, capitalism and materialism.

Capitalist globalisation of markets has removed cause and effect thus enabled exploitation to increase Western consumption. These relations are the latest results of the division of labour, land and power (it is to these that most greens look for solutions to environmental problems. For greens, while increasing productive capacity (and controlling its benefits for a few) these divisions remove other means of personal satisfaction and lead to economic dependence through deskilling. While addictions to material consumption are often fed in the West to compensate, this deskilling is catastrophic in exploited regions. The dichotomy between 'developed' and 'developing' is clearly oversimplistic the rich use more resources wherever they live often in third world. Inequality prevails in varying degrees between classes and sexes in every political and economic system - between regions of the same country, between countries and between regions of the world. The West however is it seems driving the system and more generally as Bookchin would note in a position of 'post-scarcity' generally.

In terms of global trade a steady state economy may be based on global equality through comparative advantage and appropriate specialisation determined by a global government or local steady state economies trading principally in ideas. The former however has in-efficiencies of transport and not fitting ecosystems (in terms of farming efficiency) even if swapping goods is avoided. Greens would also note that it is self defeating because such specialisation is problematic in social terms. Further only by developing locally based trading will addictions to wealth be addressed. Local level linkages reduce 'externalities' (including global transport) but also enable them to be accounted for. They are consistent with community ownership and control of land and local environments that I explore in this thesis.

1.4.7. Possible Green Strategies

In responding to 'limits to growth' various green positions can be taken in terms of political-institutional arrangements needed in a sustainable society (i.e. restructured society). O'Riordan suggests four typologies:

• A 'new global order' arranged to deal with global co-ordination needed by the international nature of the environmental crisis. Supporters suggest the nation state is both too big and too small to deal with problems. Although the lack of efficacy of the United Nations is criticised it is this sort of organisation that such a policy would be based around according to the Brundtland Report.

---

111 Jeremy Seabrook, *The Myth of the Market: Promises and Illusions*, Green Books, 1990.
112 ibid.

• The second position is 'centralised authoritarianism'. Again this takes seriously environmental crisis and suggests the measures needed will not happen voluntarily. The locus of authority would be at the level of the nation state and thus no major political change is believed necessary. Governments would decide on a sustainable course of action (protectionism, rationing, population control and restriction of immigration) and put it into effect.
• The third position is the 'authoritarian commune', similar to above but with smaller scale organisation although social structures would necessarily remain hierarchical.
• Finally the 'anarchist solution': a self-reliant communities modelled on anarchist lines. Left-liberal, egalitarian and participatory.[113]

While most greens (not environmentalists) are reluctant to accept politics within the framework of nation-state they often find themselves unable to countenance a full-blown picture of independent self-sufficient communes. Critical to the Green question is how we manage one world of complex interacting systems to reduce consumption. On one extreme is increasing hierarchies and un-elected capitalist corporations that make our decisions and impose rations, on the other, a participative democracy within an intricate anarchic framework based on federation. It may be asked for which of these is the world too complex and what will is the most desirable form of society.

All the above respond to a perceived global environmental crisis. The later can be distinguished as social ecology. For social ecologists like Bookchin it is human hierarchies that are the cause of the environmental exploitation and thus *only* an anarchist alternative is ultimately possible. The emergence of hierarchies has resulted in the 'objectification' of humans. These have culminated in capitalism its division of land, labour and power and 'objective' worship of markets. The global divisions noted above are the latest product of the emergence of social hierarchies. For Bookchin if hierarchical institutional structures remain and freedom is seen as material wealth then 'limits to growth' remain. There are limits to growth of capitalism. Critically imposed rationing, because it is seen as such, maintains a hierarchical and materialist attitude that is socially and ecologically exploitative. Thus while greens may impose restrictions to all from above, social ecologists encourage development of the South and a generalised (not class based) anarchist revolution in the North.

For social ecologists then the environmental movement must not only become a genuinely radical movement questioning the very roots of the modern political and economic structure "It must, like Chomsky, demand that we in the democracies are not at all free, that we are still chained up by the corporately controlled media and government swamping us with their advertiser friendly editorial and plain old propaganda. Only when the general population begins to wake up to this sort of truth, can it begin to develop what Chomsky calls "the tools of intellectual self-defence" and so begin to challenge that propaganda".[114]

Frugality and Productive or Political Self-reliance

The alternatives proposed to capitalist ownership and divisions of *land*, *labour* and *power* include:

• a simpler, smaller scale, face to face life closer to nature;
• decentralisation and local autonomy;
• labour-intensive modes of production;
• de-emphasis on materialism as a means of fulfilment;
• individual self-sufficiency;
• cultural diversity.

The green alternative society is generally one in which human beings live frugally within 'natural limits'. Greens generally criticise growth philosophies of both left and right. They will note how both are based on *growth* through *industrialisation*. Redistribution of wealth they may argue is irrelevant if the human population is set on growth. Critically our exploitation of nature is a product of our separation from nature and ultimately industrialisation. For social ecologists however only through overcoming human hierarchies will we stop exploitation of nature. Our exploitation of nature is only needed because of human exploitation of human. Creating a sustainable society is thus a social problem. The materialism of Marxism and Capitalism both reduce human subjectivity. An anarchist society is the only one that addresses human hierarchies in a non-materialist form. Unlike many 'deep greens' Bookchin acknowledges that separation from nature is inevitable but that our social structures can be changed so that we will manage nature sustainably. We must manage the planet but, in an anarchist society, we will do so sustainably.

---

113 O'Riordan in Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p82
114 David Edwards, 'Deceptive Freedom', *Resurgence*, January, February 1994.

The green notion of living closer to nature demands 'returning' to less specialised forms of work by which industry and agriculture are mixed in decentralised communities and thus rotation of work allows a complete knowledge of process (and nature). For greens self-reliance is postulated as a means by which self-determination can replace dependence. Subjectivity outside capitalist market relationships and greater autonomy replaces material goods as trappings of success. As noted few greens will advocate complete self-sufficiency. Rather they specify individual or more likely community self-reliance that allows for variety of work and contact with process. In moving towards a sustainable society an emphasis on Western self-reliance today, as noted, can reduce exploitation of developing countries. For social ecologists dependence on growth will be reduced more by self-governance than self-sufficient production. Mechanisms for addressing consumption thus become empowerment and direct democracy in the West where the post-scarcity nature of our society should be developed. Self-reliance for greens means a return to self-reliant production but for Bookchin, the principal proponent of social ecology political self-reliance and an egalitarian anarchist society with communal ownership of land are more important.

Planning and Architecture
The major problem greens have to overcome is that since we have become so dependent on consumer goods and thus so disempowered that the prospect of 'simpler' 'more frugal' living is not only undesirable but unattainable (we do not have the skills of self-reliance). Developments in architecture and planning are critical to *enabling* but also *encouraging* local production of energy, food and other 'goods'. They can reduce energy needs and enable local use of solar power thus increasing self-reliance. Techniques used will also affect the potential to use local materials and labour particularly in maintenance. Self-help techniques can physically involve people in their local environment, inform, and develop appropriate skills. Local self-help in housing can also encourage local trade of *skills*. Both green technologies and participative architectural process, by addressing lifestyles, may aid reducing addiction to provision through the market. They can increase the attractiveness of a self-reliant lifestyle. In encouraging self-help in architecture developments may extend to other areas. Architecture, landscaping and planning initiatives can directly and indirectly influence lifestyle and thus economics and modify them but with reference to existing systems and contexts, changing them in a direct and visible way. They provide a training ground for political decentralisation. How this can be facilitated is the subject of this thesis.

1.4.8. Reasons for Care of the Environment

Care of the environment is advocated by greens, social ecologists and environmentalists because it:

• is in the human interest (environmentalism and social ecology);
• because it has 'intrinsic value' (deep green).

Some deep greens argue that living in harmony with nature would mean social harmony. This notion has been strongly criticised by the left and right. Social ecologists argue alternatively that social harmony (through anarchy) would mean a harmonious relationship with nature.

1.5. Cornucopians, Techno-centrics and Promethean Environmentalists

I have noted the limits to growth thesis and some ideas on the development of sustainable society and I have begun to distinguish social ecology as a distinct approach. I now look at some other views that are opposed to the limits to growth thesis before going on to discuss social ecology in more detail.

1.5.1. Criticism of Limits to Growth

The 'limits to growth' thesis has been described as a doomsday prediction and generated reactions. Criticisms of the limits to growth thesis and its conclusions come from right wing cornucopians, environmentalists (technocrats) and social ecologists (left anarchist). The left includes Susan George, Frances Moore Lappé and Murray Bookchin. For Bookchin 'limits to growth exist' to present systems but not in a non-hierarchical society while in addition we cannot justify the imposition of limits to growth on developing countries.

Critiques of limits to growth note that predictions of exhaustion have, in the past, proved wildly wrong. Andrew Blowers notes that on the one hand there is little evidence that all resources are becoming scarce while there is some evidence to suggest an increase in the resource base as a whole in response to economic growth. Non-renewable resources have expanded through new discoveries, substitutes and better utilisation.[115] The potentials of renewable resources also continue to be developed. In addition there is no reason to assume the future will behave like the past. On the other hand, it should be noted that certain resources are fixed while problems of pollution on a global scale are becoming more important. Harrison notes further that it is so called 'renewable resources' - the ones we thought would last for ever - that are being destroyed at an accelerating rate.[116] These are living things that are renewable but at present are not being renewed - loss of biological diversity and extinction of potentially valuable and irreplaceable species.

Cornucopians

The belief of cornucopians is that adaptation through technological change *driven by unrestrained growth* will achieve environmental stability while continued growth will move people out of 'poverty'.[117] Galleano has described this as the promise of the politicians, the rational of technocrats, the fantasy of the forsaken. Simply the 'developing' world will become like the 'developed', rich, cultured and happy, if only it behaves itself and does what it's told without kidding around or asking embarrassing questions. Eventually, or in "the final episode of the soap opera called History prosperity will reward the good behaviour of those dying of hunger".[118] This scenario, asserts Galleano is impossible since if poor countries rise to the level of production and waste of the wealthy, the planet will die, "our unlucky planet is already in a coma - poisoned by industrial civilisation and squeezed to the next-to-the-last drop by consumer society".[119] Nature the world over he argues has already been humiliated and subordinated to the accumulation of capital and consumption of resources by the West. Galleano argues that the average western income for everyone is impossible.

The right criticise anti-humanist notions of the 'limits to growth' thesis. They note that 'standards' of living have continued to rise as human populations have risen (the left note that this has only been for the top few percent globally). Harrison notes US Economist Julian Simon who argues that the principle cause of increased wealth is population growth. More people mean bigger markets and easier communication. Economies of scale become possible. Productivity improves as larger numbers of factories with higher output learn by each other's mistakes. Above all more people bring more brains to dream up more technological solutions.[120] Simon argues that increasing population has produced more resources not less. Far from decreasing with erosion agricultural land has increased and continues to increase. Shortages occur but are temporary because human ingenuity (driven by markets) brings solutions. The right might also note that at the extreme of ecological politics is the notion that the sun could eventually go supernova. The radical right argue that free market mechanisms work well in ensuring that as a product becomes scarce it becomes more carefully husbanded and that interference in the free market causes problems.[121] Daly notes the view of free marketeers that when growth has generated wealth people will clean up.[122]

Bramwell suggests the fact that 5 billion people can exist on earth today may well be a direct consequence of the technical advances made by agronomists, including the agricultural Green Revolution.[123] In 1794 when Malthus described the problems of population growth Britain had a population of 10 million, it now has 56 million and at a higher 'standard of living'.[124] Many economists and technocrats believe in the light of such advances that the ingenuity of *the unrestrained* free market will continue to solve any problems that may arise due to increased population and consumption.[125] Technology driven by growth it is argued can continually devise new methods to generate energy and solve pollution problems. Clearly 5 billion people cannot live on 'slash and burn' agricultural techniques and our systems have developed to that extent. Again however the West, other than moving planet has now nowhere left to exploit.

---

115 Andrew Blowers, 'The Time For Change', in Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993. P11
116 Paul Harrison, *The Third Revolution*, Penguin Books, London, 1993. p54
117 Martin Lewis, *Green Delusions*, Duke University Press, 1992.
118 Eduardo Galleano, 'View from the South', in John Vidal (ed.), 'earth', *the Guardian*, June 1992.
119 ibid.
120 Paul Harrison, *The Third Revolution*, Penguin Books, 1992. p18
121 ibid. p262
122 Herman E. Daly, 'The Perils of Free Trade', *Resurgence*, no 163, March/April, 1984.
123 Anna Bramwell, *Ecology in the 20C A History*, London 1990.
124 ibid.
125 Martin Lewis, *Green Delusions*, Duke University Press, 1992.

1.5.2. Eco-radicalism - A Critique

Lewis defines 'eco-radicalism' as the belief that existing society is unsustainable, must be attacked at the root, and reconstructed to a different socio-economic logic.[126] Such action cannot involve 'reform' since this merely perpetuates what are seen as intrinsically destructive features of the existing system. The more profound reinvention of society is supposed to occur by revolution, enlightenment (ideological conversion of the population) or post-holocaust rebuilding. Lewis notes four common postulates or core beliefs of eco-radicals that derive from the belief that economic growth is unsustainable:

- the capitalist market system is inescapably destructive and wasteful;
- primitive peoples exemplified how we can live in harmony with nature and with each other (a romantic view of balance in primal societies);
- decentralisation leading to local autarky is necessary for ecological and social health (small is beautiful);
- technological advance (if not scientific progress) is inherently harmful and dehumanising.[127]

For Lewis the eco-radical critique of capitalism is based on:

- capitalism as inherently destructive of the earth since it leads to ever more exploitative social hierarchies and ever greater centralisation;
- a Marxist (class critique) that capitalism separates those who own the means of production and those who control only their own labour (plus a reserve army of unemployed) - this binary system is replicated globally with the capitalist core and resource and labour providing south;
- power of capitalist owners makes bourgeois democracy a sham involving workers conspiracy in their own exploitation;
- commodity fetishism (media);
- elected bodies have little control compared to multi-national corporations;
- the materialist market system that underlies capitalism.[128]

Lewis argues that in accordance with these tenets radical ecology would have us abandon urban, industrial, capitalist civilisation and return to the earth, a simpler existence where natural landscapes are transformed by human agency as little as possible. For Lewis radical ecology argues that people must never be arrogant and manage nature. He isolates what he sees as fatal flaws of eco-radicalism that I outline here.

Threat to Nature

Lewis sees 'eco-radicalism' not only as a threat to 'human society', civilisation, and material progress but as a threat to 'nature' itself. Problems include:

- reduced public support for environmentalism and fuelling of anti-environmental counter movements due to perceived eco-extremism;
- extreme radicals opposing reforms (as simply postponing necessary reconstruction);
- anti-technology movements undercutting technological research and preventing improvements in technology;
- the dismantling of large economic organisations would increase pollution since smaller ones could not afford 'abatement equipment';
- the impossible nature of autarky in a 'complex society';
- an increase in population growth in small self-sustaining rural communities and in the developing world because of reduced industrial growth;
- the opposition to human management of natural resources;
- the impossible nature of 'return to the land' with our world population (romanticism of primitive systems).

Incorrect Postulates

For Lewis eco-radicalism is based on shaky foundations since it's four postulates are contradicted by empirical record:

- primal economies rarely harmonised with nature;
- decentralised small-scale political structures can be violent and ecologically destructive;
- technological advance has been necessary;

---

[126] ibid.
[127] ibid.
[128] ibid. p154

• capitalism, "despite its social flaws" presents the only economic system resilient and efficient enough to see the development of a more benign human presence on earth.

Strategy
Lewis has pragmatic objections to eco-radical political *strategy* that add to his theoretical and empirical disagreements. He believes it naive to think that ideological campaigns of intellectual hectoring will result in mass conversion to environmental romanticism marked by vows of poverty. If wide scale conversion were to occur specific policies must still be formulated. Neither does Dobson see potential in eco-revolutionary groups (although he does in the dispossessed) to cause revolution.

Naive Globalism
Lewis sets himself up against 'naive globalism'. The need for international co-operation he argues does not mean that we can ignore the existing geopolitical framework of competing sovereign states "Leading countries - those boasting economic and technological prowess - will unavoidably play key roles in determining whether an ecologically sustainable socio-economic order is ever to be created."[129] By condemning and not coming to terms with international competition, radical greens undermine the prospects of creating a global economic economy. Lewis argues astonishingly that by attacking the foundations of scientific research radical environmentalism will "hasten the decline of the United States relative to Japan". Rough parity between the two is essential since environmentally they are mirror images of each other. Japan is 'ahead' in energy and resource efficiency but American is 'ahead' in terms of preservation of nature for natures sake. He argues that in a world economy dominated by Japan, energy and resource conservation would likely be high priorities, but not the preservation of biological diversity. Thus argues Lewis America must compete to keep up with Japan presumably in a race to environmental destruction and greater third world poverty!

1.5.3. Promethean Environmentalism

In opposition to radical environmentalism Lewis postulates a Promethean Environmentalism that embraces "the wildly creative, if at times the wildly destructive, course of human ascent".[130] I note later how for Bookchin this is a limited view of the creativity and expression based around money in a machine controlled society. As I have noted it is also a vision of creativity for a few and domination of the many. Promethean environmentalism combines technological advance and wilderness preservation.

Lewis acknowledges that signals of impending disaster are many (global warming and ozone depletion) and that we should graduate from contemporary agri-business, from fossil fuels to solar power and from discarding of material artefacts to recycling. We must prevent destruction of species, and reduce population. Lewis supports single issue direct non-violent action as a means by which pressure can be exerted on the economy. He argues however, contrary to steady state economics that we need a *vigorously expanding economy* to pay for pollution control. Power from the sun is effectively infinite and 'everything is energy'. Thus we can have an ever expanding economy. Lewis points out that in *An Environmental Agenda for the Future*: leaders of the America's ten most influential conservation groups explicitly accept capitalism and expressly endorse economic growth. He notes that the World resources institute argue that environmental health depends on sustainable *development* while techno-environmentalists such as Oppenheimer and Boyle propose that technical advances in power generation and in transportation systems offer the best hope for protecting the atmosphere. It must still be asked whether material satisfaction is the final locus of human expression.

Lewis proposes decoupling the human and natural worlds, a guided capitalism, political pragmatism and post-modern environmentalism. His views come between those of cornucopians who would not 'guide' capitalism and people like Harrison who although an environmentalist develops a leftist critique of global exploitation.

Decoupling the Human and Natural Worlds
Lewis rejects both the 'instrumentalist' notion that nature should be used merely for human ends and the 'anti-humanist' 'deep green' argument that humanity should be one species in nature. Lewis argues that development of solar power will come from high-tech corporations not through deep ecologists reaffirming their connection with nature - from firms operating in a social, economic and technical milieu almost wholly removed from the intricate webs of the natural world and driven by capitalism. Lewis also notes how the future may be in 'plastics' to replace paper, wood, and cotton. This scenario suggests we will always be one step ahead if we let capitalist market economics drive our technology.

[129] ibid.
[130] ibid.

Again Lewis criticises the deep green view of nature as a wilderness of intrinsic worth. Instead nature is a necessary habitat for humans. Promethean environmentalism would separate human activities from nature both to protect nature from humanity (for natures sake) and allow continued technological progress (for humanity's sake). This means acknowledging a profound difference between humankind and rest of nature (exactly what deep greens see as the problem). Lewis argues that "We would be better off admitting that while human kind is indeed *of* nature, intrinsically creative human nature is a phenomenon not found in nature's own creations. In a Promethean environmental future, humans would *accentuate* the gulf that sets us apart from the rest of the natural world—precisely in order to preserve and enjoy nature at somewhat distant remove. Our alternative is to struggle within nature, and in so doing to distort its forms by our inescapably unnatural presence".[131]

Guided Capitalism
For Lewis only a controlled capitalism can generate the resources necessary for the development of a technologically sophisticated, ecologically sustainable global economy. For Lewis the market plays an important role but should not be given full sway. In this respect he sees Germany or Japan as examples of combining free market and individual initiatives with social organisation. Social equity and environmental protection are best achieved by working through rather than fighting against the market economic system and the corporate structure of late 20th Century capitalism. Economic growth, environmental protection and social welfare are positively linked. This idea is based on the notion that a country that demands pollution controls will be advantaged at the highest levels of technological sophistication as will a society that continually upgrades its social system. Lewis acknowledges however that at present "only a few societies are growing more prosperous, the gap between rich and poor is increasing both in the United States and the world at large and environmental systems throughout the planet are deteriorating."[132]

Uneconomic Despoilation
Lewis argues that many environmental problems are the result of the fact that our economic system is not 'complete'. He focuses on actions that are good for individual firms but not to the American economy as a whole. A real economic long term balance sheet would then stop such practice. This leaves us to define long term and ask why the American economy is a more appropriate 'economic unit' than an individual firm. Lewis calls for a new economic calculus that fully encompasses environmental variables but at the same time argues that many problems are the result of "governmentally mandated economic distortions".[133] While freedom to discharge wastes without cost into the environment may benefit one firm it does harm to the economy as a whole. He thus calls for economic efficiency at the most 'abstract' level. Lewis argues critically however that it is untrue that economic growth rests fundamentally on exploitation of natural resources 'Technologies, not natural resources, provide the essential motor for economic progress."[134] This concept is opposite to that of Daly as discussed who sees the economy as a subsystem of the globe not nature as a subsystem of the economy.

Political Pragmatism and Moderation
Lewis believes that generally environmental sympathies are growing and most people are willing to 'forgo something' for the environment. Environmentalism thus needs to form a broad middle ground coalition - left of centre - liberal moderate. Lewis stresses that working with large corporations so that some change can be achieved is the best way to progress practically.

A Post-modern Environmentalism
Lewis calls for a post-modern environmentalism since it accepts no ultimate truth and can accommodate today's wide and increasingly varied cultures. This is at odds with Chomsky's and Bookchin's notion of the emergence of a universal market led, media controlled culture in which fashion and taste are controlled by a few corporations. Lewis accuses eco-radicals of rationalist epistemology and reductionist thinking in that they look at a few postulates only from which they generate a series of simple polarities such as the wicked west versus the virtuous east or the evil industrial versus peaceful primitives. Capitalism is reduced to a self-cancelling impulse to accumulate for the sake of accumulation. Most eco-radicals are modernist in their search for absolute certainty. Limits to growth is postulated as inevitable. Bookchin unapolegetically prefers modernist thinking to fractional post-modernism that serves only the status-quo.[135] Bookchin argues that capitalism however has betrayed rationalism, science and technology.

---

[131] ibid.
[132] ibid.
[133] ibid.
[134] ibid.
[135] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991.

Re-evaluating a role for science
Lewis also notes the work of Trist who looked at positive as against negative science policies (in terms of resources given to its already extensive domain) in response to the dislocations it has brought but the potentials it has opened.[136] A negative policy would mean withdrawal of resources from science and its disestablishment as the core value in the culture of our society. The costs of abandoning a positive science policy argues Trist would be penal but the case for continuing a positive policy must be made on the basis of the social aspects. Three new concepts in science have been advantageous in this respect - abandonment of the belief of total explanation, the abandonment of reductionism and appearance of an integrative as well as analytical strategy.

1.5.4. The Response of Social Ecology

While seeing limits to growth of present society social ecologist such as Bookchin tend to criticise the 'limits to growth' thesis because:

- many of today's limits are artificial and based on exploitation (for example food distribution) and waste in the West;
- we cannot use limits to deny developing countries their desires to industrialise;
- the idea of 'limits' cannot be used to produce other definitions of the 'good life' that must be done because material wealth is available to all but is not the final locus of human expression;
- there are no 'limits' if technology is brought within human subjectivity of freedom (nature is more than the sum of its parts);
- limits are more a problem of pollution than resources.

In addition social ecologists seem ready to accept that the powerful will survive and that this raises questions about the nature of society now and in the future. A technocratic future is criticised because it will be increasingly hierarchical, inhuman and prone to dramatic failure. In response to Promethean environmentalism it can be noted that social ecology does not consider trade as alien or encourage 'developing' countries to shun industrialism although it does see the global economic system based on capitalism as intrinsically exploitative of people and thus the planet. Further it does not see technological advancement as inherently destructive. It sees labour saving technology as important to the development of human subjectivity. It does not inherently criticise science and rationalism but their betrayal by hierarchical social and economic systems and capitalism. It sees human intervention in and management of nature as inevitable and desirable. As I will go on to describe however social ecology concentrates on social relations and locates technology firmly within its 'social matrix'. Bookchin agrees that there were many problems in primitive societies. I go on to discuss social ecology through the writings of Bookchin and how he is as critical of greens as he is of environmentalists. I look at social ecology in more detail because it appears to balance the green and environmental critiques to provide a radical but realistic alternative that can be used to redefine 'green architecture'.

---

[136] Martin Lewis, *Green Delusions*, Duke University Press, 1992.

1.6. Social Ecology

I have started to distinguish the social ecological position from those of greens and environmentalists. As the main proponent of social ecology Bookchin, as radical greens, focuses on the need to address consumption and the factors (systems and attitudes) that drive it not simply technological methods. While initially reacting against environmentalism much of Bookchin's later writing has responded to the right wing nature of much deep green philosophy that he criticises as atavistic, anti-enlightenment, biocentric (anti-humanist), and Malthusian. He also notes a lack of coherence and 'half baked' ideas. In these respects he has much in common with environmentalists. By contrast Bookchin argues that social ecology is consistent, relevant, radical and realistic. He draws together the social and green critiques of capitalism into a consistent whole. While Marshall has noted many problems of such a wide ranging critique Bookchin's work does provide the basis of a socially committed and consistent green approach.[137]

Philosophy
Bookchin develops a comprehensive philosophy of nature in which to ground his ethics and politics.[138] It rejects both mechanistic materialism that sees nature as a dead body of resources to exploit, and the 'spiritual mechanism' in which all is dissolved into a 'cosmic oneness'.[139] Bookchin is not philosophically idealist instead he differentiates 'first nature' and 'second nature' and deals with the two as 'nature-as-a-whole'. While 'first nature' is a product of biological evolution, 'second nature' is product of social evolution of a mind that can act purposely and creatively. Nature has within it latent consciousness and subjectivity; human consciousness is nature made self conscious.[140] While human beings are a product of natural evolution they are a conscious and subjective product, unique in that they are able to shape societies and make their own history. We are also distinct from our human ancestors who often destroyed the natural environment as a direct result of their closeness to it.

Need for Separation
For Bookchin then we are conscious beings with no choice but to 'intervene' in the natural environment. Further our care for the environment is a product of our consciousness or apartness from first nature. For Bookchin as for environmentalists such as Lewis it is our separation or apartness from nature that will enable us to deal with environmental problems "whether we truly know and fully appreciate first nature depends very much on having the intellectual and emotional ability not to confuse ourselves as human beings with coyotes, bears, wolves, much less with insensate things like rocks, or rivers, or even more absurdly, with the cosmos."[141] For better or worse, human beings are the sole ethical agents that exist. Rights are not spontaneously generated in first nature. Wolves, notes Bookchin would devour the last caribou alive if they were hungry ('mutual aid' is within species). We do not have to simply follow 'genetic code' and thus destroy other species. Our appreciation of differentiation enables creative human intervention and 'participatory evolution' as opposed to what Bookchin sees as the stagnation proposed by deep ecologists.

Participatory Evolution
Social Ecology offers then, an evolutionary not static view of nature. Unlike deep greens Bookchin points out we cannot absorb the social back in to natural evolution by equating humans with animals or imposing 'natural law'. Increasing subjectivity turns humans into an active force in their own evolution, not merely the passive objects of natural selection. Bookchin is critical of deep ecologists who argue we should not intervene in nature except for minimal needs of life and survival. The appreciation of differentiation enables creative human intervention. 'Otherness' must however take the form of differentiation, articulation and complementary *not hierarchy*. If this is the case human intervention in biological nature and stewardship can actualise the potential of first nature. *Natural evolution becomes participatory evolution.*

Humanism
Bookchin is humanistic. He is particularly critical of the extreme 'bio-centrism' of some 'deep ecologists' that tends to attribute rights of 'self fulfilment' to all creatures. Bookchin argues that human beings have a 'special worth'. However much Gaia might be able to survive without the existence of human beings, such a Gaia would have no more ethical meaning or value in the scheme of things than a meteorite. Bookchin

[137] Peter Marshall, *Demanding the Impossible*, Fontana Press, London , 1993.
[138] Murray Bookchin, *The Philosophy of Social Ecology*, Black Rose Books, Montréal, 1990.
[139] Peter Marshall, *Demanding the Impossible*, Fontana Press, London , 1993. p605
[140] ibid. p606
[141] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p2

argues however that to confer rights on non-human species or even forests, streams, and certain geological formations, from a practical standpoint might be an invaluable way of conserving and expanding eco-communities that should be preserved for many reasons. Bookchin humanism extends to the notion that "our re-entry into natural evolution is no less a humanisation of nature than a naturalisation of humanity".[142]

Emergence of Social Hierarchy

If our gradual differentiation from nature provides the potential for sustainable development, this potential has been destroyed by the social emergence of hierarchy. Bookchin traces the roots of the environmental crisis to the emergence of hierarchical society culminating in capitalism and argues that only the creation of a free anarchist society will solve the threat of ecological disaster facing humanity. The need to dominate and exploit nature first emerged from mans domination of woman in patriarchal society and mans domination of man in hierarchical society.[143] The emergence of hierarchy in human society *preceded* exploitation of nature. Bookchin roots both capitalism and our growth ethic in the development of social hierarchies. Hierarchy, class and ultimately a competitive capitalist system nourish a view of the natural world as a mere agglomeration of 'resources' for human production and consumption and thus cause environmental dislocations. Environmental dislocations are rooted in the materialism of human domination of human. Bookchin notes "if we make this planet uninhabitable for humans it would be through the kind of society we have; change society and we have a reasonable chance of harmonising our relationship with Gaia".[144] Thus our ability to intervene creativity in natures evolutionary development to the benefit of humans and the globe depends on kind of society that emerges.

Bookchin uses anthropological studies of organic societies particularly of Paul Radin that he argues had no hierarchical structures and thus *developed a system of needs* that it was possible to satisfy without a struggle against nature. Their view of nature was primarily decided by the nature of their social structures. What such societies lacked was a developed sense of self conscious. According to Bookchin, a sense of community and co-operation became more important in agricultural societies but in other hunter gatherer societies the *division of labour* contributed to the emergence of domination and hierarchies. The domination of human by human (and thus environmental problems) did not arise because people created a socially repressive mechanism in order to 'free' themselves from domination by nature (survive and overcome scarcity).

Bookchin is however not a primativist. His comments on organic societies also note problems of parochialism and alternatively ritualisation of animals and overkills due to a 'closeness' to nature. While subsequent history in the West led to a legacy of domination culminating in capitalism he notes several periods since when elements of free societies have emerged. He particularly stresses Greek civilisation based on *autarky* of the polis. Here living well was seen as achieving a balance. Building on such notions a future free society would be an ecological one. Bookchin is fond of the term 'Janus-faced' to describe how many developments have improved on organic societies but with attendant problems. The city for example overcame the parochial nature of organic society but at the expense of communal ownership and human (balanced) scale.

For Bookchin then hierarchy is strictly a social term not found in first nature. He notes that any domineering behaviour in nature is episodic and temporary. It is also genetically programmed not based on socially contrived institutions open to radical change and revolution.[145] Hierarchy involves both institutionalised and ideological systems of command and obedience in society. Its origins are in a complex combination of economic, political and cultural factors. *Changes must be made in the way people think and feel as well as their social organisation.* This has implications for his ideas on freedom and revolution discussed later.

Deep Green Criticism

Deep greens accuse Bookchin of arrogance since he argues that humanity has been endowed by natural evolution with a degree of intellectuality, a range of expression, a physical flexibility, and a cultural tradition unprecedented in the biotic world. *For deep greens it is this belief in superiority of humans that is the root cause of environmental problems.* Marshall notes the critique of Bookchin as 'hierarchical' because he argues that humanity is unique and has the potentiality to bring consciousness to the service of natural evolution.[146] Bookchin argues however that the existence of differences including more

[142] ibid. p342
[143] ibid. p1
[144] Walter Schwarz, 'Anatomy of an eco-anarchist', *the Guardian*, 15 May 1992.
[145] Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p62
[146] Peter Marshall, *Demanding the Impossible*, Fontana Press, London , 1993. p618

complexity does not presuppose or imply hierarchy. We depend on phytoplankton but we can consciously affect phytoplankton.

Lack of Social Concerns
Social ecology links both social and environmental problems to hierarchy. The destruction of the environment, the destruction of the Third World, and the dehumanisation of society are the result of hierarchies and ultimately the absolute dedication of corporate power to short-term gain at whatever long-term environmental/human cost. This link to social problems is characteristic of left greens such as Moore Lappé, Susan George and Richard Gott. Bookchin attempts to give this view a consistent philosophy.

For Bookchin many trends in the ecological movement today serve to refocus public attention away from social issues and toward safe socially neutral phenomena. They become crudely atavistic when they blame 'technics' rather than the corporate and state institutions that employ them. Greens often fail to address the deep seated divisions in society that came into existence with hierarchies, threaten the survival of the biosphere and should be criticised in their own right. The human social condition ceases to be a concern. Critically such an approach also leads to the treatment of people merely as a 'species' and brings all human beings (young people and old, women and men, poor and rich, exploited and exploiters, blacks and whites) into complicity with their own degradation by elites, classes, and the State, not only the degradation of nature by a grow-or-die society. For Bookchin this stands completely at odds with social reality. Radical criticisms of class are being replaced by anguished cries, based on views of Thomas Malthus, about the population problem as though modern capitalism, given its competitive market economy, would not ravage the planet even if the World's population were reduced to a fraction of its present numbers.

Richard Gott also points out that instead of practically addressing local environmental and social problems today's ecological movement has allowed itself to become obsessed with utopian ambitions and the "impotent, apocalyptical rage of Mother Earth mumbo-jumbo".[147] For Gott the environmental debate has transcended the sound anti-capitalist argument that world resources will run out if all its population is brought up to the standard of living enjoyed in the so called western world. Instead we have entered the territory of the 'mad scientist' and the 'eco-fascist' with their concerns for the violation of the biosphere, the need to protect 'Mother Earth' and the imminence of environmental apocalypse. In this way we have essentially become removed from the real environmental problem: *the wealth of a few sustained through exploitation of both the environment and the poor, if not the environment of the poor.* Deep green debate has moved the emphasis of the green movement away from helping people at a local level.

Limits to Growth
Marshall suggests that Bookchin remains unconvinced by ecological arguments for 'limits to growth', the dangers of overpopulation and the dwindling of finite resources.[148] He attempts to demystify the notion of 'stingy nature' that has left some ecologists to call for 'limits of growth' and a 'return to nature'. Nature is conceived as a developmental process - as distinguished from the static, picture-postcard scenic view of wilderness. It is extraordinarily fecund, marked by an increasing realm of differentiation, neural complexity and the creation of diverse ecological niches. Natural evolution is not a narrow 'realm of necessity' but a fecund striving development although neither is this a 'law of nature' but a potentiality.

Bookchin however does see 'limits to growth' of capitalism based on pollution due to the recent thrust to increase production in both capitalist and communist states. In a free society such limits would not exist but Bookchin also notes that freedom does not mean mindless affluence but a "sufficiency of technical development that leaves individuals free to select their needs autonomously and to obtain the means to satisfy them".[149]

Bookchin is critical of green efforts to deny 'growth' to developing countries. Nothing could be more damaging to the green cause than the perception that it is supported by privileged people who have enough for their own needs, and are now eager to limit the access of the poor to those benefits of industrial society which they themselves enjoy. Further however whatever the prospects of achieving a free ecological society in the past, today humanity must be free to reject bourgeois notions of abundance precisely because abundance is available to all. *We no longer live in a world that treasures gift- giving over accumulation and has moral constraints that limit growth.* "Capitalism has warped the values of that earlier world to a point where only the prospect of abundance can eliminate insensate consumption and a

---

[147] Richard Gott, 'Comment' in John Vidal (ed.), 'earth', *the Guardian*, June 1992..
[148] Peter Marshall, *Demanding the Impossible*, Fontana Press, London , 1993. p621
[149] Murray Bookchin, *Towards an Ecological Society*, Black Rose Books, Montréal, 1986. p251

sense of scarcity that exists among all underprivileged people".[150] Bookchin notes that the technology of abundance (through capitalism in the West) has provided the necessary pre-conditions for free society, a society without class rule, exploitation, toil or material wants. Present society is 'Janus-faced' since it has produced a position of post-scarcity in the West that can enable us to develop a less materialist view of human fulfilment.

Free Nature
Only the active political involvement of anarchy will produce appropriate definitions of the good life. If not humanity remains less than human (instrumental) and thus destructive. In a participatory democracy natural evolution becomes 'participatory evolution'. In this case no 'limits to growth' exist. Nature is not a dead body of resources that will run out rather the whole is greater than the sum of the parts. Participatory evolution can extend 'limits to growth' but social evolution has been thrown against natural evolution because of human hierarchies.[151] 'Free nature' can be created only through developing human nature.

Artificial Scarcity
Supporting Bookchin's 'post-scarcity' ideas is the notion that 'artificial scarcity' has been more important than natural carrying capacity in creating 'limits'. Francis Moore Lappé points out that between 1950 and 1986 world production of grain increased by 260% far outpacing world population growth while poverty and hunger have increased.[152] She describes how, at the same time, over half the harvested acreage of farmland in the US is used to provide feed for cattle and other livestock that produces only a tiny amount of the protein the country consumes as meat. In addition, Americans are eating twice as much protein as their bodies need. The proteins needed could be provided through a combination of plant foods and on a much smaller acreage. Moore Lappé concludes that hunger is not a consequence of the physical limits of the earth but of economic, *cultural* and political forces that determine what is planted and who will eat.[153] The 'natural scarcity' of food and arable land is a myth. We are not faced with an absolute shortage but an irrational society. The poor of the third world do not need western grain - they are quite capable of producing enough food of their own. As already noted GNP differences in last 30 years between North and South have increased. Francis Moore Lappé extends the notion of food to argue that no one today need be denied adequate food, clothing or shelter. The notion of scarcity is thus largely a problem of distribution of capitalism.

Social ecology must "demonstrate that modern systems of production, distribution and promotion of goods and needs are grossly irrational as well as antiecological."[154] Bookchin is critical of environmentalism in terms of its support for existing systems and deep ecology whose arguments for 'limits to growth' and the 'life-boat ethic' have been reared *largely* on specious data and ignored the 'institutional technics' of an increasingly authoritarian state.[155]

Science of Anarchy
One of Bookchin's principal contentions is that in ecology we can find guidelines on how a free society can be organised. An important principle is that overall harmony in an ecosystem is best realised by diversity. Man is undoing the work of organic evolution by replacing a highly complex organic environment with a simplified inorganic one. Hierarchy destroys diversity. The critical message of ecology is that it we diminish variety in the natural world we debase its unity and wholeness. If we wish to advance unity and stability in the natural world we must preserve and promote variety.[156] Anarchism is the only social philosophy that offers the possibility of achieving unity in social diversity. Anarchism can help realise ecological principles and ecology can enrich anarchism. In fact anarchism is the social equivalent of the ecosystem. Bookchin defines an ecosystem as "the image of unity in diversity, spontaneity, and complementary relationships, free from all hierarchy and domination".[157] Bookchin also develops Kropotkin's ideas that nature provides the grounds for human freedom based on mutual aid not competition. A basic sense of decency, sympathy and mutual aid lies at the core of human behaviour. *He stresses the importance of the concrete rounded individual but not the individualist.* Selfhood is not merely personal but social - we are above all social beings and have a need to associate, to care for our own kind and to collaborate.

---

150 Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p170
151 ibid. p38
152 Sue Aspinall, *Visionaries: Changing the way we live*, Channel Four Television, 1993.
153 Frances Moore Lappé and Joseph Collins, *Food First*, Abacus, London, 1982.
154 Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p262
155 ibid. p261
156 Murray Bookchin, *Post Scarcity Anarchism*, Black Rose Books, Montréal, 1986.
157 Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991.

Naturalistic Fallacy
For Bookchin then anarchism is scientifically vindicated by ecology. Marshall however notes the problem of the 'naturalistic fallacy': the transference of scientific principles (from ecology) to social and moral theory (of anarchism); a moral imperative from empirical observation; an 'ought' from an 'is'.[158] Marshall also criticises the notion that how we see nature working today is the ultimate truth. Bookchin's accepts that our relationship with nature is always mediated by our technology and knowledge. There is no true definition and our ecological description may be a temporary model. Human beings not only decide what is valuable but so called 'laws of nature' are merely observed regularities. Bookchin however deters these criticisms by his division of first and second nature. Nature is not an ethic but a 'matrix' for an ethics and nature can be a source of 'values and ideals'. Marshall also argues that there is a conflict between Bookchin's emphasis on biological and social evolution and his use of terms like harmony, equilibrium and stability in ecological society. The historical anarchist is opposed to stasis.[159]

Criticising Environmentalism
As noted in defining what he refers to as 'social ecology' Bookchin was initially attempting to advance a holistic, socially radical, and theoretically coherent alternative to what he saw as the largely technocratic, reformist and single issue environmental movement.[160] Environmentalism is rested on an *instrumental and engineering approach* to solving ecological dislocations that in effect attempts to adapt the natural world to the needs of existing society and its exploitative, capitalistic imperatives by reforms that minimise harm to the material well being and power of the wealthy. Such reform (restrictions to urban growth, roads, control of toxic wastes) represents a necessary struggle that can only slow down problems. It does not supplant the need to get to the roots of environmental dislocations that are for Bookchin inherent to capitalism; a product of its law of life as a system of limitless expansion, capital accumulation and 'instrumental 'exploitation of nature.[161] To ignore this anti-ecological core (also present in Marxism and Socialism that share a materialist approach) is to allay public concern about the depth of the crisis and suggest the present social order is capable of rectifying its own abuses (individual consumer action and evolution of corporate responsibility). Groups like Greenpeace and Friends of The Earth attack the symptoms not the cause of problems. Direct actions are however important in 'rehearsing participative democracy' and in the development of a 'politic'. Environmentalism is also self corrupting because it participates in state craft. Both the environmentalist demonstrator and government share the idea that change can be accomplished through the exercise of power that for Bookchin is at the root of environmental dislocations because it produces simplified and eventually material relationships. Practically Bookchin notes how participation with state power has simply meant bargaining away large tracts of the environment for insignificant benefits.[162] I discuss the social ecological revolutionary project in more detail below *(1.9.2. Remaking Society - The Social Ecological Project)*.

A Coherent Approach
While Bookchin initially criticised environmental reformists and parliamentarians he sees their actions as necessary and at least dealing tangibly with practical problems. He reserves his most forthright attacks for 'deep ecologists'. I have noted several of his criticisms. Another predominant reason is that while criticism of capitalist western growth systems has characterised the development of ecological economics throughout the 20th Century convincing alternative models are more difficult to find. Bramwell also notes that the moral criticisms of trade, which imply imbalance, greed and resource exploitation to the ecological economist, are contrasted with "a hypothetical, but unspecified, viable moral economic order".[163]

In his attempts to develop a 'coherent' and 'rational' view of the social sources of our ecological crisis Bookchin also criticises post-modernism and in particular deconstruction that celebrates incoherence in the name of a passion for pluralism.[164] While understandable in the face of our modern totalitarianism it ignores exploitation and domination and is according to Bookchin a testament to the sense of disempowerment in both social and personal lives. It is a product of the inability of millions of people to cope with a harsh and demoralising reality, to control the increasingly oppressive direction in which society is moving. Again this fragmentation only serves the prevailing hierarchical condition.

[158] Peter Marshall, *Demanding the Impossible*, Fontana Press, London , 1993. p610
[159] ibid.
[160] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. pxiii
[161] Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p160
[162] ibid. p161
[163] Anna Bramwell, *Ecology in the 20th Century: A History*, Yale University Press, 1989.
[164] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. pxvii

Betrayal of Enlightenment by Capitalism and by Deep Greens
Bookchin sees a growing *anti*-Enlightenment tendency amongst deep ecologists that criticises the goals of a rational society, its belief in progress, its high hopes for education, its demands for human use of technology and science, its commitment to reason and its ethical belief in humanity's power to attain a materially and culturally viable world. For Bookchin the abuse of enlightenment principally by industrial capitalism through commodification and mechanisation does not negate its original ideals "the enlightenment tried to formulate a general human interest over feudal parochialism and to establish the idea of a shared human nature that would rescue humanity as a whole from a folk-like tribalistic, and nationalistic particularism".[165] Capitalism has warped reason to a harsh industrial rationalism focusing on 'efficiency', using science to quantify the world and dualise thought, and being and using technology to exploit nature (critically including human nature). Attempts to denigrate reason, science and technology today are parochial reactions to bourgeois distortions. All these distortions have their roots in society and in ideologies that seek to dominate humanity.

Green, Environmentalism, Social Ecology and Limits
The green 'limits to growth' argument is that anything that is not renewable is exhaustible. They also note that even renewable resources are being drastically cut back. The problem of pollution exceeding regenerative capacities is even greater. By contrast Promethean environmentalists argue there can be no serious claim that any major resources will run out before humanity can develop new resources and technical methods. Bookchin accepts the absolute notion of producing conditions unsuitable to human habitation due to pollution and argues technological methods will not prevent us reaching limits without institutional and social alternatives. These alternatives will reduce consumption but also extend limits. A logical problem of Bookchin's argument is the rate of destruction. Further it should be noted that production of food for global populations remains a technological problem even without artificial scarcity (balanced technological means need to be found to produce food even in a social ecological future).

Technocratic Society
For Bookchin the environmental problem goes beyond inventing new technologies. Such a future would inevitably be a hierarchical technocracy replacing natural process and subject to catastrophic misjudgements. It would involve technology replacing natural cycles, for example, determining the ratio of atmospheric carbon dioxide to oxygen, providing a substitute for the decomposing ozone layer that protects all life from solar radiation, and substituting highly hydroponic solutions for soil.[166] All of this, *if it were possible*, would require a highly disciplined system of social management that is radically incompatible with democracy and political participation of the people. It would probably be the equivalent of the centralised totalitarianism in *1984*.[167] The degree of social co-ordination needed is impossible for a *hierarchical system*. In remaining class beings we would also continue to narrow our meaning of what it is to be human.

A Social and Cultural Revolution
As noted Bookchin goes beyond simplistic denunciation of the State and Capitalism. Exploitation and class rule are particular concepts within more generalised concepts of domination and hierarchy. Hierarchy means not only a social condition but a state of consciousness - cultural, traditional and psychological systems of obedience and command as well as the economic and political systems of class and State. The state as an instrument of organised violence emerged with the gradual politicisation of certain social functions and is now so meshed in society that it is difficult to distinguish between the two.

To create an ecological society Bookchin thus notes how a *cultural* and *social* revolution need to take place that involves a 'remaking of the psyche'. Both human beings and nature have become victims of domination to such an extent that they are now faced with ecological distinction. We must recover a subjective and human definition of the good life beyond those of material needs. Bookchin argues that humanity today is still less than human. Freedom is the unhindered volition of self-consciousness. It involves equality based on recognition of inequality of capacities, needs and responsibilities. It involves provision of an 'irreducible minimum' to survive.

Today a free society can emerge because of 'post-scarcity' (in advanced industrial societies). Because of this position we can choose needs 'beyond' materialism. Anarchy is further, a realistic and practical goal involving the creation of a balanced community, a face-to-face democracy, a humanistic technology and a

---

165 Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal 1989. p166
166 ibid. p171
167 Murray Bookchin, '"1984" and the spectre of Demerorization', in Marsha Hewitt and Dimitrious I. Roussopoulos (eds.), *1984 and After*, Black Rose Books, Montréal, 1984.

decentralised society. *This social perspective changes the brief for green 'technics' including green architecture and city form.*

1.7. The Social Matrix of Technology

Summary
I have noted how Bookchin sees ecological problems as social problems of hierarchy and hierarchy not simply as social organisations but the way we think materialistically and technically. For Bookchin then, as for greens, technology cannot solve environmental problems. Technologies cannot be separated from the social and institutional arrangements that drive then. Only by addressing these will we address what often appears to be the technological problem of environmental dislocation. The efficiency of instrumental technology is secondary to the creation of libertarian institutional arrangements and libertarian society. For Bookchin our systems of hierarchy and domination have objectified humanity and thus made our relationship with nature exploitative. The ultimate development of sustainable technologies will depend on the development of an anarchist society in which technology will be rooted in human subjectivity. Its development will not be based on the materialist notion of exploitation of nature because exploitation of nature is a product of exploitation within society that is not part of an anarchist society. This technology will thus not be based on natural 'limits' but 'sufficiency' within human limits. In developing a 'social matrix' that will generate these technologies there is a need to break down materialist attitudes to exploitation of nature that are rooted in and originate from social hierarchies. This demands re-empowering people and breaking down institutional, social and psychological hierarchies. It involves creating self-governing and creative citizens. Some technologies (defined as biotics) can help by bringing natural and production process back into our lives (in addition to being efficient). Bookchin only partially agrees with Schumacher when he writes "I know no better way of changing the 'system' than by putting into the world a new type of technology - technologies by which small people can make themselves productive and relatively independent".[168] He sees a role for technology particularly if it is both decentralising and biotic but the core of the problem is our human relations. This technological description is critical to defining an architecture of social ecology and is thus briefly expanded on below.

The Technology of Abstract Labour
For Bookchin the abstract nature of labour today is an example of the extent of objectification of humans. He notes that labour underpins contemporary relationships in the rewards it brings, privileges it confers, discipline it demands, repression's it produces and social conflicts it provokes.[169] Labour, to the modern mind, is external to real life - a rarefied abstract activity extrinsic to human notions of 'genuine self-actualisation'. Our image of labour is homogeneous 'labour-time' measured in hours, products and efficiency. Labour simply to earn money has economised social life. The monetary reward is an incentive for submission rather than the freedom of creativity and self-fulfilment.[170] We associate the 'realm of freedom' with 'free time' (the later being the political counterpart of Marx's 'abstract labour' or 'labour time'). This means that freedom is temporary and comes between 'mindless production'. It is seen as material plenitude on the one hand and inactivity on the other. Thus 'freedom' is seen as freedom *from* labour, not freedom *for* work.[171]

I have already noted Seabrook's notion of 'poverty of wealth'.[172] Bookchin contrasts this with the potential for creative labour developed by the utopian socialists at the turn of the century. Bookchin thus criticises Marx since his notion of labour process is essentially utilitarian and thus materialistic (thus part of capitalist domination). By contrast in an organic society - the materials, work process, and transformed result become an organic whole - 'labour time' or 'abstract labour' has no meaning.[173] He notes how the labourer today is not allowed an imagination. Further "Even the process of design by today's architects and other professionals has become a stereotyped process of rational techniques."[174] The fundamental premise today is to reduce the length of the working day not fundamentally question the working day. Such abstract labour is essential to both capitalism and communism. Bookchin, as an anarchist, is not in favour of endless toil often implied by deep greens. Again technology should be limited by human

[168] E. F. Schumacher, *Small is Beautiful*, Abacus, 1973.
[169] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p224
[170] note also Jeremy Seabrook, *The Race for Riches*, Green Print, Basingstoke, 1988.
[171] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p262
[172] Jeremy Seabrook, *The Race for Riches*, Green Print, Basingstoke, 1988.
[173] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p230
[174] ibid. p225

subjectivity not natural scarcity. *Bookchin thus distinguishes 'libertarian municipalism' with 'democratic workplace democracy' that is little more than a participatory approach to productive activity not an emancipatory one* (see *1.8. Ecotopia - The Sustainable Society of Social Ecology*).

Capitalism and Technology

Bookchin emphasises that 'mindless labour' is not simply a result of technology but is a calculated and deliberate product of subordination and control. Bookchin notes how Mumford observed that the earliest machines to appear were massed human beings that reared the huge public works of early civilisations - these bureaucracies may have co-ordinated people but many turned them into machines - oppressed and dehumanised. The culmination is the capitalist emergence of the factory with its abstraction, rationalisation, and objectification of labour. Bookchin uses the 'putting-out' system as an example of human objectification through exploitation. So called factors brought wool to family cottages, passing on unfinished yarn to weavers and then to dyers, that led to concentration of all cottagers into 'factories'. Here they were obliged to work under "harsh, exploitative, and highly disciplined conditions".[175] It was in this way that "the new industrial bourgeoisie circumvented the traditional guild restrictions in the towns and brought a growing class of dispossessed proletarians into its service".[176] Workers could then be played off each other in a 'free' labour market, driving down wages in the new factory system. It should be noted that for socialists such factories brought together labour as an organised collective force.

Bookchin argues then that we cannot substitute 'industrial society' for 'capitalism'. In England the labour force in early factories was structured around simple machines and techniques. *What these factories did was to intensify the labour process, not introduce particularly startling technical innovations. Bookchin notes that to speak of an 'industrial society' without clear reference to the new social relations introduced by capitalism, namely wage and labour and a dispossessed proletariat, often wilfully endows technology with mystical powers and a degree of autonomy that it does not really have. It also creates the highly misleading notion that society can live with a market economy that is 'green', 'ecological', or 'moral' even under conditions of wage labour, exchange, competition, and the like.*

Hierarchy and Technology

Critically then, for Bookchin, modern technology has become objective because human relations became objective - they became hierarchical "technics does not exist in a vacuum, nor does it have an autonomous life of its own".[177] A given body of sensibilities, social relations, and political structures is no less the components of 'technics' than the material intentions of the producer and the material needs of society. Modern technology is inorganic because society has become inorganic in terms of its own 'social tissue' and structural forms (ultimately capitalism). Bookchin refers to a loss of the social matrix of technology. In line with the capitalist market, technology today is largely driven by profit (through innovation and the development of new products or through cost saving substitution of capital for labour) and the quest for power, scientific inquiry and rational thought.

Bookchin argues that we can no longer distinguish between the social and technical in our lives. We are thus losing our ability to determine which is meant to subserve which. As a consequence we have failed to control the machine. We lack a 'social matrix' (a social meaning) in which to embed technology. Thus "In its massive tendency to colonise the whole terrain of human experience, technics now raises the apocalyptic need to arrest its advance, to redefine its goals, to recognise its forms, to rescale its dimensions—above all, to reabsorb it back into organic forms of social life and organic forms of human subjectivity."[178]

Thus the historic problem of technology lies not in its size or scale, its 'softness' or 'hardness', *much less the productivity or efficiency t*hat earned it the naive reverence of earlier generations; "the problem lies in how we can *contain* (that is, absorb) technics within an emancipatory society."[179] Terms like 'small', 'soft', 'intermediate', 'convivial', and 'appropriate' remain utterly vacuous adjectives unless they are radically integrated *with emancipatory social structures and communitarian goals*. They cannot transform an authoritarian society into an ecological one.[180] Instrumental technologies then, *'soft'* or *'hard'* cannot be dissociated from institutional techniques.[181] Some of the most dehumanising and centralised social systems were fashioned out of very 'small' technologies; "but bureaucracies, monarchies, and

---

175 Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p92
176 ibid. p92
177 Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p223
178 ibid. p241
179 ibid. p240
180 ibid. p260
181 ibid. p260

military forces turned these systems into brutalizing cudgels to subdue human kind and nature".[182] Today in the green movement there is a tendency to concentrate on the scale of technology that for Bookchin deflects attention from links to social structures and freedom. We *need to find social spheres that can resist technical control of social life*. Either technology is used to reinforce the larger social tendencies that render human consociation technocratic and authoritarian, or else a libertarian society must be created that can absorb technology into emancipatory human and ecological relationships.

Distance from Process and Exploitation

Many products today show no indication of from where they were derived. It is not simply that advertising and media have imprinted these products with corporate names to guide our purchasing power but more significantly that the "actual fabrication of the product - from mine, farm, and forest to factory, mill, and chemical plant has reduced the entire technical process to a mystery."[183] We become an unknowing client of an industrial apparatus. We think of nature as a nonhuman industrial apparatus. Critically "what is most important about our denaturing of natural phenomena is that we are its principal victims - we become the 'objects' that our industry most effectively controls."[184] We are victims because we are unaware of the way, technically and psychologically, in which industry controls us. We do not participate except as minutely specialised agents and thus cannot exercise control. Further it is not the complexity of the machine that inhibits our ability to control our life but the rules of society.

As noted the building block of what we call 'industrial society' arose not from the need to integrate people with modern machinery but to rationalise the labour process - to intensify and exploit it. The initial goal of the factory was to dominate labour and destroy the workers independence from capital.[185] It was not to conquer nature to supply everyone but to conquer the workers to supply the rich. This loss of independence resulted in loss of workers control of food cultivation (initially there was an equal split of work between factory and fields). This division of labour produced distance from 'natural process' and enabled 'domination' of humans. The workers' complete dependence on the factory and the industrial labour market was a precondition for the triumph of industrial society (the few over the many and nature). "Urban planning, such as it was, together with urban congestion, long working hours, a generous moral disregard for working-class alcoholism, and a highly specialised division of labor melded the needs of exploitation to a deliberate policy of proletarianism. The need to destroy whatever independent means of life the worker could garner from a backyard plot of land, a simple proficiency in the use of in the use of tools, a skill that provided shoes clothing, and furnishing for the family - all involved the issue of reducing the proletariat to a condition of total powerlessness in the face of capital".[186] In *Chapter Seven* I discuss the form of this city in more detail and particularly how spatial fragmentation has reinforced the 'alienation' of capitalist divisions.

Biotics

While for Bookchin in moving toward an ecological society there is a basic need to address our social structures within which technology operates, some technologies (their social matrix aside) have certain attributes that can nourish social freedom as a daily activity.[187] A revitalisation of human relationships and humanity's relationship with nature can be achieved by bringing natural (and production and market) process into our lives as well as by working within a social matrix of 'creative labour' and 'empowerment'. Bookchin argues that natural processes must be brought back into technology. For Bookchin "we may well want to enhance natural diversity, integration and function, if only to reach more deeply into a world that has been systematically educated out of our bodies and innate experiences".[188] He is however critical of 'alternative' technology today in which our design imagination is often utilitarian and economistic. A solar house can symbolise a designer's ability to reduce energy costs and be a monument to financial cunning. This however deals with nature merely as a natural resource: "it exhibits the sensitivity of a concerned engineer – not an ecologically sensitive individual."[189] To think ecologically is to think of technics as an ecosystem, not merely a cost effective device based on 'renewable resources'. To think ecologically include *nature's* labour in the technical process, not only humanity's. This involves the use of organic systems where possible to replace machines - producing fertiliser, filtering sewage, heating greenhouses, providing shade, recycling wastes.[190] These are of

---

182 ibid. p242
183 ibid. p310
184 ibid. p311
185 ibid. p312
186 ibid. p312
187 ibid. p264
188 ibid. p264
189 ibid. p265
190 ibid. p265

economic wisdom but also sensitise the mind.[191] We gain a sense of communication with the biotic world.

Social Matrix of Social Ecology
Bookchin notes solar sunspaces, wind generators, reed beds, organic gardens and small scale urban agriculture as biotic alternatives whose technical implementation to replace the mechanical systems that drive modern industry is eminently possible. The problem we face however is not strictly technical. Simply we must arrest more than just the ravaging and simplification of nature. We must also arrest the ravaging and simplification of the human spirit, of human personality, of human community. This involves "a sweeping program of social renewal".[192] Only then will our technologies develop ecologically (within human subjectivity).

"A purely technical orientation toward organic gardening, solar and wind energy devices, aquaculture, holistic health, and the like would still retain the incubus of instrumental rationality that threatens our very capacity to develop an ecological sensibility. An environmentalistic technocracy is hierarchy draped in green garments, hence it is all the more insidious because it is camouflaged in the color of ecology. *The most certain test we can devise to distinguish environmental from ecological techniques is not the size, shape, or elegance of our tools and machines, but the social ends that they are meant to serve, the ethics and sensibilities by which they are guided and integrated, and institutional challenges they involve.* Whether their ends, ethics, sensibilities, and institutions are libertarian or merely logistical, emancipatory or merely pragmatic, communitarian or merely efficient—in sum, ecological or merely environmental—will directly determine the rationality that underpins the techniques and the intentions guiding their design. Alternative technologies may bring the sun, wind, and the world of vegetation and animals into our lives as participants in a common ecological project of reunion and symbiosis. But the 'smallness' or 'appropriateness' of these technologies does not necessarily remove the possibility that they will keep trying to reduce nature to an object of exploitation. We must resolve the ambiguities of freedom existentially—by social principles, institutions, and an ethical commonality that renders freedom and harmony a reality."[193]

Green technology must reduce impact on the natural environment, communicate process and achieve "highly articulated integration".[194] Above all however labour must recover its own creative voice and recognise its own subjectivity.[195] Without institutional changes greenhouses, windmills, solar collectors, gardens, solar villages will not challenge in any significant way the systems of hierarchy and domination that originally reared the mythology of nature 'dominated' by one of its own creations. *The role of the architect in social ecological terms is one of using resource efficient, communicative ecological systems within a process of enabling participation and self-reliance and a wider social matrix.*

The aim of social ecology for Bookchin is no less than to rehumanise the psyche (and demystify technology). "The rounded person in a rounded society, living a total life rather than a fragmented one, is a precondition for the emergence of individuality and its historic social hallmark, autonomy."[196] This does not deny community but presupposes it: "it visualises community as a *free* community in which *interdependence*, rather than dependence or 'independence,' provides the many-sided social ingredients for personality and its development". It involves creating self-creative beings and self-productive subjects.[197] Again Bookchin criticises 'scientific socialism' for ignoring the role of the factory with its elaborate hierarchical structure extending the condition of workers to obedience "and schooling them in subjugation from childhood."[198] "A liberatory technology presupposes liberatory institutions; a liberatory sensibility requires a liberatory society."[199] I now go on to look at Bookchins version of a liberated society.

---

[191] ibid. p265
[192] ibid. p314
[193] ibid. p314
[194] ibid. p266
[195] ibid. p266
[196] ibid. p313
[197] ibid. p242
[198] ibid. p313
[199] ibid. p243

1.8. Ecotopia - The Sustainable Society of Social Ecology

As noted, for Bookchin, 'free nature' can only begin to emerge when we live in an anarchist society free of privilege and domination. The rudiments of an ecological society would probably be structured around the commune - freely created and human in scale based on *cultural affinity* rather than *common ancestry*. Communes would be confederated into a composite commune similar to the Greek polis without the ethnic parochialism and political exclusivity that contributed to its decline.[200] Ecotopia would have five predominant features:

- popular control over the material means of life (land, factories, transport) and no private property (on which others depend);
- the concepts of irreducible minimum and equality of unequals;
- a direct participative democracy based around communes and confederation;
- decentralised cities that are humanly and ecologically scaled;
- development of technologies and production based within human subjectivity.

Learning from the Past
As noted for Bookchin Western history has not been a unilateral advance of ever greater control over supposedly 'harsh' nature and it is not atavistic to use the past to provide examples of the ways people have attempted to develop humanistic lifestyles and realistic institutions. He uses three principal examples:

- the irreducible minimum, equality of unequals and ethics of complementarity that emerged in organic societies before patriacentric warrior societies are irreplaceable standards of freedom as long as they extend beyond parochial, group, band and tribal bonds;
- the Greek notion of 'limit' and 'balance' in terms of needs and the institutions of direct democracy relieved of patriacentricity, slavery, exclusionary forms of citizenship, and the high premium they placed on war;
- the 'age of cities' that presented possible alternatives based on urban confederations of humanly scaled communities, artisanal technologies and a balance between town and country (before the emergence of the nation state) and added to our repertoire of freedom even considering patriciates that ruled many cities.

Libertarian Municipalism
Bookchin postulates a concrete and almost programmatic project for our times that he refers to as *Libertarian Municipalism*. It is:

- libertarian in terms of 19th Century European anarchists (not contemporary American right wing) in that it advances *popular control* over material means of life (land, factories, transport);
- based on municipalism in that it advances new politics of civic control over public affairs, mainly by means of direct face-to face *citizen* (not worker) assemblies;
- confederalist in that it seeks to foster interdependence of municipalities and their economies on a regional basis (partly to avoid parochialism of completely self-sufficient communities) in a rational and ecological manner;
- based on policy decisions initiated, formulated, and decided upon by citizen assemblies of the municipalities but with administrative decisions, subject to oversight by municipalities, made by mandated, recallable delegates to confederal councils.

Property and control of property
Traditional socialist radical criticisms have emphasised nationalisation of land and industry that presupposes a nation state and thus has no role in an anarchist society. Syndicalist alternatives have favoured *workers* control in opposition to nationalised economies. For Bookchin however such a collective enterprise is not necessarily a commune or communistic in its outlook.[201] Because they maintain a division between worker and citizen they become particularistic and strive for efficiency and growth. Instead libertarian municipalism advances a holistic approach to an ecologically orientated economy. Policies and concrete decisions that deal with agriculture and industrial production would be "made by citizens in face-to-face assemblies--as citizens, not simply as workers, farmers, or professionals who, in any case, would themselves be involved in rotating productive activities, irrespective of their

[200] ibid. p344
[201] Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p194

professional expertise. As such they would function at their highest level - their 'human' level - rather than as socially ghettoised beings."[202]

Instead of nationalising and collectivising land, factories, workshops and distribution centres, an ecological community would municipalise its economy and join with other municipalities in integrating its resources into a regional confederal system. Land, factories, and workshops would be controlled by popular assemblies of free communities. Everyone, in a sense, would function as a citizen, not as a self-interested ego, a class being, or part of a particularised collective. The citizen engaged in discursive, face-to-face relationships would acquire *economic underpinnings*. "Such an individual, presumably free from particularistic interest in a community where each contributes to the whole to the best of his or her ability and takes from the common fund to produce what he or she needs, would give citizenship a broad, indeed unprecedented, material solidity that goes beyond the private ownership of property."[203]

An important proviso in the success of ecotopia is the 'self-governing citizen' not a 'constituent' or 'taxpayer'. Bookchin shares the Greeks mistrust of specialists - "because excessive expertise seemed to involve a warping of ones character around a particular interest or skill. To know a little bit about everything and not to much about one thing was evidence of a rounded person, who as need arose, could form an intelligent view of an issue and advance a good case for his judgements."[204] It implied a measure of 'self-sufficiency' and thus competence and independence.

Economics

Marshall notes that in the economic sphere ecotopia would practice 'anarcho-communism' that presupposes the abolition of private property, the distribution of goods according to individual needs, the dissolution of commodity relationships, the rotation of work, and a reduction in the time devoted to labour.[205] Justice based on exchange values would be replaced by freedom recognising equality of unequals without regard to physical or mental condition. Need would become the object of conscious choice not dictated by scarcity or custom. In short distribution would be based on:

- usufruct where resources could not be owned as property and are available to individuals of a community because they are needed not because owned or created by the labour of a possessor;[206]
- *complementarity* where personal differences are considered part of a larger whole not hierarchically;[207]
- an *irreducible minimum* where every member of the community would have access to basic means of life irrespective of his or her abilities to contribute to the common fund.[208]

Each would give freely without consideration of return. Bookchins anarchism goes beyond Proudhon's, Bakunin's and Kropotkin's appeal to contract to regulate relationships without the law. For Bookchin, however freely entered contract is inevitably based on the notion of equivalence, a system of equity that reaches its apogee in bourgeois conceptions of right.[209] Transport similarly would be based around collective use of vehicles be they monorails, railroads, bicycles or automobiles.

Work

The need to mass produce goods in highly mechanised installations would be vastly diminished by a lack of need and a concentration on quality and permanence. Work would be more craftlike than industrial and would be as readily rotated as would positions of public responsibility. Members of communities would relate to each other in face-to-face relationships rather than by electronic means. In a world where fetishisation of needs would give way to freedom to choose needs industrialisation would perhaps be an insult to physiological rhythms. Many processes would be reworked into collective even festive enterprises. Eco-communities could jointly operate certain industrial enterprises. As a base point "no law of production requires that we retain or expand the gigantic, highly centralised and hierarchically organised plants, mills, and offices that disfigure modern industry."[210]

Bookchin emphasises that labour saving devices would have a role in ecotopia and would even be at a premium - be they computers or automatic machinery - these would free human beings from needless toil

202 ibid. p194
203 ibid. p195
204 ibid. p177
205 Peter Marshall, *Demanding the Impossible*, Fontana Press, London, 1993. p613
206 Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p50
207 ibid. p49
208 ibid. p98
209 Peter Marshall, *Demanding the Impossible*, Fontana Press, London, 1993. p613
210 Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p345

and give then unstructured leisure time.[211] Bookchin unlike many deep greens does not advocate labour intensive technologies to save energy or attribute work (of working classes) with intrinsic value. This he describes as a self-indulgent, middle-class affectation. Work would be *one activity among many.*[212]

Bookchin believes then that an ecological community would overcome existing contradictions between town and country, work and play, mind and body, individual and society, humanity and nature. It would achieve the Greek ideal of the complete and balanced person. Work would be rotated between town and country and between everyday tasks. The workday would be highly variegated. Within this context 'ecotechnologies' would be developed that would not only make use of local materials and energy sources with the minimum of pollution but positively favour diversity in the ecosystem and consciously promote the integrity of the biosphere.[213] As noted for Bookchin technologies exist within a social matrix and development of ecological technologies depends on creating a free society. It involves developing a technological imagination that sees matter as 'active substance' not a dead collection of atoms. Any emancipatory technology would be rooted in the new culture and develop new meanings as well as designs. It cannot be defined today.

Policy and Administration
For Bookchin no substantive democracy is possible and no concept of self-administration is meaningful unless the people convene in 'open', face to face assemblies to formulate policies for society. No policy is democratically legitimate unless it has been proposed, discussed and decided upon by the people directly not through representatives or delegated authority. There is however a distinction between *administration* and *policy*. Administration can be left to boards, commissions or collectives of qualified, even elected individuals, fully accountable to policy making assemblies. Assemblies can then function at the level of block, neighbourhood or town - they have only to be co-ordinated by appropriately confederated sinews to become forms of self governance.[214] Irrespective of the complexity of the problem, or size of the community, assemblies can be rapidly convened to make policy decisions by majority vote and convene appropriate boards to execute them. Delegates to town, city or region are simply walking mandates to larger assemblies. Decision would still be by majority. Experts will always be available to offer their solutions to the more specialised problems a community may face - hopefully competing ones that will foster discussion.[215]

Bioregions
The bio-regional paradigm is at the heart of most green thoughts on sustainable societies independent of the notion of local political control proposed by social ecologists. It is closest to 'deep green' ideas expressed in living with 'natural rhythms' and within 'natural regions' - bio-regions. These regions have been discussed in most detail by Kirkpatrick Sale.[216] He defines several scales of region - eco-regions, geo-regions, morpho-regions. Such a policy means identifying regions and living with what those territories provide in terms of resources. The larger region would be self-sufficient.

For Bookchin, communes, networked by confederation, would be physically tailored to the local ecosystem in bioregions. They would approximate local and regional autarky with a balanced mix of agriculture and industry. Bookchin describes how "We can envision that their squares will be interlaced by streams, their places of assembly surrounded by groves, their physical contours respected and tastefully landscaped, their soils nurtured caringly to foster plant variety for [our]selves, [our] domestic animals, and wherever possible the wildlife they may support on their fringes."[217] They would aspire to live upon life-forms indigenous to the ecosystems in with they were integrated. Land would be used ecologically, solar and wind power exploited, and organic and inorganic wastes recycled. Forests would grow in areas most suitable for arboreal flora and widely mixed food plants in areas that are most suitable for crops. Encouragement of a wide diversity of wildlife would remove the need for pesticides.[218] It would make use of local resources, many of which have been abandoned because of mass production techniques. In *Chapter Six* I discuss Permaculture that closely approximates such an agricultural system.

Decentralisation of Cities
Critically for Bookchin *while a precondition for a harmonious relationship with nature involves the abolition of psychological, cultural and social hierarchy; the rehumanisation of humanity requires more*

---

[211] Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p196
[212] ibid. p192
[213] Peter Marshall, *Demanding the Impossible*, Fontana Press, London, 1993. p614
[214] Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p175
[215] ibid. p 175
[216] Kirkpatrick Sale, *Human Scale*, Secker and Warburg, London, 1980.
[217] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p344
[218] Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p193

contact with natural process and this demands more decentralised cities. The physical decentralisation of the city can be looked at in terms of introducing natural process into the city but also enabling greater local self reliance and rotation of work and rescaling urban form to a more human level. Ecotopia is thus based on both self-government and bioregions. Although assemblies can function as networks on block, neighbourhood or town level, *they form traditional ideals of civic democracy when the cities in which they are located are decentralised.* Whether a municipality should be subdivided into a confederation depends on its size.

Decentralisation and Biotic Technologies

Having lost sight of our roots in natural history, our new technologies today must enable us to "discern our roots in sun and wind, in minerals and gases, as well as in soil, plants and animals."[219] Organic gardening can meet our requirements for chemically untreated food, provide us with a greater number of nutrients and improve our soil but it 'may' also bring us *into* the cultivation of food not merely its consumption. The use of solar power, a technology that has reached an extraordinarily high degree of sophistication and efficiency, can be regarded as ecological not only because it is based on a renewable energy resource, but also as noted because it brings sun and changing climatic conditions into our lives in a palpable way.[220] The same is true of wind power, mixed farming in the city, and composting techniques that recycle a community's waste into soil nutrients. *For Bookchin the physical decentralised of the city enables use of such technologies.*

Decentralised Anarchism as Ecological Imperative

For Bookchin then the traditional demands of utopian anarchist movements have become ecological imperatives. Without seemingly utopian solutions involving a rescaling of human communities to fit the natural capacity of the regions in which they are located, creating a new balance between town and country and a harmonisation of social relations we face a very real subversion of the material and natural basis on the planet.[221] These movements also have a long pedigree in attempting to bring about change often not acknowledged in the environmental movement that I build on below. In most of this thesis I focus on the relationship between the city and it's hinterland and criticise the decentralised anarchist utopia.

City Politic and Assembly

It should be noted that despite the social blight experienced in many cities and Bookchin's critique of its inhuman scale, the city does form a shared domain for people of different ethnic backgrounds, occupations and status groups. Bookchin notes that the assembly of people found its home in the city but not the city of the private ownership of property, classes, patriacentricity or the state. He argues that the city (as capitalism) is Janus faced in its potential for common humanity but its development towards ever greater hierarchy. If participatory democracies and popular assemblies originated in tribal and village communities they were not *self-conscious* forms of consociation which people regarded as ends in themselves until the city. The city, in effect, "opened a new terrain for social management that involves neither the use of state institutions - that is, statecraft - nor a strictly private domain that involves one's home, workplace, schools, religious institutions, and circles of friends. Taken literally from the Greek term in which it originates, the city created *politics*, a very unique world in which citizens gather together to rationally discuss their problems as a community and administer their affairs in a face-to-face manner."[222]

Today however we are loosing sight of the city, of citizenship and of politics as a domain of municipal self-management. The form of the city reflects the form of government. Cities have become urban regions; citizens, originally active formulators of policies have become 'constituents' of elected representatives, passive taxpayers and recipients of public services provided by bureaucratic agencies; politics has become statecraft, an art practised by cynical, professional manipulators of power. Monocultural suburbs of today's urban regions are locations for such constituents. Bookchin notes how the city is dissolving into huge urban belts.[223] Cities that historically brought people together are now atomising them - fear is replacing sociality.

Conclusions

Bookchin's ecotopia is distinct from many green visions in its insistence that freedom is a prerequisite to sustainability, its belief in human management, and critically its notion of participatory evolution that, as

---

219 Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991. p346
220 Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p192
221 ibid. p185
222 ibid. p181
223 ibid. p182

it were, enables and is enabled by development of time saving technologies. Ecotopia is not based on the work ethic common to many green critiques. The lack of a town and country division and bio-regions are however familiar to greens. While Bookchin does acknowledge the city as a place of congregation his decentralised vision seems to limit 'freedom' and 'diversity' in terms of the lifestyles envisioned. Perhaps in this respect decentralisation of control and ownership is confused with reduction in densities and spatial arrangements. Appropriate densities however clearly depend on definitions of 'sufficient productive self-reliance' required.

In chapters two to six I discuss some 'biotic' technologies within the context of today's cities and note how, in fact, they may be consistent with maintaining city densities while enabling self-reliance and introduction of natural process. A balance between spatial decentralisation and the city is clearly important in avoiding 'family' or parochial organisation and in utilising benefits of 'society' and the wealth of experience given by cities. Bookchin uses the Greek *polis* and medieval city as (imperfect) examples of preferred forms. He also notes the importance of cities as centres of revolution. Such a balance is also relevant to the development of existing cities that I argue is efficient in *Chapter Five* and socially important in *Chapter Seven.*

Bookchin's ecotopia is *not agrarian* but balances agriculture and industry (controlled by participative democracy). The bioregion is not a self-sufficient unit but tends to it in provision of certain goods and services. Bookchin's notion is that in a 'free' society wants will be more consistent with local bioregions (with some exchange) because they are placed within human subjectivity. A person will take part in rotations of work. He or she is not self-sufficient but part of a society. Specialists will have a role in ecotopia but under the control of participative decision making.

Although Bookchin notes a need for consideration of specifics in terms of social context he does not looked at the existing city, technologies and densities in discussing suggested forms.[224] Here I look at UK cities in terms of climate and social and cultural trends. I look at the potential of biotic technologies of solar, microclimate, city agriculture and the potential of self-reliant cities in the UK. What forms are most appropriate to immediate sustainable ends and to what extent they are consistent with ecotopia. Bookchin notes that we are heavily mired in the existing city. We have become trapped in economic logistics, its systems of transportation and distribution, its national division of labor, and its immense industrial apparatus."[225] In moving from 'here to there' a critical role is how authoritarian techniques can be dismantled. Later I concentrate on the local effects of self-reliance in terms of the built environment as a basis for a realistic city based anarcho-communism. My concern remains with the existing city not a perceived utopia ı fields/workshop or agrarian society. I look at existing technologies and the existing socio-political context that provide less utopian reasons for increased self-reliance at a local level.

It should be noted that Bookchin does not see small as necessarily beautiful in technological terms but local control of the technology is important. It is also clear that some of our larger scale systems will be maintained for a long time due to their very existence. Regional direct control of these is a starting point in empowerment. In an age of mass communication it is also still possible to argue for face to face politics. Again it means putting technology into a support role to the creation of a social matrix of face to face democracy.

Decentralisation and its Limits

As noted decentralisation is a consistent green theme only sometimes linked to the idea of political responsibility devolved to communities either as communes or neighbourhoods with a federative decision making system at higher levels. Arguments for decentralisation include: the allegedly minimum impact of small communities based on contact with 'process', their human scale and sometimes their focus for political decentralisation. While Bookchin is a communitarian anarchist more often the practical and ethical problems of such ideas are resolved by advocating the concept of subsidiarity, local politics and participatory democracy - rather than communal autarky. Dobson notes that looked at in terms of present society a commitment to local politics and participatory democracy is unlikely to produce a co-ordinated green approach. The classic dilemma is that within subsidiarity the legislative framework given to government for greening is often great thus centralised authoritarianism is maintained. Critically for Bookchin the green solution cannot be engineered and decentralisation of political control is critical to ending hierarchies.

[224] ibid. p184
[225] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991, p345

1.9. A Green Revolution

1.9.1. Strategies for Green change

The green movement has criticised today's patterns of production, trade and consumption and developed an alternative 'prescription'. It has not however given as much attention to how to get from the former to the later. Dobson argues that this may be due to:[226]

• a belief that environmental 'catastrophe' is needed first;
• a belief that delivery of the message of impending doom is enough;
• the immaturity of green ideology that has not come to terms with the issue of social change;
• the fact that the green movement has strategies but they have been found wanting - environmental awareness has increased but within the status quo and thus the 'fundamental shift' desired has not occurred.

While not denying the importance of environmental action and the achievement of groups like Friends of the Earth it should be stressed it is a 'radical shift' that greens (and social ecologists) see as necessary. Here I look at Dobson's 'vehicles for change' including - legislature, individual lifestyle, communities and classes.[227] I then look at Bookchin's social ecological revolutionary project in particular that has been able to develop on the considerable anarchist legacy in this area.

Legislature
This approach can be seen in terms of:

• attempts to seek election (party political activity);
• attempts to pressure and influence those elected (political and pressure group activity).

The principle assumption of both actions is that existing liberal democratic politics and economic structures with which they are engaged are sufficiently open to allow the green agenda to be fulfilled. Further it should be noted that political change is a matter of both *political and economic powers*. If elected the Green Party would still find powerful constraints preventing change. Taxing of resource efficient industries would for example be met by flight of capital. I have noted how power is increasingly outside political control. It must be asked then whether sustainable society can be brought about using existing state institutions given the radical political and social change that is proposed by dark greens and social ecologists and its colonisation (and thus betrayal) by existing institutions. Clearly these institutions are not neutral but have evolved and are tainted by strategies and practices that green politics attempts to criticise. From a social ecological point of view it can be noted how our present institutions are designed to *preclude* the possibility of massive regular participation. From the existing political perspective there is no radical green criticism beyond environmentalism. Clearly however political actions can support other options for change. The principle benefits of 'direct action' campaigns may be in preparing for direct democracy and increasing political awareness. Action around the legislature can and has in some areas increased the energy efficiency of technology (relevant to architectural design) but it seems, will not, on its own, bring about fundamental changes. It tends to a hierarchical imposition of technological fix. I discuss later however how social ecologists and thus social ecological architects must however use 'objective realities' to facilitate change. This may involve legislative change.

Individual Lifestyle Changes and Communities
The principle behind both 'lifestyle' and 'community' changes is that sustainable living must be prefaced by sustainable thinking. Lifestyle refers to changes in patterns of individual behaviour in daily life. It involves a personal transformation of *consciousness* leading to altered individual behaviour - people moving towards a greener way of life and joining together. Clearly there has been a move towards greener lifestyles amongst certain sections of the community (more bottles are recycled, more lead free petrol is brought).[228] Unfortunately it has been limited to a minority of the middle class who can afford often more expensive alternatives. More importantly, given the green criticism of present systems, definite limits to such initiatives exist. There is nothing inherently green in green consumerism, the 'message' tends to spread to those who can afford it while it does not address the central concern of unlimited production and consumption. The problem is not to consume lightly but to consume less. The Body Shop like any other business is dedicated to consumption - to wield purchasing power more responsibly not less often. Again there is a difference between environmentalism and ecologism. From

---

226 Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p130
227 ibid. pp 130-170
228 ibid. p140

the view of the ecologist the consumer strategy may be counterproductive if it simply encourages consumption of more goods creating more brands within the competitive market.

In social ecological terms lifestyle strategies, if they do not involve green consumerism, are critical. They operate outside representational politics and take seriously the idea that a profound change in attitudes is a pre-condition for social and political change. Unfortunately they are subverted by the simple lack of skills and the difficulty of living outside the market if not the state. Further the individualistic nature of personal lifestyle change is in opposition to communitarianism that is central to most descriptions of a sustainable society. Dobson notes how "It would appear more sensible to subscribe to forms of political action that are already communitarian, and are therefore both a practice and anticipation of the advertised goal."[229] In so doing collective resources may increase the potential of success. Community development can enable people to live 'outside' the system by utilising their variety of skills for mutual benefit.

Community Development and Self-help
Robyn Eckersly notes that the revolutionary subject is the community and because the ultimate principle of ecopraxis is the need to maintain consistency between *means and ends* the most revolutionary structures are those that "foster the development of self-help, community responsibility and free activity and are consistent with the ecotopian ideal of a loose federation of regions and communes".[230] Obviously these must operate sustainably. Examples may include: rural self sufficiency farms, city farms, some workers' co-operatives, some squats in European cities, the Centre for Alternative Technology (CAT), Findhorn, and some co-housing schemes of Holland and Denmark (discussed in detail in *Chapter Nine*). Most community initiatives oppose the prevailing culture rather than living outside of it. The CAT community started by operating outside the existing culture providing a radical alternative. It is now however a successful institution charging visitors. It has become incorporated as do most. It may be argued that this is beneficial since it is not seen as 'fundamentally different' and can provide an example that people can see and emulate.

Community strategies are arguably more effective than lifestyle since they make more ready connections between present practice and future aspirations. The problem however is that they depend on leading by example. People can refuse to be seduced. Many are of little relevance to most peoples everyday lives. In addition places such as CAT and Findhorn are miles from anywhere ignoring the city context in which most people live. City initiatives that balance living outside with addressing the existing culture and city context may be most effective (see co-housing in *Chapter Nine*).

Agents
The above notions of lifestyle and community change both largely ignore *how* the necessary change of *consciousness* is to be brought about other than almost religious conversion based on 'mankind's survival' that needs a 'revolutionary change of heart' in individual human beings. Such a change of consciousness it is usually argued will develop if prefaced by 'education' and example. Many strands of the green movement rely on the on the idea that its appeal is universal and undeniable since failure to embrace greening will result in global catastrophe. Dobson points out that it is simply untrue given present conditions that everyone's interest is best served by bringing about sustainability.[231] There is money to be made from the environmental crisis and those making it are not part of any movement for profound change. Neither is or will the environmental crisis be suffered by everyone equally. Further green ideas demand looking beyond immediate concerns of family, city, nation over short period of time and thus has a problem of persuasion. Only a few people have a global perspective that extends into the future and green is seen as advocating what are seen as 'cut-backs' today for this global future.

One potential solution is to identify and organise a group whose immediate interests lie in living a 'green life' with all that it implies. Greens however (including Bookchin) criticise Marx for isolating the proletariat. Instead they take the 'species' interest as the fundamental point of reference - not a social class. Marx's criticism of utopian socialists was their universal appeal to improve everybodies conditions. Dobson argues that this is relevant to the contemporary green movement. Firstly Marx argued it was impossible to expect all classes to usher in socialism (is it possible for all 'classes' to usher in green change). Secondly he argued that small experiments and force of example is an unfounded attempt to change *people* without changing the *conditions* under which they live and work.[232] Clearly small

[229] ibid. p146
[230] Robyn Eckersly quoted in Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p146
[231] ibid. p153
[232] ibid. p155

experiments (as CAT) have failed to change general ideas *although they do have value in questioning accepted truths.*

Marx 's solution was then to isolate a 'sphere in society' (or 'class') whose prime interest lay in changing society - bringing about profound social change. Its characteristics were:

• it had 'radical chains' so that;
• its emancipation would involve the general emancipation of humanity;
• it had to be opposed to not just the 'particular consequences' of a political system but to its general 'assumptions'.

For Marx this was the proletariat but it's claims proved not so radical. It's questioning of the assumptions of the political system was partial and as Bookchin points out material. Not only has scepticism grown over the idea of the working class as an agent of social change but also the whole notion of agents. Dobson notes "The typically post-modern view of the world is, in principle, one of an unlimited number of models of order, each one generated by a relatively autonomous set of practices".[233] The post modern criticism of the green movement is its totalling political aspirations that as with Marx (finding a class that will bring about 'the total redemption of humanity') can only be unwarranted legislation. It is important to note that:

• in many respects green strategies for change respond to this post-modern criticism especially Bookchins celebration of difference, diversity, and humility (although he criticises post-modern thinking as inevitably supporting the status quo);
• we cannot make universal claims for any agent or lifestyle (utopia) but can still identify *agents* whose immediate concerns are served by green aims.

Bearing this in mind who are 'agents'? The middle class are seen by Porritt as agents of green change because they can assess where their genuine self-interest lies. From an environmentalist standpoint this is true but the middle class are deeply implicated in present political practices and self-interest would be to preserve them. They are the green consumers. Small businesses are advocated by Porritt as the mainstay of green economic activity and opposition to corporate big business.[234] Unfortunately in order to survive they need to produce the products and values demanded by the system. Small capitalism is not necessarily better than big capitalism.

Murray Bookchin identifies 'new classes' that are *united by cultural ties not economic ones* (ethnic groups, women, gays, counterculture, environmentalists, aged, the *déclassé*, unemployables and unemployed, the 'ghetto' people. Within this pot-pourri Dobson notes are some who seek 'particularistic' change and those who seek fundamental change - opposed to consequences or opposed to basic assumption. The green aim for Dobson is to distinguish those groups whose project most profoundly questions the presuppositions on which present social practices depend - disengaged groups who are also inclined to foundations of sustainable living.

Unemployed
Dobson notes how (particularly with the movement of labour to the third world due to the cost of high environmental standards in the West) we are producing a group of people in the West who are constantly unemployed. The external limits put on production process are beginning to shape a class that is more or less permanently marginalised from the process of consumption. From this point of view "it is the distance from the process of consumption and the degree of permanence of this isolation that currently determine the capacity of any given group in society for green social change"[235]

The unemployed are an obvious group disengaged enough to resist colonisation. Its problems are (and will increasingly be) caused by the present unsustainable economic system and insoluble within it. For Dobson they would thus not press for change in ownership of the means of production but see that its interests lie in changing the means of production themselves into a *locally* sustainable system. While it has always been possible for capitalism and socialism to promise employment and unmarginalized existence's within their current systems - the green argument is that this no longer holds. Seabrook argues

---

233 Zygmunt Bauman quoted in Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p157
234 Jonathan Porritt in Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p160
235 Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p163

"the most urgent task is to show how and why the poor would be the chief beneficiaries of Green politics".[236]

It can be argued however that firstly marginalisation from the process of consumption simply produces an increased desire to be part of it. Dobson argues against this, pointing out that a group exists who have decided to live with less but that more importantly the green movement could make the marginalised classes believe that present consumption has no future 'for them' and they can better fulfil their interests in a self-sufficient manner.[237] Secondly the smallness of this group is important. Dobson notes that unemployment is only one form of marginalisation from consumption and the group can be expanded by including low waged and those living in poor conditions.[238] It is also, according to the greens criticism of growth, a group destined to increase in size. It may be asked when cities such as Liverpool will decide that becoming self sufficient is in their own interest. The green aim may be to aid empowerment of this group through increasing their knowledge of their built environment and the potentiality of that environment to self-sufficiency. The fact that it is the better off who are more environmentally damaging questions this approach.

1.9.2. Remaking Society - The Social Ecological Project

As noted for Bookchin creating an ecological society can not be separated from creating an anarchist one. The fundamental libertarian precept is that every normal human being is competent to manage the affairs of society and, more specifically the community in which he or she is a member. Only this sensibility will replace domination of humans and thus nature. Neither he argues can the revolutionary process be separated from this goal: libertarian means are essential to libertarian ends (in *Chapter Eight* however I describe the particular problem of practical self-help initiatives that serve capitalist ends). This infers not a seizure of power but a dissolution.[239] Dissolving power involves re-empowering the individual to control their own life. Bookchin accepts that a long period of enlightenment is a requirement (a problem in terms of green limits to growth). The revolutionary project he argues is a slow and uncertain one. Between 'here' and 'there' lies an indefinable zone of highly complex transitions, one that involves the development of a new *sensibility* as well as a new *politics* but "what people cannot shape for themselves they will never control".[240] The anarchist revolutionary project is one of continually pressing against society in search of its weak points and trying to open areas that would make revolutionary change possible. For Bookchin there have been potential liberating points throughout history from which to draw lessons. Here I look at Bookchin's suggested mechanisms to determine their architectural and planning consequences.

The essence of Bookchin's anarchist revolution is shown by his critique of the Marxist revolutionary project.[241] Particularly that:

• the proletariat were integrally wedded to the economy and its narrow demand for jobs, higher wages and shorter hours within the capitalist system - they were thus never a revolutionary force;
• workers became economic beings as in capitalism - community had no bearing on basic economic concerns and the wide ranging interests of human beings were not part of the project;
• this denaturing of human beings into class beings led to denaturing of nature as an assembly of resources that labour and technology had to subdue and dominate.

The later two points bear particularly on the social ecological project (libertarian municipalism). The former on the problem of revolution generally. Critically it is Marx's lack of 'humanism' in reducing humans to objective forces that Bookchin criticises. It is not enough for workers merely to *take over the running of the factory* (as in worker co-operatives) since the factory is inherently authoritarian.[242] As noted for Bookchin 'power' and 'objectification' corrupt and destroy.

Post Scarcity Potential

For Bookchin the removal of problems of scarcity in the West is critical to the revolutionary project. The revolutionary project must show that we can reject the material good life because it is available to all.[243]

---

236 Jeremy Seabrook, *The Race for Riches*, Green Print, Basingstoke, 1988. p166
237 Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p168
238 ibid. p168
239 Peter Marshall, *Demanding the Impossible*, Fontana Press, London, 1993. p615
240 Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p196
241 ibid. pp 133 - 136
242 Peter Marshall, *Demanding the Impossible*, Fontana Press, London, 1993. p616
243 Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p138

This is because modern notions of consumption (post commodity fetishisation) lack social and cultural restraints. The only appeal that can be made in the West is that we can obtain goods but that material gain is not the final locus of human expression. Bookchin thus argues that we cannot deny industrial growth in the South. This implies that revolution must be Western. He thus notes that capitalism is Janus faced (it was necessary). Neither however has it run its course and thus a revolutionary project is needed.

Bookchin uses 60's counterculture as the classic example of a reaction to material wealth that was 'available to all'. It is this 'New Left' counterculture (based on local control emerging spontaneously) that Bookchin favours over Marxism. Whether 60's counterculture really did reject materialism remains open to question. The momentum of the New Left was for Bookchin lost due to lack of organisation, ideology, and the end of 'post-scarcity' feeling with harsher economic 'realities' of the 70's.[244] His revolutionary project involves rejuvenating elements of 60's counterculture with - the 'general interests' of the ecology movement and feminism. The notion of 'general human interest' is not specific to particular class, gender, race, nationality. It involves universal interests shared by humanity as a whole. This does not mean ignoring class conflicts but neither does it mean restricting revolution to them.[245]

Further the ecology movement will never gain any real influence or have any significant impact on society if it advances a message of despair rather than hope, of a regressive and impossible return to primordial human cultures and sensibilities, rather than a commitment to human progress and to uniquely human empathy for life as a whole. We need to develop an idea of what is worth rescuing in human civilisation if ecology is to play a transformative and creative role in human affairs. It is the loss of humanity that has caused environmental dislocations.

Problems of Statecraft (and Capitalism)

For Bookchin direct democracy avoids the corruptive 'politics' produced by political professionalism, bureaucracy, and top-down representative systems of governance. Citizenship, expressed through popular assemblies, can avoid a statist 'politics' based on privatised anonymous 'constituents' who exercise no control over their social life. If any radical movement for social change and an ecological balance between second and first nature can be achieved, it must be based on a participatory democracy and *rooted in politics of gradual confederation—the step-by-step formation of civic networks that can ultimately challenge the growing power of the nation-state*. The anarchistic imperative of not working through statecraft becomes an ecological one since ecological society cannot be hierarchical. Similarly it cannot work within capitalism. The private ownership of the planet by an elite strata must be brought to an end if we are to survive the afflictions it has imposed on the biotic world, particularly as a result of a society structured around limitless growth. Practical initiatives however cannot be completely outside capitalism and statecraft.

General Human Interest

The anarchist revolution cannot be particularistic because this involves domination. The social ecological revolutionary project involves abolition of hierarchy and reharmonisation of humanity with nature through the reharmonisation of human with human - the achievement of an ecological society through ecologically sound technologies and face-to-face democracy.[246] Social ecology is based critically around the notion that domination, loss of subjectivity and ecological threats are areas of general human interest (we are all affected by environmental destruction if not equally). Bookchin is continually critical of the particularist (and economic) nature of the Marxist revolutionary project. Revolution as the emergence of general human interests that cannot be achieved by the proletariat's pursuit of particularistic interests that marked earlier revolutionary movements (this interest was also solely material - based in production). Further since capitalism has completely absorbed traditional opposition if any general interest is to emerge today it will be shaped by external forces - notably ecological limits of an economy that must grow or die, thereby endangering the biosphere itself. Bookchin is optimistic that the present ecological crisis is capable of mobilising this support (perhaps *aided* by internal crises of capitalism). The revolutionary project will emerge with the steady decomposition of traditional classes and emergence of trans-class issues such as ecology and feminism (unemployed, young city dwellers - disenfranchised). Bookchin argues that the ecological and feminist movements can be broadened into a sweeping social movement, into a libertarian new left that can speak for a *general human interest*. Movements like the citizens' initiative movements in cities are addressing issues other than wages and class conflicts. These movements suggest, for Bookchin, new possibilities for generalising the ideals of freedom. The various social movements of the 80's and 90's - environmentalism, feminism, municipalism and pacifism will

---

[244] ibid. p149
[245] ibid. p156
[246] ibid. p156

develop the libertarian impetus of the 60's against growing centralisation of states (recent groups have included travellers, raves and road protesters).

Technology
As noted it is, for Bookchin, too easy to blame technology for what is the result of bourgeois interest. It is technology under capitalism that is the problem. Clearly however technological methods need to be addressed. For human and ecological interest we must eventually make our technological relationship with nature 'creative' not 'destructive'. It involves working with natural process. Moving towards creative not destructive technologies however requires doing the same with our interactions with each other and forming a *general interest* that succeeds particular interests of hierarchy, class, gender, ethnic background, and the state "This involves the abolition of hierarchy in all its forms - psychological and cultural as well as social - and of classes, private property, and the State."[247] In this thesis I go on to discuss the architectural implications of this argument.

Affinity Groups
For Bookchin the revolutionary process must aim at the formation of popular assemblies and communities involving all members of the community and enable them to act as individuals ('rounded' citizens not passive material consumers).[248] Bookchin proposes 'affinity' groups as the revolutionary cell (and fundamental unit of ecotopia). These groups (based on the cellular units of the Spanish anarchist movement) he defines as "a collection of intimate friends who are no less concerned with their human relationships than with their social goals".[249] Such a group *overcomes the split between the psyche and the social world* that is intrinsic to socialism and capitalism. Affinity groups should be 'catalysts' not 'leaders'. They should remain autonomous and local but federate with other such groups. Bookchin does not deny the need for organisation, co-ordination and planning, but it should be achieved through assemblies and conferences of the organs of self-management.

New Consciousness/Real World
Bookchin admits that "Ultimately, every revolutionary project rests on the hope that the people will develop a new consciousness if they are exposed to thoughtful ideas that patently meet their needs and if objective reality - be it history, nature, or both renders them susceptible to the need for basic social change. Without the objective circumstances that favour a new consciousness and the organised means to advance it publicly, there will be no long-range change or even the measured steps needed to achieve it. Every revolutionary project is, above all, an *educational* one. The rest must come from the real world in which people live and the changes that occur in it."[250] Further "An educational process that does not retain contact with that real world, its traditions as well as everyday realities, will perform only a part of its task."[251] All cultures have quasi-utopian visions. The revolutionary project must make contact with these popular longings and find ways to rework them into the contemporary ideals of freedom. It must do this, I argue within the city. In concluding this thesis (*Chapter Ten*) I produce an application to aid effective dialogue between architect and housing occupant to provide working examples within the city.

Immediate Environments and Agitators
For Bookchin then "New programs and new politics must be structured around the immediate environment of the individual - his or her housing conditions, neighbourhood problems, transportation facilities, economic conditions, pollution issues and workplace conditions. Power must be steadily shifted to neighbourhoods and municipalities in the form of community centres, co-operatives, occupational centres, and ultimately, citizens' assemblies."[252] Success cannot be measured by the immediate and constant support that a movement of this kind gains. Only relatively few numbers of people are likely to participate in neighbourhood assemblies and municipal confederation. Some may spring up suddenly as citizens initiatives in response to specific local issues. They may not be lasting ones and can fade away as quickly as they arrive. One can only hope they establish a tradition and the popular education they provide is not lost on the community at large.[253]

Truly committed members of such a movement must however advance with a vision of what society *should* be like in the long run and advance immediately practical solutions "No radical movement, in effect, can lose sight of its ultimate vision of an ecological society without losing, bit by bit, all the

---

247 ibid. p189
248 Peter Marshall, *Demanding the Impossible*, Fontana Press, London, 1993. p616
249 ibid. p617
250 Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p197
251 ibid. p197
252 ibid. p190
253 ibid. p191

constituents that give it its own identity."[254] It must also give visual character to its ideals so that it enters into the imagination of a new politics, not just present programmatic statements. In the process however "what people cannot shape for themselves they will never control."[255]

A Revolutionary Inner City
Marshall notes Bookchin's over optimism based on the 60's.[256] Many Northern European inner city initiatives today show signs of the emergence of Bookchin's general human interest again not limited to the poor but including other unsatisfied groups - travellers, inner city groups generally, squats, inner city communes, co-housing, local environmental action groups, LETSystems. Many are dissolving themselves from power within a non-exploitative framework. It is not beyond the bounds of belief, for example, that areas of Liverpool will decide it is in their best interest to 'go it alone' through self-reliance. Confederation of such districts may follow or be essential from the start. The role of city farms, food co-operatives, and co-operative/farm relationships should also be noted.

Local money systems are far from new and often appear when local economies stagnate owing to flight of capital or under-utilisation of local skills and resources. They aim to return a measure of control of currency to the community and to put dormant skills and resources back into circulation. They are a community strategy since they anticipate the decentralised communitarian nature of the sustainable society. The most well known example is the Local Employment and Trade System (LETSystem).[257] People who live locally and want to trade agree on LETSystem rules and give themselves account numbers. Each then makes out a list of 'wants' and a list of 'offers' (following normal market prices). A joint list is then made up and circulated. Barter thus becomes a collective proposition. No money changes hands but credits and debts are registered usually on computer. Money stays local thus benefiting run down local economies and incentive is provided to exercise skills. There are however problems such as hoarding, inflation, tax liability, social security implications, defaulting and leaving the system.

Here to There
I have noted arguments that indicate that power today is being bureaucratised, centralised and concentrated in fewer and fewer hands. More land is locked up in private ownership. The city actions of squatting, demonstrations against the criminal justice bill, co-operative housing are responding to exactly this scenario. Such direct action attempts to achieve re-empowerment over social life. Further in many places "the State, with its extensive cutbacks of social services, has left a vacuum that cities are obliged to fill merely to remain functional. Transportation, housing, and welfare needs are being met more by localities than they have been in the past. Urban residents obliged to fend for themselves, are learning the arts of teamwork and co-operation."[258] Bookchin notes a need for movement towards confederation - a conscious movement that will search for ways to get from a centralised statist 'here' to a decentralised confederal 'there'. The seeds of such a movement clearly exist and may develop with an increase in the sense of disempowerment. Movements that can raise the demand for communal confederation as a popular alternative to the modern day centralised power.

Communes, co-operatives and various vocational collectives form schools for teaching people how to administer self-managed enterprises but are usually marginal and short lived as I note in *Chapter Seven.* Unfortunately "No co-operative will replace a giant supermarket chain merely by competing with it."[259] The main problem remains that *we need a movement not isolated examples.* State power is ranged against the emergence of, and demand for, local control (or has a tendency to use it for its own purpose). Actions are taking place within the city on a variety of fronts - they need co-ordinating into a *general human interest.* The movement must alter one community after another and establishes a series of confederal relationships between municipalities - one that will form a regional power in its own right. Critically how far we can take this libertarian municipalist approach depends on "knowing in detail the lived traditions of the region, the civic resources it possesses, and the problems it faces".[260]

While environmentalism is already on the political agenda, from a green point of view current political strategies have been found wanting. A sustainable society involves more than putting environmentalism on the political agenda to be co-opted with a few sustainable communities as distant examples. Developing a sustainable society clearly needs action in all the areas discussed. In social ecological terms it involves change from bottom up but with supporting initiatives and emphasis on confederation.

---

[254] ibid. p191
[255] ibid. p196
[256] Peter Marshall, *Demanding the Impossible*, Fontana Press, London, 1993. p621
[257] Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p150
[258] Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p183
[259] ibid. p183
[260] ibid. p184

1.10. A Social Ecological Definition of Sustainable Development

Having discussed the social ecological position it can now be put in the context of 'sustainable development' (SD), a concept that has emerged to replace that of economic growth over the last two decades and received international recognition in 1987 with the report of the Brundtland Commission.[261] It has since, at least in propaganda terms, become a 'fully established objective' of the national and global environmental agenda. The Brundtland Commission defined SD as "development that meets present needs without compromising the ability of future generations to achieve their needs and aspirations".[262]

Glenn Albrecht notes that sustainable development contains two key concepts:

- the concept of *needs* (of the global poor);
- the idea of *limitations* imposed by the state of technology and social organisation on the environment's ability to meet present and future needs.[263]

By introducing the concept of *needs* SD recognises that at present 1.1 million people live in absolute poverty.[264] For the global poor it is clear that objectives include *growth* not simply qualitative *development*. An end to absolute poverty is an end in itself but may also contribute to reducing environmental degradation through encouraging technological change (argued by those on the environmental right) and reducing population growth. In theory, poverty has traditionally been addressed, if not alleviated, by *overall economic growth* rather than *redistribution*. I have however noted distributional problems of capitalism, global trade patterns and in particular GATT in maintaining poverty.

Promethean Sustainable Development
The Brundtland Commission focuses on the notion that human development is linked to the satisfaction of basic human needs and aspirations for all. Albrecht notes that there is occasional acknowledgement that ecological realities, imposed on what humans can extract from nature, will play a role in directing and limiting economic growth.[265] The report however explicitly links advancement in human welfare to improvements in technological capacity, wealth generation and environmental management. Rather than highlighting the ecologically defined 'limits to growth' it links SD to the *ongoing expansion of economic growth* as the key to social justice enabling basic needs to be better met. In turn, it argues, this will generate environmental protection based on management by less desperate people with more efficient technologies.[266] These advances, it argues, will follow from the wealth generation that is characteristic of capitalism (and through GATT). Failure to 'develop' argues the Brundtland Commission leads to poverty, and poverty creates a tendency to destroy the environment. A 'non growth' economy will not drive essential technological advances. In the hands of Western governments then SD is an optimistic tool that does not reject the notion of further human (material) development as do biocentric-focused environmental groups. The existing mode of economic production and its associated values can continue with only minor modifications.[267] For trickle down improvements to benefit the poor and for technology to develop environmental solutions growth for the rich must continue. The growth ethic involving 'trickle down' improvements is maintained as is faith in the power of technology to solve environmental dislocations and resource shortages. The Brundtland Commission strategy seems to imply that poverty in less developed countries causes environmental degradation comparable to the impact of the wealth of the West. It serves to prevent discussion of what many believe to be the real source of problems: western levels of consumption and the technological inefficiency of capitalism.

A Problem of Definition
Elkin notes that sustainable development is based on the notion of *futurity* that involves a maintenance of at least a minimum environmental capital stock for future generations and restricting pollution to regenerative limits based on the environment's capacity to absorb pollution could also be added.[268] Such a definition is open ended and vague and thus open to interpretation. The precise definition of sustainable development has remained elusive. We do not have the ability to define; minimum environmental capital

---

261 The World Commission on Environment and Development, *Our Common Future*, OUP, Oxford, 1987.
262 ibid.
263 Glenn Albrecht, 'Ethics, Anarchy and Sustainable Development', *Anarchist Studies*, Autumn 1994.
264 Eduardo Galleano, 'View from the South', in John Vidal (ed.), 'earth', *the Guardian*, June 1992.
265 Glenn Albrecht, 'Ethics, Anarchy and Sustainable Development', *Anarchist Studies*, Autumn 1994.
266 The World Commission on Environment and Development, *Our Common Future*, OUP, Oxford, 1987.
267 Glenn Albrecht, Ethics, 'Anarchy and Sustainable Development', *Anarchist Studies*, Autumn 1994.
268 Elkin, McLaren and Hillman , *Reviving the City*, Friends of the Earth, London, 1991.

stock or, full and true environmental costs. We cannot deal with absolutes but only concepts such as '*minimisation*' or '*reduction*'. In many ways this vagueness has enabled environmentalists, business people, politicians and consumers to claim they are pursuing sustainable goals while failing to comprehend the undoubtable conflicts and contradictions in their approach. Neither is the notion of futurity exactly relevant. There can be little doubt that human survival is possible. The question is perhaps, for whom and, at what cost in terms of the form of hierarchical and technological society that may result and its inclination to dramatic failure.

Sustainable Development and Limits to Growth
I have noted how the optimism about the economic version of SD has been questioned by political ecologists. Rees for example after analysing the current carrying capacity of the globe concludes "Such considerations call seriously to question the Brundtland Commission's route to sustainable development through *five-to-ten-fold increase in industrial activity.*"[269] Many retain the ambiguous concept of SD but are more critical of the whole basis of the system of *production and exchange* driven by consumption. Critiques include social ecologists and greens.

Marxist and Green Criticism of Capitalism
As noted criticisms of growth and thus the WCED definition of SD are not restricted to its 'sustainability'. Marxists and other critics of the anti-egalitarian tendencies of Western Capitalist growth have long pointed out that 'progress' within this system is achieved at the material and spiritual expense of various groups and classes of people. I have noted the green case that as well as not being sustainable, continued economic growth (based on trickle-down improvements for the poor), is not meeting (and will never meet) the needs of the least disadvantaged globally or locally.[270] Social and economic well being may not necessarily be best served by continued economic growth (i.e. it fails on own terms). Such a critique notes global exploitation of people and the environment along with poverty and inequality that exist even in 'advanced' western cities. It also notes a 'poverty of wealth' that I have described. Dobson notes how planetary 'limits to growth' are added to by social and ethical limits such as Marx's internal conflicts of capitalism (growth at the expense of those who do not own means of production). Greens see unemployment as inevitably increased by growth, because of the development of labour saving technology, and that the social costs are unacceptable. In addition growth is inflationary due to depleted resources and inclusion of externalities increasing prices.

Greens also argue that GNP as an inadequate measure of economic strength (growth). It; ignores non-monetorised production (estimated up to 60% of GNP in some countries), gives no idea of distribution, gives no idea of sustainability of production, ignores externalities or costs (pollution, degradation of urban fabric and wear and tear on people). In fact the expenditure encountered in counteracting these negative side-effects is actually added to GNP giving a false impression of growth (measure of throughput only). GNP as a measure of economic performance also omits many human activities - the black economy, voluntary economy and household economy. Greens see GNP as symptomatic of an obsession with economic growth.[271]

Instead greens propose non materialistic progress and define sustainable 'development' more as cultural and social development in a frugal society.[272] *Greens and social ecologists note, above all, that material desires are flawed notions of fulfilment even without 'limits to growth'.*

Needs through Equity
Pearce argues that notions such as equity within the present generation are integral to any reasonable definition of 'development'.[273] The concept of needs and differential consumption within limits introduces the issue of redistribution. For many growing affluence has turned luxuries into needs, yet others are unable to attain basic necessities. Improving the lot of the least privileged in society is the stated goal of conventional economic development as well as SD although as stated this is to occur through growth. On a global scale greens argue that the average western rate of resource consumption cannot be achieved by the entire global population without ecological catastrophe.[274]

For social ecologists improving the lot ('standard' of living') of the least privileged in society requires redistribution and greater equity, not continued growth and trickle down 'improvements' to the life of the poor along traditional lines (while the pursuit of growth measured by GNP remains our main economic

---

269 William Rees, 'The ecology of sustainable development', *The Ecologist*, 20(1): 18-23, 1990.
270 Jeremy Seabrook, *The Myth of the Market: Promises and Illusions*, Green Books, Bideford, Devon, 1990.
271 Andrew Dobson, *Green Political Thought*, Harper Collins Academic, London, 1990. p89
272 ibid. p89
273 D. Pearce, A. Markandya, E. Barbier, *Blueprint for a Green Economy*, Earthscan, London, 1989.
274 Elkin, McLaren and Hillman, *Reviving the City*, Friends of the Earth, 1991.

objective). As described however, even redistributing increases in wealth to reduce inequalities has not been achieved. To achieve 'development' (both in developing and developed countries) within sustainability we must instead redistribute resources. As described this will also aid the stabilisation of population growth and reduce environmental impacts of poverty. I have noted how 'above a certain level' material poverty is only one form of poverty.

The Brundtland report describes how the process of development in less developed countries must be geared to sustainability rather than growth and it is the responsibility of the developed nations to allow this to occur.[275] It must be asked why developing countries should restrict their growth. For poor nations achievement of (material) equity requires *significant production growth.* For greens it involves releasing third world dept and allowing agriculture and industry for home production not the West. *This implies greater Western self-reliance.*

Artificial Scarcity, Development and Social Ecology

In discussing 'sustainable development' it is important to note that after *3 'development decades'* the share out of global GDP has grown even more unequal. In 1965 high income countries enjoyed 70% of global GDP while by 1989 73% went to the richest 16% of population.[276] Projections of the combined impact of global consumption and population remain estimates. In anticipating increasing responsibility on the developing world for impact they *ignore power relationships.*

Social ecologists stress artificial scarcity and population growth caused by inequity. Population growth is a symptom of deep-rooted problems, not a cause. The root cause of population growth is poverty that is the result of exploitation, expropriation, inequality, and injustice. Social ecologists tend to blame this on Western colonialism, imperialism, neo-colonialism: an unjust economic order of multinationals, trade restrictions, cash crops for exportation, debt. On the other hand they focus on consumption in the West (and technology) driven by the same exploitative systems.

The problem of famine and starvation in the developing world is often used as a case in point by social ecologists. Although there are limits to the carrying capacity of the globe given present systems (primarily illustrated by pollution) the current food crisis in many parts of the world is exacerbated by grossly unequal distribution of food in a global 'free' market. Western capitalist agribusiness currently wastes and dumps enormous amounts of food while Western power drives systems that encourage production of 'luxury' crops of coffee, tea, cocoa, sugar, beef cattle raw materials for consumer goods predominantly for Western consumption. Such systems have displaced food production for local consumption. Harrison notes however that while global food production (renewable resource) kept ahead of population growth until 1979, since 1985 it has fallen behind.[277] The difficulties of feeding a growing global population will remain a technical problem but one that greens argue is best addressed through reducing Western consumption, increasing local self-reliance and exploiting the diversity of ecosystems locally.

Re-defining Development

As described Promethean environmentalism is based around the notion that no 'growth' may in principle be equally compatible with unsustainability and injustice. This not only defines growth and 'development' from a narrow Western capitalist view it assumes today's capitalist economic system is capable of redistributing resources. The fact that many live in absolute poverty today (within a capitalist system) does not mean that our definition should be restricted to material wealth (above a certain level). Poverty means different things in different places. Our tendency to use the word 'developed' to describe the West implies something static and completed; it is a sign of our complacency, our unwillingness to look at the direction in which we are developing and it saves us from having to confront some of the disfigurements that form of development creates and will continue to create. Seabrook notes that such a view means we are degrading irreplaceable ways of living from which we have everything to learn.[278] *The challenge for social ecology seems to be to demonstrate that alternatives are not 'primitive' or 'atavistic' but that other monitors of 'performance' are needed for social and environmental reasons.*

As noted by Bookchin not accepting the capitalist version of sustainable development does not mean having to accept the bio-centric view. Social ecology sees *human* development and liberation (and management of resources) as critical but not within a context of capitalist ownership, economic growth in

---

275 ibid. p1
276 Paul Harrison, *The Third Revolution*, Penguin Books, 1992.
277 ibid. p325
278 Jeremy Seabrook, *The Myth of the Market: Promises and Illusions*, Green Books, 1990.

the West and representative democracy. Bookchin is also critical of Marxists for their materialist (capitalist) if egalitarian views.

Social ecology has developed in response to environmental degradation and emphasises the way that alternatives to market-based social order arise out of 'sociality' or 'humanity' of the human species. A different kind of spontaneous order is formed when the individual, the social and the ecological are in harmony with each other. *Bookchin's notion of 'limits' seems to be that there are ecologically derived limits to what humans can do in their social sphere.*[279] The left anarchist tradition has a particular assessment of the SD debate - intra- and inter-generational justice. Inter-generational justice cannot become a reality unless social hierarchies produced by competitive struggle are replaced by the 'principle of equality of unequals' (intra-generational justice).[280] This involves equality of land and power distribution. Bookchin's notion of justice is that of Kropotkin's 'mutual aid'. Concern for quality of life for future generations is predicated on an unfolding potentiality of the species to live better lives in harmony with life supporting ecosystems and other humans. We do not yet know the full richness and complexity of natural ecosystems. They will emerge when culture celebrates socio-diversity and eschews homogeneity. "It is only through active political involvement within the community that definitions of 'the good life' emerge to give direction on what may improve quality of life".[281] Glenn Albrecht distinguishes ESD (Ecologically Sustainable Development) from SD. The WCED definition of SD remains objective (materialist).[282]

Potential of Sustainable Development and the City
It is clear that the meaning of SD is highly contested. It is seen as a blueprint for economic growth (without a corresponding decline in social and environmental quality) and it is seen as a means of providing a radical critique of the whole industrial growth paradigm and a base for 'remaking society'. Despite problems of its definition and its use by governments SD can provide a counterpoint to the concept of economic growth as a basis for consideration of city form and process. Growth conveys the idea of physical or quantitative expansion of the economic system. Development is however a qualitative concept incorporating notions of improvement and progress and including cultural, social and economic dimensions. The distinction between 'consumption/growth' and 'development' is critical. By demanding fundamental change in the way economies and societies are developed and managed (on a global scale) it has consequences for city form and development process. Development may mean direct democracy and creating liveable, healthy, social and cultural cites.

Summary on the Global Debate
From this discussion of the global environmental debate I note that:

• Population trends are set to rise even if action is taken to increase growth in the South and implement Harrison's non-coercive measures. The notion of growth today in the South is however often a screen for exploitation.
• Many developing countries need to 'grow' to; address poverty, reduce population growth; develop efficient technologies and enable the development of a 'post-scarcity' approach. To achieve this addressing global trading systems is a priority. It puts an onus on the West to write off debts, increase aid not tied to trade agreements and above all become self-reliant at existing or lower levels of consumption thus not exploit developing nations. Given such an approach in the West levels of industrialisation in developing countries may not necessarily evolve as in the West. Other notions of development may emerge.
• Western consumption is critical for advocates of the 'limits to growth' thesis. Further it is in the post-scarcity West where we can start to address consumption as the final locus of human expression. Reduced consumption raises questions of 'rationing' if the 'safe' level is below today's or we can concentrate on maintaining steady state economies at today's levels and concentrating on 'development' in an non-materialist sense. From a social ecological point of view rationing imposed through hierarchies simply exacerbates problems.
• Technological efficiency is important especially in *immediate actions*. Efforts to increase technological efficiency will be aided by internalising markets but allowing *free flow of ideas*. Problems of technologies being ineffective in a larger context should be addressed by looking at cities as a whole. Greater self-reliance and internalisation is in addition more efficient for identical consumption levels and encourages development of less polluting technologies by internalising costs of pollution. Critically *ideas* should be

[279] Glenn Albrecht, Ethics, 'Anarchy and Sustainable Development', *Anarchist Studies*, Autumn 1994. p109
[280] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991.
[281] Glenn Albrecht, 'Ethics, Anarchy and Sustainable Development', *Anarchist Studies*, Autumn 1994. p113
[282] ibid. p113

globally free if essential goods are not. I will go on to note how participation is 'efficient' in energy terms in solar architecture.

Conclusions

In a space as restricted as this it is clearly impossible to do justice to the variety of opinions in the environmental debate and the consequences of each for future directions. It is equally difficult to try and pigeon hole them. Here, I believe, it is sufficient to acknowledge a threefold distinction of; environmentalists, greens (deep greens) and social ecologists. While 'deep green' views are all too easily discredited due to their lack of relation to our present context, questions remain about the ability of technological methods to deal with environmental dislocation within our existing growth economy. If no ultimate 'limits to growth' exist then valid criticisms remain regarding a future society increasingly removed from any 'non-human' world and increasingly hierarchical. Further today's social divisions are not only part of the environmental debate but, if ignored by greens or environmentalists, clearly question their reasons for advocating environmental measures or a 'future' sustainable planet. It does not seem good enough to argue in the face of any evidence that the needs of the poor will be catered for by capitalism through the 'trickle down' effect.

In addressing environmental dislocations there is clearly a need to address all three proximate determinants; population growth, technological efficiency, and consumption levels. Of the three it is the later that poses the greatest problems and is the one usually side tracked by environmentalists. It can be argued however that even if we stabilised global population (eventually reducing it but not through coercion) and used efficient technologies (driven by growth) we could not all consume the quantities demanded by West today let alone the additional demands of continued growth. Western consumption surely must be addressed. I have looked at how Western consumption has reached such levels and how it can be replaced as the means by which so many define themselves.

In proposing solutions *deep greens* have principally a message of scarcity backed by energy intensive labour and local trading. At the extreme this involves living within 'natural limits' with humans of 'equal worth' to animals. I agree with the environmentalist view that deep green ideas are regressive and unrealistic. We cannot return to the 'wilderness' and if we were to do so it would mean, to put it mildly, 'controlling' populations. Neither as Bookchin points out can we avoid 'intervening' in nature. Deep greens also have a profoundly anti-humanist streak that gives no philosophical reasons not to let starvation and AIDS take their natural courses. Many deep green solutions are based on totalitarian societies that for Bookchin will only exacerbate our desire to exploit nature.

Environmentalism by contrast is optimistic that growth will raise standards of living and provide technological solutions. In its more right wing forms it seems as overly optimistic and dismissive of any problem as deep ecology is pessimistic and regressive. Technological environmentalism is ultimately unquestioning of the form of today's or tomorrow's society both in terms of sustainability and existing social divisions. The environmentalist views of Harrison however are clearly those that Bookchin would support as necessary if not sufficient. Harrison notes that in addressing population measures should be non-coercive, technical 'development' is required in both first and third worlds (encouraged through protectionism), and debts should be written off.

Social Ecology

Western consumption for social ecologists as greens is at the core of environmental problems. Our exploitative trading systems have enabled us to reach levels of consumption unsustainable globally at today's level of technology. This is despite (unlikely) global action on reducing impact through tackling population growth (by 'development') and technology. For social ecologists technology driven by 'growth' in a capitalist context will not defeat 'limits'. While population reduction in the developing world and technological efficiency are undeniably of great importance in addressing environmental dislocation immediately social ecologists note that population control and technological change do not address root causes while technological change is often counterproductive. Further, development of third world economies seems a shallow promise (thus so is population reduction through development). Social ecologists as greens note that capitalism and global trade based on 'comparative advantage' serve only to maintain divisions in society (globally and locally). This leads them to question the environmentalist argument that growth will lead to reduced poverty, control of population growth and eventually encourage technological solutions for all. Unlike greens, social ecologists stress that solutions ultimately lie in our hierarchical structures and will not be solved by 'rationing.'

Another issue contemplated by social ecologists is the idea that 'limits to growth' may be staved off. The economy may continue to grow and replace nature but this would need extreme hierarchical organisation.

They question the nature of the society needed and its ability to deal with catastrophic failures. They would view such a society as the ultimate dehumanisation or objectification of society. Social ecologists are concerned with social problems today. Bookchin argues that the most heinous crime of certain ecologists is how they have dropped the human condition from the very discourse of their concerns.[283] This is absolutely true of what passes for green architecture today.

In criticising a 'return to nature' Bookchin has neatly encapsulated our relation to nature in the notion of first and second nature. We are 'of' nature but capable of taking part in 'participatory evolution'. This enables social ecology to be radical but progressive. Social ecology sees the solution to both *environmental* and *human* dislocations in the human resolution of an anarchist *society*. Revolution involves recreation of the psyche away from a materialist attitude towards human subjectivity (unlike socialist revolutions that were similarly materialist). *We only 'destructively exploit' nature because of our materialist view based on human hierarchies.* It is not clear whether Bookchin sees a steady state economics developing from addressing hierarchies and the notion of domination in human society. If we do not dominate people for material gain however we will not need to dominate nature. Any 'growth' will be sustainable. It remains after all (more than any utopian dream) a leap in the dark to believe that material wealth is the final locus of human expression. The question remains how can it, and will it, be supplanted. For social ecologists Western consumption levels may now enable us to go, as it were, *'beyond growth'*.

As I have noted the concept of greater self-reliance applies to accompanying Western consumption reductions and reducing exploitation of developing countries. It can empower the poor at a local level. It also applies to reducing inefficiencies of global trade and controlling externalities. Critically however for social ecologists political, economic, productive and social self-reliance apply to breaking down material and hierarchical 'attitudes' and de-marketising social relationships. It involves the end to private ownership of the planet by an elite strata. The fundamental libertarian precept of social ecology is that every [normal] human being is competent to manage the affairs of society and, more specifically the community in which he or she is a member. This involves the abolition of hierarchy in all its forms - psychological and cultural as well as social - and of classes, private property, and the State. It involves despecialisation since specialisation is a form of objectification and domination. Ultimately for social ecologists consumption in the West is addressed by addressing hierarchies. Encouraging political, economic and social self-reliance at a local level in the West, it is argued, will replace consumption with freedom. This can be done at various levels.

It is as it were our institutional techniques that drive overconsumption. These have percolated our psyche (a term Bookchin is not afraid to use). These techniques that the social ecological project must address include:

• the enclosure of land, resources and power by a few under 'capitalism' (local and global),
• a 'free' market system that ignores environmental and social externalities,
• a 'free' market system that favours large scale operations thus globalising markets and removing cause and effect,
• an addiction to the wealth created by this exploitation and economic dependence generally, due to de-skilling, enclosure, division of labour and removal of means of satisfaction other than monetary (increasing distance from decision making and powerlessness),
• representational democratic systems that have maintained this exploitation for the benefit of their elites,
• today's emergence of trans-national corporations that are above democratic control,
• 'propaganda' and advertising that hide the unacceptable results in the 'democratic' West and maintain a consumer ethic.

For social ecologists all have their origins in the emergence of human hierarchy and thus a materialistic attitude. The message of social ecology is that the West must address its own consumption, not, as it is prone to do, blame the developing countries for global problems that are forced on them. Sustainable development cannot ethically deny the poor the material wealth of the West but can only attempt to show that it is the product of a restricted notion of freedom.

Social Ecology Tinged with Environmentalism
While Bookchins and Moore Lappé have exposed specious claims of shortage and thus put the emphasis on our institutional distribution it is pollution that is today's principle environmental concern. One criticism of Bookchin is that he does not develop the issue of time and loss of, for example biological diversity. There is perhaps a need then to address environmental concerns immediately while

[283] Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p202

empowering. *This suggests that we should employ technologies that reduce impact and increase self-reliance through supporting initiatives that move towards a 'living democracy' by giving people a working say in decision making and their own lives.* Certain technologies intrinsically support local self-reliance. This 'balance' is critical.

An Architectural and City Context
In summary I note Elkin "the optimum path to the more sustainable city has two immediate implications for the future. First, it places emphasis on the resourceful, self reliant city, minimising waste of resources by energy conservation and recycling, and reducing its dependence on imports. Second, it places emphasis on enabling the people who live in cities to increase their control over their own future development, by encouraging bottom-up urban revival based on local community initiatives".[284] *Certain architectural and planning technologies are efficient from an environmentalist point of view, enhance local control and bring natural and production process into the city. These are the technologies of social ecology. How they are implemented must be consistent with empowering.* The technologies (architecture) we employ will not produce greener systems if they do not work within such a social matrix. High technology or large scale technologies are not inherently problematic.

Today 'green architecture' is usually that which I have termed 'environmental'. Generally, in practice, it bears little relationship with green political and economic thinking. Some designs for 'sustainable communities' explore green notions in greater depth but usually outside the city on exclusive sites lacking relationship to the city. Social ecology alters any definition of what is 'green' and thus 'green architecture'. A social ecological view changes the city planning/architecture brief linking architects/planners involved in participation and self-help (anarchist) with those dealing with environmental techniques. There already exists a considerable movement in participative and self-help housing that may be tapped. Social ecological architecture, landscape and city planning involve breaking down hierarchical relationships and specialisation's that have homogenised a supposedly 'free' and 'complex' society. Technologies in architecture must operate within an appropriate 'social matrix' of empowerment. They involve the need to de-materialise life-styles and de-marketise (more not total self-reliance) as many of our processes (production, distribution and consumption) as possible. Architecture, landscape and city planning are ideal disciplines within which to address notions of empowerment particularly at the local of living and working environments. Architecture critically deals with our daily environment. I could be a means by which people are brought creatively into environmental development.

The social ecological critique has many connotations for architecture and city planning. Consistency of means with ends demands gradual empowerment (trans-class in the post-scarcity west) while I argue also pursuing an environmentalist agenda. This involves:

• use of process and technologies that increase participation in design and maintenance;
• introduction of energy efficient architectural technologies (e.g. solar power, microclimate design) and landscaping (e.g. naturalistic landscaping, microclimate design) that also communicate industrial and natural process (origins of energy and goods) in the city;
• introduction of (perhaps limited) agricultural process in and around the city (food and timber production);
• importance of integrated living, working and leisure environments (close proximity) that reduce the notion of 'abstract labour' and inform people of various processes;
• the development of city technologies and form that allows for greater self reliance at a variety of scales (neighbourhood, district and city);
• development of a city fabric that allows for decentralised 'control' (neighbourhood building);
• confederating networks for initiatives such as city farms, technology resource centres, city based demonstration centres, green builders yards and environmentally aware support specialists - government funding could also be co-opted;
• encouraging a general 'social matrix' of empowerment and dematerialism;
• development of methods to creatively involve people in their own environment.

Whether limits to growth exist or not the importance of developing efficient technological processes and avoiding 'escalator problems' of technology in the West need to be addressed. This involves looking at technologies such as architecture in the city context. In the next chapters I thus examine 'city greening' not simply 'environmental building'. This enables development beyond the idea on 'total ecological load' i.e. the best environmental measure. I discuss those techniques that best fall into the realm of 'social ecology' as discussed. I also discuss the efficiency of encouraging participation in housing design in terms

[284] T. Elkin, D. McLaren, M. Hillman. *Reviving the City, Towards sustainable urban development*, Friends of the Earth, 1991. p213

of energy use, maintenance and appropriateness and thus add to the non utopian arguments (environmental) for greater self-reliance in building or at least participation between architect and user.

In concluding on these techniques in *Chapter Seven* I also note:

• The effect of distant control processes and disempowerment within existing cities in the West and how they can be practically addressed through re-empowerment. The effects of dependency have been exaggerated where jobs have been removed from areas and the skills do not exist to survive without them but are also visible in isolated suburbs.
• The fragmented form of cities driven by our present economic system that further disempower and how they can be modified. This is necessary in light of efficient city wide environmental techniques (chapters two to six) and 'social ecological' economic process (*Chapter One*);
• Problems of implementing environmental techniques contrary to present trends.

By looking at the city as it exists I hope to embed social ecology in the realities of today's city form and process. I then go on to look at actual and potential development in self-help housing before attempting to suggest means of progressing 'biotic technologies' and self-help together. This I argue involves development of appropriately targeted 'supports' for different groups based on their 'objective realities'.

In attempting to develop a strategy that enables architecture and city design to make 'positive' environmental contributions as opposed to simply 'reduced impact' social ecology provides a coherent starting point. Further, cities and architecture are critical areas within which to tackle 'development' as opposed to growth. They are areas where the notion of post-scarcity can be given form. Architecture, landscape design and planning are vital to any process of empowerment. Local environmental control can be introduced, appropriate skills gained, and dependency reduced through city farming, energy efficient and local recycling technologies. The physical form and arrangement of houses can aid and focus local initiatives. Process of implementation, form of the fabric and the technologies used are all important. *We need to develop a 'common language' for both professionals and users, involving people in the design and control of their environment, communicating natural processes and re-empowering local people.*

Contributions, I have argued must go beyond increased levels of insulation in houses located in car parks whose owners will still drive to work, replace their car every two years and continually 'update' their consumer goods. They must also go beyond designs for 'deep green' villages removed from the city context. In fundamentally questioning our existing society green architecture cannot be a saleable commodity (capable of being twisted into almost any shape by self interested parties to increase profits or maintain power). Manufacturers are already exploiting the potential of 'green gadgets' to increase market shares (as status symbol commodities) and thus growth within the present economic system. Environmental gadgets are potentially just another multimillion pound market competing for profits and using the environment as an excuse to further exploit people.

The tendency to supply marketable, low energy in use designs without consideration of the context into which they will be inserted I have argued will not green our environment. I develop this argument in future chapters. Certain 'low energy' technologies applied universally may actually increase overall consumption since they do not consider the 'total ecological load' in each site specific case as a product of the hinterland. They may fit into an inefficient city fabric (all these discussed next). Neither will they communicate environmental processes and awareness or address the idea of 'growth' or a change in power structure suggested here as fundamental. 'High technology' cannot be criticised *per se*, but rather its tendency to be non-communicative, applied universally for its own sake, and applied within an unsustainable economic system.

BLANK IN ORIGINAL

Chapter Two:

Urban Transport

Introduction

Current trends in the transport sector (particularly the increase in car use and dependence, and the growth in road freight) pose major problems for resource use and pollution. These trends threaten to reverse gains made, for example, in energy conservation in buildings. At present the transport sector accounts for 20% of total greenhouse gas emissions in the UK and is the only sector where the output of greenhouse gases is rising.

Here I begin by outlining some of the environmental problems of increasing car use. I also note some social and economic consequences of increased car reliance. I go on to outline a range of options to reduce the environmental impact of transport in and around cities in the UK. The effective development of more sustainable cities, I suggest, depends largely on creating urban space that is not dominated by cars but promotes cycling, walking, and the use of public transport of various forms since these are less energy consuming and less polluting. Such urban space can encourage recolonisation of our cities the other benefits of which (in addition to further transport efficiency) I outline in later chapters. Making drivers pay the 'true costs' of automobile use, regulating its use and providing efficient and convenient public transport alternatives are all essential in moving from car dependency but the gradual physical restructuring of cities and suburbs regionally and locally will increase the viability of alternatives and reduce the need to travel. Such restructuring is vital in the long term if real alternatives are to be maintained.

Such a restructuring, I suggest, should address the existing city fabric and build on the notion of the compact city in which functions are brought together not zoned separately. Planning should aim to meet peoples travel needs by the most environmentally friendly methods but also reduce the need for transport. Minimising travel distances will increase the potential for cycling and walking. The aim is not to replace the car, but complement it where it is least efficiently used in the city particularly for daily commuting and shopping. The resultant form, I argue in chapters three, four, five and six would facilitate energy efficient architecture and free up space for ecological landscaping and food production within the city.

In recent years a body of evidence has emerged to suggest that a transport system *can* be developed in the UK that would meet transport needs, lower road accidents, limit local and global environmental damage, conserve finite resources, give value for money, extend opportunities for groups with low personal mobility and income and promote healthy lifestyles.[1] Co-ordinated action is needed on a number of fronts. Simply to boost public transport in urban areas without restricting the car, for example, would be unlikely to lead to lasting improvements. Neither would an energy tax be appropriate without provision of alternatives. Critically consideration of the city must include its hinterland (commuters) and the provision of goods from outside.[2] It also involves international transportation discussed i.e. global 'swapping' of goods and our economic concept of specialisation for 'comparative advantage'.

2.1. Trends and Problems

2.1.1. Global and Local Environmental Impact

Transport growth is a world-wide phenomenon accounting for an *increasing* share of global energy consumption and pollution.[3] Road transport alone accounts for approximately 80% of the energy used in transportation and is entirely petroleum based contributing greatly to finite energy consumption, to pollution at both local and global levels and to oil dependency. Globally motor vehicles use one-third of the world's oil.[4] Passenger cars alone, are responsible for more than 13% of the total carbon dioxide emitted from fossil fuels world-wide, or more than 7000 million tons of carbon annually.[5] Moreover by the year 2000 the number of cars in developed countries is expected to increase by 55% compared with

---

[1] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City: towards sustainable urban development*; Friends of the Earth, London, 1991.

[2] Urban agriculture is particularly relevant here.

[3] Chris Gossop and Adrian Webb, 'Getting Around: Public and Private Transport', in Andrew Blowers (ed.), *Planning for a sustainable environment*, London, 1993.

[4] Peter Newman, *Urban Villages: Concept for the 90's*, ECODesign Conference, RMIT, Melbourne, October 1991.

[5] Marcia D. Lowe, 'Alternatives to the Automobile, Transport for Livable Cities', *Worldwatch Paper 98*, Worldwatch Institute, October 1990.

1984 and by 150% in developing countries (from a much lower base). China, India, Pakistan and Bangladesh together currently have only half the car population of Greater Los Angeles.[6]

In the UK the transport sector accounts for approximately one-quarter of total *energy consumption* and *carbon dioxide emissions*. This is second only to space heating emissions but more significantly it has been growing continually in contrast to the reduction of energy use in other sectors, particularly housing.[7] Clearly, in addition to vehicle use, the impact of manufacture, maintenance and infrastructure provision must be added for all transport forms (as with buildings). Gossop and Webb argue that this increases total energy used in transport by 50% and thus official figures tend to understate total levels.[8] Newman notes further that low density sprawl produced by the car is more costly in physical infrastructure provision than other forms.[9]

The transport sectors contribution to more local air pollution include:

• Nitrogen oxides. Transport is responsible for 50% of the UK's emissions. Road vehicles account for almost all of this pollution that is a major cause of acid rain and other acid deposits that kill life in lakes and streams and are suspected of damaging forests.
• Carbon monoxide. Road vehicles generate 88% of the UK's CO emissions.
• Volatile organic compounds (VOC's). The hydrocarbons emitted from road vehicles are responsible for 37% of VOC's. The main component of smog is ozone formed as nitrogen oxides and hydrocarbons react with sunlight. Ozone, carbon monoxide, nitrogen oxides, and hydrocarbons aggravate bronchial and lung disorders and "are often deadly to asthmatics, children and the elderly".
• Particulates. Particulates blacken buildings (and may be carcinogenic).
• Sulphur dioxide and Benzene. Both of these emissions are carcinogenic.

Road traffic is the single largest source of local air pollution and noise nuisance. It creates a haze of smog over many cities. Oil spills are another, less often considered, consequence of heavy car use yet while accidental spills annually dump an estimated 2.9 million barrels into the sea, roughly six times more gets into the oceans simply through routine flushing of carrier tanks, run off from streets and other everyday by-products of a petroleum economy.[10] Spillage also results in soil pollution.

Mode		*Occupancy Rate*		
	25%	50%	75%	100%
Petrol car (<1.4 litres)	2.61	1.31	0.87	0.62
Petrol car (>2 litres)	4.65	2.33	1.55	1.16
Diesel car (<1.4 litres)	2.26	1.13	0.75	0.57
Diesel car (>2 litres)	3.65	1.83	1.22	0.91
Rail (Inter-city)	1.14	0.57	0.38	0.29
Rail (suburban electric)	1.05	0.59	0.35	0.26
Bus (double decker)	0.7	0.35	0.23	0.17
Minibus	1.42	0.71	0.47	0.35
Cycling				0.06
Walking				0.16

Fig. 2.1. Energy consumption for different passenger modes Megajoules primary energy/passenger-kilometre[11]

[6] Chris Gossop and Adrian Webb, 'Getting Around: Public and Private Transport', in Andrew Blowers (ed.), *Planning for a sustainable environment*, London, 1993.
[7] Joan Davidson and Ann MacEwen, *The Livable City*, RIBA Publications, London, 1984. tables - p123 (and Architects Journal, 13 September 1989)
[8] Chris Gossop and Adrian Webb, 'Getting Around: Public and Private Transport', in Andrew Blowers (ed.), *Planning for a sustainable environment*, London, 1993.
[9] Peter W. G. Newman and Jeffrey R. Kenworthy, *Cities and Automobile dependence: a sourcebook*, Gower Technical Press, Aldershot, 1989.
[10] Marcia D. Lowe, 'Alternatives to the Automobile, Transport for Livable Cities', *Worldwatch Paper 98*, Worldwatch Institute, October 1990.
[11] ibid. p114

Given the predominance of road transport for both passengers and freight it is not surprising that the vast bulk of transport sector energy use and pollution derives from motor vehicles. Per passenger kilometre comparisons between modes of transport are complex but figures suggest rail is much less polluting than the car in terms of CO, NO_x and Hydrocarbon emissions and significantly so in terms of CO_2.[12] Relative efficiencies however vary within the range of distances. In energy used per unit load (passenger or tonne kilometre) it is generally accepted that the rank order of bus (low), rail, car (high) applies. *Fig 2.1.* gives an indication of the relative efficiencies.

2.1.2. Use of the Car in the UK

Today there are some 18 million cars in the UK (+ 5 million other vehicles) an increase of 10 million or 125% from 1965 when 41% of households had the use of a car (62% in 1985).[13] Car ownership at present is less than 40 per 100 population but Adams puts the UK 'saturation level' at over 60 per 100.[14]

	Estimated billion passenger kilometres				
	1978	1981	1984	1986	1988
Road					
• public service vehicles	50	42	42	41	41
• private transport	378	410	441	471	523
• pedal cycles	5	5	6	5	5
Rail	35	34	35	37	41
Air	3	3	3	4	5
Total	471	494	527	558	614

Fig. 2.2. Passenger transport in the UK[15]

Between 1952 and 1988 passenger kilometres travelled in the UK decreased for cycling, bus and train and increased tenfold for the car. Many factors have structurally favoured the car including the psycho-social benefits of car ownership, growing job mobility, physical distribution of housing and employment locations and not least speed, convenience, privacy and freedom. Increased availability of cars due to economic growth and technological advances has grown hand in hand with land-use changes that have segregated homes, jobs and services. Studies have shown that the largest single cause of traffic growth in recent years was length of journey not numbers of journeys - especially for journeys to work.[16] The spread of our cities that has grown with car use now tends against the use of public transport. It is this segregation and the dependence on the car to breach it that is the principle problem in terms of developing sustainable alternatives. The spread of urban areas and the extension of mileage that people travel has been a gradual process since the development of the first 20th Century suburbs in response to polluted cities aided by rail travel followed by the car (see 7.1. Fragmentation and Loss of Control).

2.1.3. Mobility and Accessibility

Sustainability and local pollution are not the only problems associated with increasing car travel. Even at today's levels the UK has some of the most congested roads in Europe. Car ownership levels remain lower in the UK than Germany, France and Italy but levels of use are higher largely due to the relatively low status of public transport.[17] Recent roads such as the M25 already handle densities greater than their design capacities. In particular the roads in our towns and cities are increasingly congested. Harley Sherlock notes that the congestion caused by the car accounts for only a small proportion of commuters. The Croydon Corridor Study described by Sherlock and carried out in 1985 demonstrated that 25% of those commuting within the A23 corridor (from central London to the M25) could just as easily travel by

---

[12] Chris Gossop and Adrian Webb, 'Getting Around: Public and Private Transport', in Andrew Blowers (ed.), *Planning for a sustainable environment*, London, 1993.
[13] ibid.
[14] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City: towards sustainable urban development*; Friends of the Earth, London, 1991.
[15] ibid. p50
[16] Chris Gossop and Adrian Webb, 'Getting Around: Public and Private Transport', in Andrew Blowers (ed.), *Planning for a sustainable environment*, London, 1993.
[17] ibid.

public transport.[18] 'Easily' was defined to exclude those who needed their car for work and those whose door to door journey would be increased by more than four minutes.

Despite our continual striving for 'the mobile society' and while overall distance travelled has increased in the last twenty or thirty years Harley Sherlock argues that mobility in urban areas has actually been reduced, "it is now more difficult for us to get around our cities, or to get goods delivered, than it was in the 1950's". 'Mobility' has today become an end in itself yet as Harley Sherlock points out in a perfectly mobile society we would be travelling for 24 hours a day and 'accessibility' is perhaps a more desirable aim "we would like our shops, pubs bingo halls and football clubs to be as close to our own front doors as possible and preferably within walking distance".[19]

2.1.4. Some Other Problems

In addition increased traffic in the city adds to noise pollution at a local level and reduces available public space due to the large quantities of land it demands. It also destroys the street as focus of social interaction and play. In Los Angeles for example two-thirds of urban space is paved for cars. The UK's pedestrian fatality rate for children is the highest in Europe.[20] "Cars are more responsible than any other main methods of personal travel for a reduction in environmental quality and a distortion in preferred travel patterns, such as cycling. They also hinder the efficient and safe use of other methods and even their own use. Their use is associated with 60 per cent of all road deaths and serious injuries. They are among the most extravagant users of finite fuel. And they are available on an exclusive basis, to only a minority of the population."[21]

The social effects of increased car use are felt particularly by disadvantaged groups the very young and old. The low ownership rate in the UK would suggest many more suffer these fates than in the rest of Europe. Increased fragmentation has meant car dependence due to increased travel distances. Those who either cannot afford a car or are unable to operate one often have no access to jobs, schools, health centres and other important destinations. Children, the handicapped, the poor and the elderly are not only made less mobile by an auto based system, but also bear the brunt of its costs: the physically weak suffer most from pollution and the poor are the most often displaced by roads. Newman notes that in the outer western suburbs of Sydney (which is associated photochemical smog) one in four children is suffering from asthma.[22] Congestion and pollution of inner cities is one factor in decisions to move to suburbs but this only serves to exacerbate the problems of inner cities. Out of town retail facilities are not only difficult to access without a car but increase costs in smaller local shops. John Roberts has developed an economic case for reducing car use, concluding that the car is not the economic grail that we have grown to believe.[23] "Commuting has a directly destructive effect, on the home area, which is not worked in; on the business local, which is not lived in; and on the places in-between, which, used as passage-ways, inevitably cease to be 'places'. Public areas that were once intensively used have been reduced to mere arteries, mechanisms to get from one place to another."[24]

Brenda and Robert Vale describe how perhaps designers should be forced to live without a car for a month "to enable them to anticipate the frustrations when an energy tax or traffic congestion brings private transport to a final halt".[25] It may be equally appropriate for them to experience the hazards of those in the inner cities to whom they lock their doors while commuting past on their daily trips to work discarding rubbish from their windows.

There is then a need to reassess transport requirements in light not only of sustainability but also local pollution, equity and congestion. The car once promised a world of speed, freedom and convenience. Societies that have built their transport systems around cars are now waking to a much harsher reality. Attempts to produce mobility and freedom have had severe environmental consequences without the

---

[18] Harley Sherlock, *Cities Are Good For Us: The case for high densities, friendly streets, local shops and public transport*, Transport 2000, London, 1990.
[19] ibid.
[20] Tim Elkin, Duncan McLaren, Mayer Hillman. *Reviving the City, Towards sustainable urban development*, Friends of the Earth, London 1991.
[21] ibid.
[22] Peter W. G. Newman and Jeffrey R. Kenworthy, *Cities and Automobile dependence: a sourcebook*, Gower Technical Press, Aldershot, 1989.
[23] John Roberts, 'The economic case for green modes', in Rodney Tolley (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
[24] Tim Elkin, Duncan McLaren, Mayer Hillman. *Reviving the City, Towards sustainable urban development*, Friends of the Earth, London 1991.
[25] Brenda and Robert Vale, *Green Architecture: Design for a sustainable future*, Thames and Hudson, London 1991.

desired effect on access. These consequences are global and local but characteristically have a particular effect on those who do not cause them - walkers, cyclists, the young, the old and the poor.

2.1.5. Current Land Use Changes and Transport Policies

Gossop and Webb criticise the UK Governments Environmental White Paper *This Common Inheritance* published in 1991 as inadequate in its dealings with transport.[26] In particular, they argue that it failed to explain how forecasted increases in car use could be rationalised with stabilising CO_2 emissions. No real incentive was offered to encourage a switch to more fuel-efficient vehicles or to encourage public transport use. Efficiency, in any case, continues to be defined in narrow financial terms with little regard to social, environmental and long term economic costs. Fuel prices that do not account for environmental impacts allows continued fragmentation of cities into functionally determined chunks and distances from work to continually increase.

In the UK current land use changes and transport policy are continuing to encourage this process (see also *7.1. Fragmentation and Loss of Control*). Certain types of land use are particularly significant : ***the retail park, the industrial park, the leisure complex, the business park, the drive-in.*** Edge of town business parks located for motorway access combine office, manufacturing, distribution and occasionally research activities at low density and accessible only by the car. Commercial pressure has been exerted on authorities to permit and plan infrastructure for out-of-town retail developments again increasing the number of journeys made by car (to exploit 80's affluence, consumerism and mobility). A 1987 test survey showed that 80% of those who used the Gateshead Metro Centre had travelled by car but only 27% of those using Newcastle city centre had.[27] Developments such as the Metro Centre and Meadowhall outside Sheffield have had damaging effects on existing centres. While both retail and business parks may potentially consist of energy efficient buildings they would still increase overall resource consumption due to the lifestyles they generate and dependence they create.

Present transport policy remains dedicated to expansion of road building and improvement to reduce congestion on inter-urban roads. Bi-passes around commuter villages are characteristic. According to the TCPA such a policy can only generate further traffic and increase congestion in urban areas.[28] It also further encourages decentralisation of business increasing car dependence. Such a transport policy based around the suburbs and village commuters only increases the isolation of the poor without adequate public transport, local services or access to the countryside. Hillman makes the salutary point that annual central and local government provision for cycling in the UK amounts to cost the of 200 yards of urban motorway.[29]

I have described how car usage is particularly high in the UK compared to Europe in general largely due to greater continental acceptance of public transport as a genuine alternative within cities. Most of our European competitors encourage highly integrated transport policies often using a mix of light rail, metro, trams and buses with restrictions on parking and comprehensive provision for cycling and pedestrians. In the UK policies such as deregulation and privatisation have resulted in a lack of possible co-ordination and reliability. In addition rules for rail and road projects vary. Rail schemes are expected to generate a financial rate of return with no allowance for wider benefits. Roads are seen as a public service for the benefit of the economy. Another feature is the higher proportion of company cars in the UK encouraged by tax incentives.

2.2. Towards a Sustainable Transport Policy

2.2.1. Towards a Sustainable Transport Policy

Marcia Lowe argues that at present "obeying the demands of the private car has become a passive routine for many of the worlds cities....the automobile embodies author Jacques Ellul's observation of all

[26] Chris Gossop and Adrian Webb, 'Getting Around: Public and Private Transport', in Andrew Blowers (ed.), *Planning for a sustainable environment*, London, 1993.
[27] ibid.
[28] ibid.
[29] Tim Elkin, Duncan McLaren, Mayer Hillman. *Reviving the City, Towards sustainable urban development*, Friends of the Earth, London 1991.

technologies: it makes a good servant but a bad master".[30] The political difficulties of reducing the use of the car cannot however be underestimated. It has become an indispensable freedom for the majority and something to aspire to for many others in the 'developing' as well as 'developed' world. In moving towards both more *liveable* and *resourceful* cities alternatives must compete with the convenience of the car particularly for the family. The aim cannot be to stop car ownership and use but, perhaps can be, to define and stop its inappropriate use. Bearing this in mind it should be noted that 50% of car use takes place on urban roads (not including urban motorways) and as described urban driving is inefficient and one of the most polluting ways of driving a car. Clearly however the city is the focus for a hinterland and thus cannot be discussed in isolation. Improved road links between cities increase pressure in city centres and inner city residential areas.

Martin Kroon describes how policies in the Netherlands are based on pollution assessment calculated as a product of: vehicle emission factor, km per year, traffic and drivers factor.[31] The later allows for local pollution problems specifically in the city. Measures to reduce these factors can be divided into four main areas:

• regulatory measures involving emission limits for vehicles;
• financial measures involving increasing cost of motoring generally, applying specific measures to congested urban areas, and investing in public transport;
• inducements encouraging research into more efficient modes of transport;
• planning - an integrated approach to transport (unifying strategy that will seek to shift use from the car) and control of the built environment (location of buildings and design for public transport, walking or cycling).

2.2.2. The Super-efficient Car

In the last 15 years the energy efficiency of *comparable* cars has improved by 50% (driven mainly by research due to the oil crisis).[32] In the UK however these benefits have largely been dissipated as drivers have used the technical improvements to acquire larger and more powerful cars. The result has been a net drop in fuel used per car of only 7%. In terms of reducing pollution per unit of fuel three way catalytic converters are now mandatory in the EC for new petrol-engined cars. They can reduce emissions of carbon monoxide, nitrogen oxides and unburned hydrocarbons to a minimum. In addition they only use unleaded fuels. Forecasts of growth in car use however will wipe out these gains by early in the next century. Nor will they reduce CO_2 emissions, indeed they increase overall fuel consumption. Lead free petrol now accounts for 40% of sales and lead emissions have been reduced considerably although again this does not address problems of increased fuel consumption. Diesel-engined cars consume 25% less fuel than petrol-engined ones and thus emit less CO_2. Promoting diesel however needs to be accompanied by research into minimising particulates in diesel exhausts, which are believed to be a risk to human health, particularly in urban areas. Recently concern has been voiced over the carcinogenic properties of lead free petrol.

In the longer term electrical battery powered motors and hydrogen-powered vehicles may gain favour and new research has produced cars that can achieve 100 mpg.[33] Again these may reduce environmental impact in some areas notably local air pollution but as a consequence may further promote the use of the car. Electric cars must run on renewably charged electric energy in order to reduce CO_2 and not simply remove its production and resource use to power stations. They may offer energy and environmental advantages over short distances where the development of high storage capacity batteries are not needed. Research by the Institute of Environmental Protection and Energy Technology in Germany found that replacing the million or so internal combustion engine vehicles with electric-engined alternatives would lead to a 20% increase in CO_2 emissions if current electricity generating technologies were used.[34]

Banister describes further how the car is the only form of passenger transport to actually decline in efficiency in recent years due principally to a reduction in the number of people per car and the popularity

[30] Marcia D. Lowe, 'Alternatives to the Automobile, Transport for Livable Cities', *Worldwatch Paper 98*, Worldwatch Institute, October 1990.
[31] Martin Kroon, Traffic and environmental policy in the Netherlands, in Rodney Tolley (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
[32] Chris Gossop and Adrian Webb, 'Getting Around: Public and Private Transport', in Andrew Blowers (ed.), *Planning for a sustainable environment*, London, 1993.
[33] Joan Davidson and Ann MacEwen, *The Livable City*, RIBA Publications, London, 1984.
[34] Chris Gossop and Adrian Webb, 'Getting Around: Public and Private Transport', in Andrew Blowers (ed.), *Planning for a sustainable environment*, London, 1993.

of larger engines.[35] In addition solutions that do not involve alternatives to private motorised transport avoid addressing the social aspects of fragmentation (discussed in *Chapter Seven*). They further encourage mass car production, adding even more to the mountains of scrapped vehicles and components as people move to their next updated 'environmentally friendly' version. At present some 30 million new cars run off the assembly lines each year. Neither does the super-efficient car ease traffic congestion or safety. Even electric cars, which could reduce fossil fuel consumption and pollution, would still contribute to traffic jams. In addition new car technology will not serve the majority of humanity who do not, or will never, own a car. It is the enormity of automobile related problems that defies such 'technical fixes'. Without alternatives to the car, progress in fuel economy and emission reduction risk backsliding because of increased driving. The super-efficient car cannot be seen as a global panacea although it does offer immediate benefits and is thus an essential part of an overall strategy.

2.2.3. Financial Mechanisms

The predominant 'convenience' of the car is its economic cheapness. It is a myth that road users pay in taxes more than they take. Marcia Lowe notes hidden costs of driving including air pollution, municipal services, road construction and repair, and building repair.[36] Police, fire and ambulance services and health services for those affected by air pollution and accidents could also be included. The non-internalised costs of road transport probably amount to several per cent of GNP. If driving was expensive people would, argues Lowe, demand transport alternatives. While car owners are given such buffering from the costs of driving they will stay in their cars. This creates a vicious circle since transport planners are unlikely to invest in alternative transport when existing systems are unused. Only argues Lowe when such costs are acknowledged will governments recognise that transportation alternatives are economical.[37]

Financial measures can aim to increase the cost of motoring generally or be applied specifically to congested urban areas. The former category includes increasing fuel price, increasing Vehicle Excise Duty and phasing out company car allowances. The Town and Country Planning Association (TCPA) advocate a shifting of taxes from Vehicle Exise Duty (VED) to petrol duties penalising inefficient cars and those driving longer distances. Elkin argues however that there are advantages to using both vehicle and fuel tax to reduce car numbers. Initially it will be difficult to raise fuel taxes enough to affect access problems in cities without disastrous short term effects on rural areas. Measures must go hand in hand with public transport improvements. Increased petrol charges increase the cost of living in rural seclusion for the village commuter but without public transport initiatives or subsidies could pose severe problems for the rural poor. Car taxes could be increased more on larger cars. Company car tax allowances (relief on buying and running for business purposes) have encouraged the overuse of the car and cancel out minimal public transport subsidies (these tax relief's have been reduced recently). Employer provided parking is another common 'subsidy'. Elkin notes that in 1982 40% of all car trips in London were by company cars.

There are several ways of discouraging people driving cars into congested areas, from the enforcement of existing parking laws and increased parking fees to road rationing by tolls or issuing permits. Such 'road pricing' is a direct response to congestion but may disadvantage the less well off and allow only the rich to use certain roads. Fair policies would demand concessions or a permit based system. Elkin argues that as cities are the focus of a hinterland road pricing should not be selectively applied to inner cities.[38] Such measures in cities can result in firms relocating outside thus exaggerating dispersal of activities. At present for out of town shopping parking is usually free but in inner cities it is usually charged. Clearly revenues from a selection of car related fees and taxes could be used in the development of pedestrian and cycling facilities and reduce fairs on public transportation. Financial measures may encourage organised car pools and van pools particularly where densities are low and public transport is thus difficult.

2.2.4. Public Transport

I have described the efficiency of public transport modes compared to the car as a basis for personal mobility. At reasonable occupancy rates they use energy and city space many times more efficiently than single occupant cars and create much less pollution. In addition public transport systems are less

---

[35] Joan Davidson and Ann MacEwen, *The Livable City*, RIBA Publications, London, 1984.
[36] Marcia D. Lowe, 'Alternatives to the Automobile, Transport for Livable Cities', *Worldwatch Paper 98*, Worldwatch Institute, October 1990.
[37] ibid.
[38] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City: towards sustainable urban development*; Friends of the Earth, London, 1991.

dangerous.[39] They benefit the large number of people who do not have access to a car and have thus been cut off from access to the countryside by the expansion of the suburbs. They also have the potential to use electricity from renewable sources. Public transport modes however differ in their fuel use, emissions, and in the space they require.

	Practical Passenger Flow/hour	*Commercial Speed km/h*	*Noise Levels db(A)*
Bus[a]	<6000	21.4	89
Light Rail[b]	2-20000	25.8	76-80
Metro[b]	15000	29.4	81

a: Assuming bus lanes and priorities.
b: Light rail is generally segregated from traffic for 40% or more of its route. Metro systems are 100% segregated.

Fig. 2.3. Comparison of alternative forms public transport - speed and noise level[40]

A city's public transport system must be clean, cheap, frequent, comprehensive and co-ordinated if it is to compete with the car and this involves running some services that are under capacity. Integrated ticketing as with Dutch 'stripe cards' (valid for tram, bus and regional rail) would aid ease of movement by the various forms. These factors both encourage and are perpetuated by increased use. In the case of buses 'bus priority networks' are also important. Harley Sherlock argues that a bus service will not reach its full potential as long as the only restriction to city travel is congestion.[41] Elkin describes how the GLC and Sheffield City Council used cheap fares to reverse the spiral of increasingly car-dependent activity. In the GLC case car commuting was reduced by 25%. He also describes how in Freiburg an 18% shift was achieved with no loss of revenue through a low-cost integrated ticket.[42]

I have noted how, in the UK, public transport is seen as a second class form of travel both within and between cities. Support for public transport has been abandoned with road building the preferred option to ease congestion. With deregulation of buses only 42 days' notice is required to withdraw a service and thus timetables are constantly altering and 'routine' is not developed. There is little confidence that services, particularly marginal ones, will continue. Deregulation has destroyed many integrated services and caused overcrowded and dangerous city centre streets. Costs are often cited as the reason for not developing public transport. A fair comparison of private and public transport however must include calculations of the full costs of both systems, including their environmental impact and social consequences, and a consideration of which approach can move the most people. As described drivers do not pay for the full cost of car use while road building is considered a public service vital to the economy. Railways and buses are run as private enterprises that must work at a profit.

Making public transport more accessible would also help - bike and ride and facilities for carrying bikes on trains. In the Netherlands 35% of rail passengers cycle to the station. Park and ride on the edge of cities is another option. It can be argued that the city could work better socially, economically and environmentally if people were encouraged to use public transport. This can be done by subsidising trains, trams and buses or taxing the car or roads. A tax on congestion by increasing the use of public transport, may render subsidies no longer necessary but until such a scheme is put into action sufficient resources must be put into making public transport more convenient.

[39] Mayer Hillman, 'Planning for green modes: a critique of public policy and practice', in Rodney Tolley (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
[40] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City: towards sustainable urban development*; Friends of the Earth, London, 1991. p77.
[41] Harley Sherlock, *Cities Are Good For Us: The case for high densities, friendly streets, local shops and public transport*, Transport 2000, London, 1990.
[42] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City: towards sustainable urban development*; Friends of the Earth, London, 1991.

2.2.5. Walking and Cycling as Transport

At present 37% of all journeys (by number) in the UK are made on foot or by bicycle.[43] This figure is even higher in metropolitan areas. More than half of all city journeys are pedestrian suggesting that to provide a civilised environment for pedestrian movement and meeting should already be a priority. Reasons why more people are not prepared to travel by foot despite its health values and cheapness include: lack of accessible facilities thus long journeys, unattractive and dangerous environments involving hazardous road crossing, noise and pollution. Similar constraints discourage people from cycling. Hillman notes that fear of accidents is the main deterrent to cycling and reduces commuting by cycling by as much as a factor of 10.[44] Elkin notes that nearly three quarters of all commuting journeys are under 5 miles and thus the cycle can be used to meet journey needs that cannot be met by foot.[45] Even accounting for the greater distance travelled by a car in its lifetime the average commuter car uses approximately 7.5 times more energy per passenger mile than a bicycle.[46]

2.2.6. Verkehrsberuhigung (Traffic Calming)

Because of their mass and speed, cars automatically take over streets, intimidating and endangering people on foot and on bicycles. Traffic calming involves reduction of vehicle speeds by a variety of measures including regulation and physical changes to the street geometry as well as reductions in the space given over to vehicles. The reclamation of formerly wide streets for parks, gardens, shared and segregated pedestrian and cycle space is an important feature of these plans. Traffic calming has been used widely, notably in German and Dutch cities. The Dutch *Woonerven* system aims to reduce vehicle speed to walking speed throughout residential areas, including through routes with residential functions. This involves physical measures such as humps, tables, raising intersections to pavement level, chicanes, measures to reduce visibility such as tree-planting and regulatory techniques giving pedestrian right of way. Such areas are marked by street signs showing a house symbol. This approach is based on a reappraisal of the relationship between the pedestrian and the vehicle.[47] It involves the acceptance of various levels of traffic mixing - of cars and people - but under radically different assumptions about their relationship.

Traffic calming can and has taken place on streets of any size and function although clearly exact strategies will vary and there are more problems are associated with 'calming' main streets.[48] To be most effective and to prevent the problem of simply removing traffic to other streets, traffic calming must however be part of an area wide approach. In the same way it must be seen as part of a city strategy for reducing car traffic throughout the urban area. Traffic restraint must go beyond a few car-free pedestrian havens in the inner city core with car orientated surrounds. It must take account of the city and hinterland. Tolley refers to such an approach as 'environmental traffic management' (ETM).[49] It has five principle strands: encouragement of pedestrian use, encouragement of bicycle use, promotion of public transport, the 'domestication' of the car, traffic reducing town planning. In addition measures that 'domesticate' the car include reducing: green times on traffic lights, the number of parking spaces, and the number of lanes (particularly turning lanes at junctions).

The results have been particularly notable in Germany where the pedestrian casualty rate has been drastically lowered. Here traffic calming has been extended to city wide applications creating a continuous pedestrian network in cities.[50] A similar approach can be adopted to a cycle network. In the Netherlands methods have been so successful that well over a third of journeys are made by bicycle (40% in some cities) and cycle accident rates are lower than the UK. In the Netherlands people of all ages cycle and journeys between cities can also be made on such routes. The cycling network 'competes' with that of the road.

Walking and cycling and the potential of traffic calming measures depend on improved public transport. At present even relatively short journeys are made by the car often because roads are seen as to unsafe

---

[43] ibid.
[44] ibid.
[45] ibid.
[46] ibid.
[47] Rodney Tolley, 'A hard road: the problems of walking and cycling in British cities', in Rodney Tolley (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
[48] John Whitelegg, 'The principle of environmental traffic management', in Rodney Tolley (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
[49] Rodney Tolley, 'A hard road: the problems of walking and cycling in British cities', in Rodney Tolley (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
[50] John Whitelegg, 'The principle of environmental traffic management', in Rodney Tolley (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.

and unpleasant for pedestrians. This is particularly true of taking children to and from school. One knock-on effect of a reduction in commuting by road (improved public transport) through cities would be to enable these shorter journeys to be made on foot.

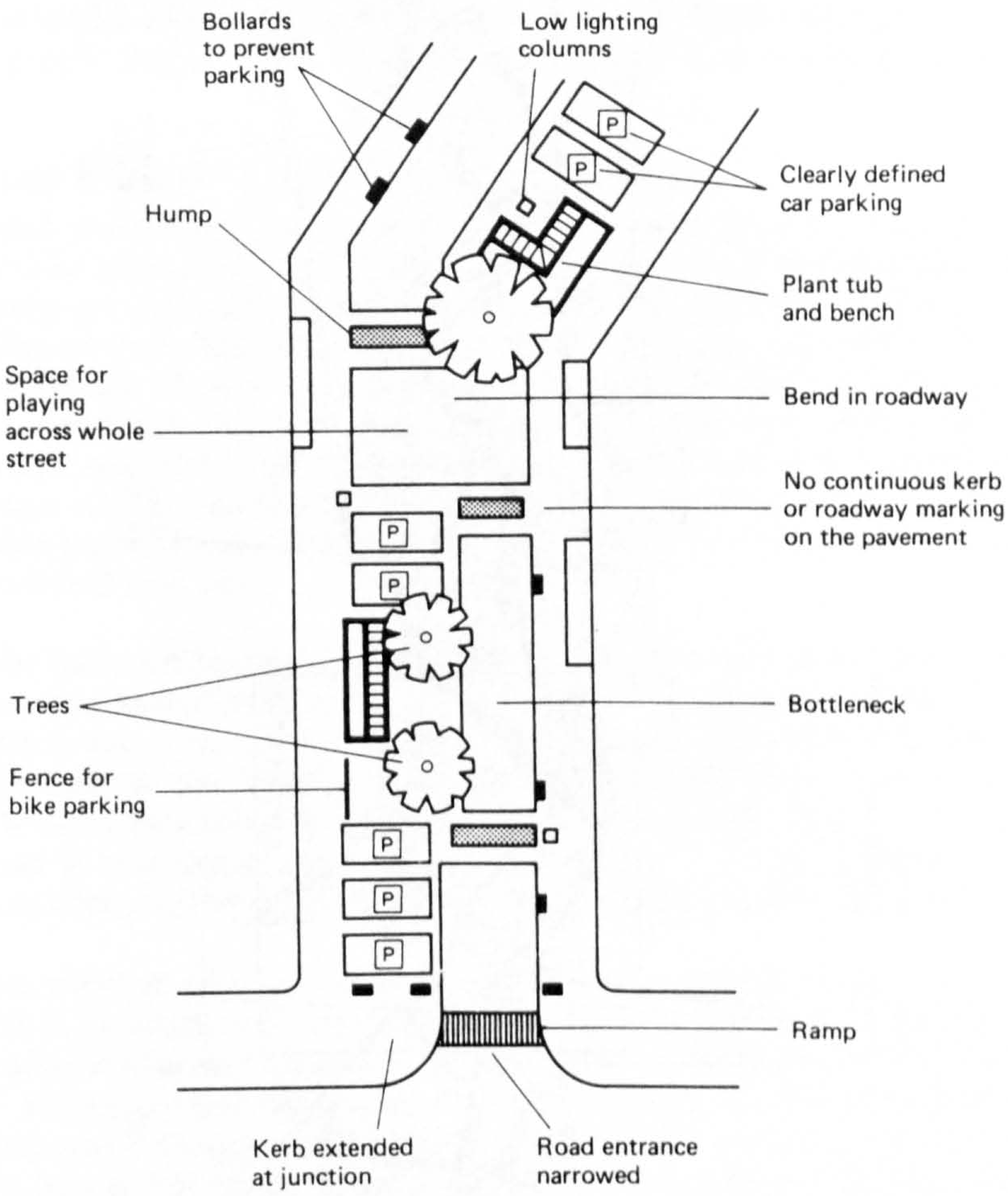


Fig. 2.4. Design principles for traffic calming in a residential street - Woonerf, Den Haag[51]

Green ways and other linear systems based on canals, rivers, disused railways, existing parks, footpaths and bridleways may be incorporated into such a city wide strategy. The Leicester Great Central Way is one example.[52] It should be noted however that separation of cars and pedestrians may cause as many problems as it solves. Overhead skywalks, isolated bikepaths, and other physical schemes merely clear children, cyclists and pedestrians from space meant to be the sole domain of rapidly moving cars that split residential areas. Generally a better solution is to make cars share regular streets with slower traffic.

An ETM acknowledges that streets do not exist just for transport but are places where people live, work, shop and meet. This is as true of the cities major roads between and in centres as it is for minor roads. Many streets could then be returned to serving their own properties, making them places for children and adults to meet and making schools and shops accessible on bicycle and foot. This would enable the integration of street and house design that could open up green landscape and community design options (see chapters three, four, five and six). Pavements could be widened at the expense of the carriageway or inside lanes and areas given over to tree planting and communal areas. The potential greening of existing town houses and the street landscape would be considerably increased in various ways. Less noise and pollution would allow use of naturally ventilated solar sunspaces (see *Chapter Four*). More room would allow for planting and microclimate design, ecological landscaping and food production, safe play, bike sheds and community recycling activities. Residents would also gain more control over their immediate environment and could potentially have a say in street design (see *Chapter Five*).

---

[51] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City: towards sustainable urban development*; Friends of the Earth, London, 1991. p73
[52] David Nicholson-Lord, *The Greening of the Cities*, Routledge and Kegan Paul, 1987. p178

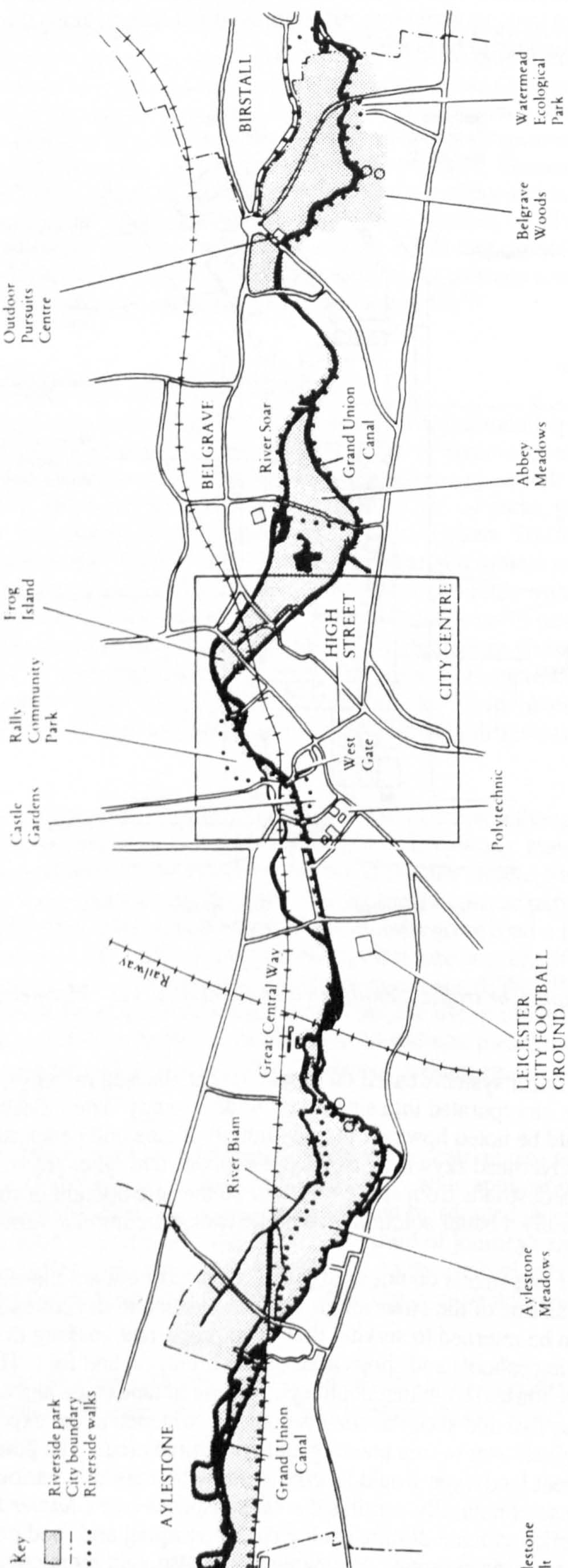


Fig. 2.5. Great Central Way and footpath system[53]

[53] ibid.

2.2.7. Integration

Cycling and walking can satisfy a much larger share of urban transport needs if well integrated with train, tram or bus facilities. This requires safe access to transit stops and stations for people arriving on foot or by bicycle.[54] Marcia Lowe gives the example of the Dutch national railway system that seeks to give the highest priority at station entrances to pedestrians, followed in descending order by cyclists, bus riders, taxi passengers, people dropped off by car and finally, those who park a car at the station.

2.2.8. Land-use Planning for Defragmentation

While efficient and co-ordinated public transport services, city wide traffic calming, pedestrian and bicycle routes and facilities, and financial incentives are all essential in encouraging movement away from car use, many of today's cities remain shaped for the car not public transport and pedestrian use. Cycling and walking are encouraged by the provision of safe cycle routes and pedestrian ways but, as with public transport, use of these forms depends on a degree of density and local provision of services. Land-use changes are thus a vital factor particularly in the longer term. Such an approach, based around 'accessibility', would ensure through land-use planning that services such as shops, work, clinics and recreation are close at hand thus providing convenience to compete with the car. This would also increase 'mobility' for other journeys that demand car use, for example having to carry freight (tools, samples, ladders etc.) connected with work.

Efficiency will be increased by concentration of activities into nodes connected by public transport. On a regional level existing town centres are the most accessible area by public transport. Planning could encourage people to live in our cities maintaining their density and a market for the city centre. Planning controls could prevent the development of out of town shopping centres. Where new commercial developments do occur they could be mixed and focused around the cities public transport system. New settlements would be best located along rail corridors. Harley Sherlock proposes a 'fine-grained dense city' of mixed use connected by efficient and integrated public transport systems.[55]

Lowe argues that although all major urban areas suffer from congestion, those with least sprawl are best able to cope with it. Newman and Kenworthy have concluded that land-use policies to increase urban densities are crucial to fostering alternatives to the car.[56] Very high densities are not essential. Lowe argues that 60 - 100 people and jobs per hectare which is typical of many European cities can greatly enhance travel options.[57] Gossop and Webb describe planning success at the new town of Redditch centred on a bus only or bus priority spine along which community facilities are clustered. Densities vary from 185 persons per hectare (near the bus stop) to 66 per hectare (at the periphery) averaging 124 per hectare (approximately 20 dwellings per acre).[58]

Although 'high density' is associated with towering apartment buildings or restricted open space a more compact urban form may actually facilitate provision of green spaces and structures on a 'human scale'. Studies have shown that a compact development can mix two- to six- story apartments and town houses with clustered single family homes, and leave 30% of the developed area for open space and parks. In a typical low-density sprawl, according to the study, only 9% of the land is devoted to open space.[59] Even some attractive and popular provincial towns have surprisingly high population densities within their most sought-after historical districts.[60] It is also in the suburbs that roads devour land.

Doug Kelbaugh and Peter Calthorpe devised the concept 'pedestrian pockets' as a solution to suburbanisation. These are small mixed use communities located on a light rail system that links them

---

[54] Marcia D. Lowe, 'Alternatives to the Automobile, Transport for Livable Cities', *Worldwatch Paper 98*, Worldwatch Institute, October 1990.

[55] Harley Sherlock, *Cities Are Good For Us: The case for high densities, friendly streets, local shops and public transport*, Transport 2000, London, 1990.

[56] Peter W. G. Newman and Jeffrey R. Kenworthy, *Cities and Automobile dependence: a sourcebook*, Gower Technical Press, Aldershot, 1989.

[57] Marcia D. Lowe, 'Alternatives to the Automobile, Transport for Livable Cities', *Worldwatch Paper 98*, Worldwatch Institute, October 1990.

[58] Chris Gossop and Adrian Webb, 'Getting Around: Public and Private Transport', in Andrew Blowers (ed.), *Planning for a sustainable environment*, London, 1993.

[59] Peter W. G. Newman and Jeffrey R. Kenworthy, *Cities and Automobile dependence: a sourcebook*, Gower Technical Press, Aldershot, 1989.

[60] Darbourne and Darke, 'Social needs and Landscape Architecture', in Byron Mikellides (ed.), *Architecture for People*, Cassell Ltd, 1980.

with existing urban centres.[61] They would consist of housing, shopping, community facilities and provide employment, with all buildings arranged to lie within a five minute walk of the station. The area of a typical pocket would not exceed 100 acres, containing housing for 5000 people and work for 3000. The density of fifty people per acre compares to 11 people per acre in Milton Keynes. In Denmark this planning strategy is referred to as 'decentralised concentration' with development in nodes.

As described it is the separation of home and jobs that is the main generator of traffic. Although long commutes can be avoided by linking work and home this does not guarantee people will work locally. It simply allows for this possibility which would be further encouraged by continually increasing congestion and financial incentives. A degree of density and co-ordinated public transport would support such measures giving access to non local services in concentrated nodes, again using both mixed use and development in rail corridors to form part of an integrated approach. Without development control buildings providing jobs are not likely to be interspersed with affordable housing because it is less profitable to developers. It may be argued that there is thus a need to tie office space development to a required number of housing units. Planning permission could be based on ease of foot and bicycle commuting and give preference to smaller more numerous local shops. A traffic impact statement could be required for any development.

Clearly the pattern and layout of a city determines whether or not transport options are appropriate or feasible. Different measures will be required for different areas. Neither has their been such a dramatic trend in suburbanisation in other European cities. A major problem in the UK is the perception that the 'good life' is in the suburbs and villages. I argue later that 'green' architecture thus has a role to play in proposing and selling alternatives.

2.2.9. General City Structure

Goulding, Lewis and Steemers report on the work of Hawkes, Owers, Rockaby and Steadman, who considered five theoretical pattern for an urban region dealing with functional zones and transport networks[62]:

- concentration of new development into the central city;
- concentration along the main road system;
- concentration into satellite towns;
- concentration into secondary roads;
- concentration into existing villages.

The more efficient arrangements were those having one or more poles (not suburban). Clearly good energy management is not compatible with random urban development. Layne Ridley (in a US context) has criticised low energy design of existing spatial patterns "even if *all* new housing developments were highly energy efficient, but allowed the existing patterns of being located farther and farther from the city centres, their energy savings would be overwhelmed by the additional transport energy involved".[63] General policy, I argue, should be to integrate activities at a local level - living, working and recreation but where this is not possible to focus specialised activities at existing nodes.

2.2.10. Freight

Tonnage of freight carried in the UK has doubled since the 1960's reflecting increased economic activity generally. Thus while actual volumes of freight carried by rail have increased the relative decline of rail use compared to road has continued.[64] The rail share has decreased from more than road transport in the 1950's to just 11.2% by 1989.[65] Although hauliers tend to attribute this to factory and distribution procedures it should also be noted that the proportion of goods carried by rail in Germany and France is almost three times that in the UK.

---

[61] D. Kelbaugh (ed.), *The Pedestrian Pocket Book: a new suburban design strategy*, Princeton Architectural Press, 1989.
[62] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford, Ltd for C. E. C., 1992.
[63] Layne Ridley, 'Site, Community and Urban Planning', in Bruce Anderson, *Solar Building Architecture*, MIT Press, 1990.
[64] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City: towards sustainable urban development*; Friends of the Earth, London, 1991.
[65] Chris Gossop and Adrian Webb, 'Getting Around: Public and Private Transport', in Andrew Blowers (ed.), *Planning for a sustainable environment*, London, 1993.

	1978	1981	1984	1986	1988
				(Billion-tonne-kilometres)	
Road	99.3	92.9	99.9	105.4	130.2
Rail	20.0	17.5	12.7	16.5	18.0
Water[a]	47.6	52.7	59.7	54.8	60.9
Pipelines	9.8	9.3	10.4	10.4	10.8
Total	176.7	172.4	182.7	187.1	219.9

Note a: Inland waterway traffic comprises only a small fraction of this total.

Fig. 2.6. Freight transport in the UK (1978 - 88)[66]

	Impact per tonne Km	
	Rail	*Road (HGV)*
Land-take	1	2.8
Accidents	1	24.8
Particulates	1	9.0
VOC's	1	16.2
Sulphur dioxide	1	1.4
NO_x	1	19.9
Carbon monoxide	1	22.6
Carbon dioxide	1	4.4
Delivered energy	1	7.7
Primary energy	1	4.2

Fig. 2.7. Impact of freight transport[67]

In terms of noise and danger the impact of freight traffic is much higher than that of car travel. It also causes increased damage to roads (increasing maintenance costs), congestion, pollution, damage to buildings and general erosion of the urban fabric. Freight could, however, be transferred to rail without the social and political implications involved in transferring passenger transport from cars.

Measures to switch long-haul freight to rail must be made high priority. In cities, however, commercial vehicles are indispensable in the way cars are not. Although city distribution of freight must be by lorry an emphasis can be placed on city friendly vehicles at certain times and perhaps using bus lanes during off-peak times. Harley Sherlock outlines the concept of 'city friendly lorries', connecting train stations to city outlets.[68] He describes the need for small clean, lower-noise vehicles for local deliveries (i.e. designed specifically for use between stations or local outlets). In some areas he suggests that deliveries may be made by trolleys of various types. With development of public transport, cycling and walking, roads would be freed for the collection and delivery of goods and other commercial services while at the same time making it generally a more accessible and attractive place to live and work. Clearly encouragement of local production and consumption of goods and services would also improve the problems of freight transport.

2.2.11. Energy in Use Architectural Design

As noted Layne Ridley has demonstrated, by looking at existing land use patterns dominated by urban sprawl, that the transportation energy consumed by a typical commuter far exceeds the energy consumed by his or her potentially super-efficient house.[69] It should also be noted that this energy is almost totally

[66] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City: towards sustainable urban development*; Friends of the Earth, London, 1991. p56.
[67] ibid. p58
[68] Harley Sherlock, *Cities Are Good For Us: The case for high densities, friendly streets, local shops and public transport*, Transport 2000, London, 1990.
[69] Layne Ridley, 'Site Community, and Urban Planning and Design', in Bruce Anderson (ed.), *Solar Building Architecture*, 1990

from fossil fuels, and will remain so for the foreseeable future. In attempting to address resource and pollution problems designing energy efficient houses in remote areas or in low density form may, it seems, be counterproductive.

As far as there is one, the prevailing trend in so called green architecture has moved away from the isolated self-sufficient houses of the 1970's. These individual 'alternative' solutions, aligned to face south on idyllic and socially irrelevant sites offered little to the city or society. They did often emphasise a holistic green approach that necessitated lifestyle changes but were limited to those already 'converted' living in their own private 'wilderness' akin to the early suburbs. Today the emphasis in 'green design' tends to be on new build 'low energy in use' designs that are predominantly accommodated on out of town, low density and single function estates designed to balance the need for southerly orientations with the needs of the car. They cannot be termed green designs in the broader sense of the self-sufficiency movement (discussed in *Chapter One*) while they also continue to ignore the role of architecture within the context of cities. Neither can specially designed solar housing estates that position buildings in south facing rows address social and community aspects that will make them sustainable in human terms. In not addressing the city these solutions are not only potentially inefficient but represent a continuous loss of blood to the city in terms of financial resources, social structure and the degree of utilisation of the existing structure. In moving out of the cities people are still reacting to city problems that can only be addressed by occupation. Ironically Milton Keynes with its road system and industrial parks has become the major centre for solar housing in Britain. Industrial parks developed outside cities within ecological landscapes similarly represent inappropriate application of green technologies. They are inefficient even in their own energy dominated environmental terms. In the next four chapters I go on to expand on this critique.

2.2.12. Climatic Design

The higher density and less fragmented solutions discussed here may I go on to argue also be more appropriate in the British climate with houses, shops and small industry grouped together against the elements utilising and utilising the urban microclimate. In *Chapter Four* I note how terraced houses are thermally more efficient than detached houses and require less insulation. I also note the potential for design solutions that utilise mutual warmth.[70] The Malcolm Newton terraced house form discussed in *Chapter Four* is the most efficient solution of those analysed and in addition does not rely on a South facing orientation. The main reason for it's performance is that the design encloses the heated space extremely efficiently with only one end wall and the roof exposed to the elements.

There are considerable quantities of appropriate housing at present derelict in cities such as Manchester and Liverpool that have an embodied energy content. In *Chapter Four* and *Chapter Five* I note how many of these are amenable to some form of passive solar retrofits.[71] Further I note how a mixture of functions and thus occupancy rates lends itself to developing efficient ways of using the heat gained. Workshops located on the ground floor for example may gain heat from accidental sources that can buffer spaces above while lifting these spaces into the sun. The denser fabrics existing in our society may thus be potentially far more energy efficient than new out of town estates such as those in our car dominated towns and suburbs despite reduced solar access. In *Chapter Seven* I note how refurbishment could utilise places and resources that exist, while addressing divisions generated by suburban growth. Associated reduced car provision would also increase the potential of climatically designed recreational space (discussed in *Chapter Three and Chapter Six*).

Conclusions

Creating sustainable transport systems that meet people's needs equitably and fosters a healthy local environment requires putting the automobile back into its rightful place as a servant. It is the daily journeys in and around cities that are the most environmentally and socially damaging and wasteful example of motoring. Road traffic restraint and improved public transport provision through financial, regulatory and physical measures can reduce car use. Land-use planning however must also aim to increase density and the mix of land uses allowing people to be more geographically self contained and increasing the potential of public transport. Reducing automobile dependence calls for a fundamental rethinking of the very shape of cities and their hinterlands. New residential developments and preferably refurbishment should ensure a full range of services accessible by foot and bicycle and should be planned around public transport for non-local services. Greater self-reliance of individuals and communities in

---

[70] D. M. L. Bartholomew, 'Possibilities for passive solar house design in Scotland', in MacGregor, Kerr (ed.) collection of contributions from, *The International Journal of Ambient Energy*, Ambient Press, 1986.
[71] N. Baker and H. Mulligan, 'Existing Housing', *Energy Saving through Landscape Planning Vol. 4*, PSA, 1988.

production of goods and services will facilitate such developments. Such a policy can also be effective on an international scale (in *Chapter Six* I discuss city food production with these aims). Co-ordinated planning and not the free market are essential to these developments.[72] Traffic impact statements should be required for all developments.

Through imaginative, co-ordinated transport and land use planning we can re-introduce a variety to our central area streets, making cities safer and more pleasant places in which to live. The various methods need to be implemented in concert if they are to be effective. With a shift in priorities cars can be part of a broad, balanced system in which public transport, cycling and walking are all viable options and cars are used more selectively. Such a pattern is not only environmentally efficient but potentially economically advantageous to the city (see *Chapter Seven* where I explore how such policies may address the socio-economic problems of existing cities).

City living, despite its potential convenience and its potential to reduce global and local environmental problems is often seen by those living in the suburbs to be unattractive. The general increase of city environment quality, and mobility with reduced reliance on the car may encourage some to move back thus reducing what Nicholson-Lord refers to as its 'hidden emptiness' or modern day 'slash and burn'. In addition the release of space, reduced pollution and noise reduction would increase the green architectural and landscape potential of the city. Later, I go on to show why I believe the resulting land should be co-operatively owned.

In defragmenting urban space and attempting to maintain densities, I further discuss how we must address the existing city, its fabric and people, not continue to attempt to escape the problem by moving elsewhere. It is perhaps ironic that many 19th Century slums would have been ideally suited to converting into the 'fine grained city' described. I also go on to look at how such a system should allow local choice in local environments through a more participative democracy. Existing suburbs are a problem and measures to fit appropriate places in the city are needed. New developments can be used to gradually modify the suburban fabric.

[72] Judith Hanna, 'Feet first: Putting people at the centre of planning', in Rodney Tolley (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990. p94 - Consulting the Experts

BLANK IN ORIGINAL

Chapter Three:

Microclimate Design and Landscape

Introduction

"We must begin by taking note of the countries and climates in which homes are to be built if our designs for them are to be correct. One type of house seems appropriate for Egypt, another for Spain...one still different for Rome, and so on with lands and countries of varying characteristics. This is because one part of the Earth is directly under the sun's course, another is far away from it, while another lies midway between these two...It is obvious that designs for homes ought to conform to diversities of climate."[1]

Here I review the climate in the UK, how it is affected by the topography of a site and its surroundings and techniques for designing climatically sensitive spaces to achieve maximum benefit from fine weather and some protection from adverse weather. I note how in the UK, emphasis will be on improving the microclimate in the heating season (when outside air temperature is below comfort levels). Reducing internal and external overheating in the summer will be of secondary consideration. Microclimate design essentially involves controlling sun and wind but also providing shelter from rain. Such techniques may reduce the heating need of a building but, perhaps more importantly, improve habitability of both private, semi-public and public outside spaces as 'usable space'. An appropriate balance between passive solar design and external considerations may be important. I note how combined initiatives and planning may improve the habitability of our cities generally and what form this city may take. I suggest a relatively dense but level urban form. I have already noted how mixed use areas would reduce transport costs. Careful design of the microclimate around buildings it is argued here will increase the amenability of such solutions.

The Rationale Behind Design for the Microclimate

Mechanical air conditioning and heating systems have protected us against the excesses of climate and enabled building design to predominantly ignore the external climate. Standard building forms can today be applied irrespective of location. To a large extent contemporary architecture has thus been removed from climatic cause and effect. The climate is frequently seen as an immutable 'given condition' that a building has to resist and overcome be it through heating and air-conditioning of 'insulated' buildings or structures designed to resist wind pressure. For Beazley the development of such an approach has been based on the wealth of most of the Western world and the consequent ability to waste natural resources.[2] I have argued that such wealth may be unsutainable globally. Dodd also notes that apparently plentiful and cheap fuel has enabled design without consideration of climate or the functional use of vegetation.[3] Our approach has been one of promoting universal building solutions based on the challenge of overcoming 'nature'.

Our reliance on mechanical defiance means most of our buildings are now totally dependent on fossil fuels to maintain comfort. Great expenditure of natural resources are then needed to make not only the building but the district and city habitable. Not needing to deal with building and landscape as a continuum means architecture tends to interior consideration only (with a car-park outside). The corollary of shutting out exterior conditions from our buildings is therefore a hostile external climate with local acceleration of winds or lack of sun. These environments are not places to 'be' but places to get 'out of' to resource expensive retreats be they buildings or cars.

Beazley points out that often the purely internal drive of our cities means landscape architects are left with 'left-over' external spaces impossible to ameliorate in addition to critical elements of buildings being subject to comfort and energy saving deficiencies.[4] These include glare, overheating, permanent shadow, cold accidental ventilation air, wind buffeting, water saturation of the fabric, and glazed north and south elevations with identical specifications. In addition as the city develops the architect is left with sites subject to down draughts and constant shadow. The separation of consideration of interior and exterior environments is exaggerated by the division of planning, landscape and architectural professions. Landscape architects may be able to slightly improve building exteriors by choice of materials and additions to areas that have been labelled 'patio' or 'piazza' but cannot usually fundamentally change them to create warm, sheltered and habitable spaces unless such factors were considered with the building at the initial design stage. Similarly architects can slightly alter the microclimate of 'their' site but are dependent on the overall shape of the surroundings and city.

With growing concern over environmental problems recent research has started to address the influence of landscape design on the energy efficiency of buildings. Microclimate design can reduce demand at the

---

1 Vitruvius, First Century B, C in John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A primer for Architects*, B. T. Batsford Ltd, 1992.
2 Elisabeth Beazely, 'Sun, Shade and Shelter', *Landscape Design*, October 1990.
3 Jeremy Dodd, 'Greenscape 1 - The Place of Buildings', *Architects Journal*, 12 April 1989.
4 Elisabeth Beazely, 'Sun, Shade and Shelter', *Landscape Design*, October 1990.

point of use extending the potential of existing energy supplies and reducing the need for new energy production methods. It should be noted however that in a product oriented growth market finance will usually be invested in international solutions of production or energy saving 'gadgets' instead of passive energy saving techniques at point of use. As an energy saving feature microclimate design involves consideration of building form, materials and landscape elements. This involves minimal use of resources and no complex technological fabrications. Energy saving benefits in the UK are small and early consideration in the building process, or if possible, at a district scale is important. Improving the microclimate however also has benefits for habitability, comfort and value of outdoor spaces that, I argue, are important in their own right in creating sustainable cities. Maximised external comfort around buildings will increase the number of days each year when outdoor conditions are comfortable. In this way it may encourage outdoor activities. Many of our external spaces for example quadrangles are designed to develop spatial relationships but they are also cold, draughty and uninhabitable. Children's play might benefit especially in the edge zone between internal and external space. The effect may be to create habitable outdoor 'rooms' that in certain situations may replace heated spaces (e.g. corridors). Good microclimate design can also improve the durability of buildings at no extra financial or material cost. Improved microclimates may also encouraged growth of plants. Planting can have many other advantages such as pollution control, provide food or building material, or simply produce a richer, seasonally and daily changing environment.

As a functional part of the plan a climatically designed covered walk instead of an internal corridor would save on capital and on-going costs. It would also allow people regular easy contact with fresh air and nature that, at present, is a rare commodity in the city particularly on the doorstep. As areas where internal and external meet Beazley describes courtyards, entrances, terraces and backdoors and yards as particularly important. A continuum of enhanced microclimates can encourage walking in the city and reduced car use. Reduced provision for cars would also increase microclimate potential.

A Forgotten Art

Banham notes that there was often (due to necessity) a respect for local climate and knowledge of performance characteristics of materials in much vernacular architecture.[5] Dodd argues that the medieval city, free from the need to make the entire city subservient to grand illusions of power, and due to its slow evolutionary pattern of irregular growth, showed every evidence of being energy conscious.[6] The wind was never allowed to gather speed in a fine grained fabric with its narrow and twisting roads. Trees were appreciated for their shade, dust-screening, and reduction of wind speed, as well as for their timber, scents, flowers and fruits. Dodd points out that it was poverty and air pollution that made 19th Century 'wens' so unhealthy not just their building 'form' as subsequent rehabilitation has shown. In the 20th Century letting in 'light' and 'air' in the abstract have been problematic in environmental terms.

Elizabeth Beazley describes what she considers as a forgotten art of planning with the microclimate in mind.[7] She uses UK examples of mediaeval monastery cloisters, arcades, walk-ways, and colonnades as examples of a long tradition for provision of indoor/outdoor living that are functional elements of plan, useful, enjoyable, economic and "particularly suited to a temperate climate".[8] She notes how monastery cloisters formed the hub of the plan usually on the south side of the abbey church exposed to the sun and protected from the cold north winds by the nave and the east and west by monastic buildings. The siting of the cloister to the south of the church extends the period during which it can be satisfactorily used both in terms of the time of day and the time of year. It costs no more than a mirror image plan with the cloister to the north.

The colonnade is another example of the provision of internal/external living that designed with reference to the microclimate has provided useful, enjoyable and economic space. It can be open to the south side as a main line of connection with an appropriately designed section in terms of height to depth to allow low winter sun to hit the back wall. The back wall can be of a material that will store heat that people sit against. The same colonnade facing north would have a totally different character as would an internal one although a passively designed internal corridor may be used to produce heat for neighbouring rooms. Perhaps reasonably it is thought to be extravagant to add a covered walk or veranda, an open arcade or deep portico to a design if it *is* an addition. Where it is a functional part of the plan it is in fact an economy not only in capital costs but in terms of the on-going costs of running the building.

---

[5] Reyner Banham, *The Architecture of a Well-tempered Environment*, Architectural Press, London, 1969.
[6] Jeremy Dodd, 'Greenscape 1 - The Place of Buildings', *Architects Journal*, 12 April 1989.
[7] Elisabeth Beazely, 'Sun, Shade and Shelter', *Landscape Design*, October 1990.
[8] ibid.

With detailed design the benefits of such elements can be heightened (depth/height ratio for winter solar penetration and wind protection, choice of materials to re-radiate heat). Here I describe how designers can exercise a measure of control over climate using simple techniques such as form, materials and layout of buildings and landscape elements. Recent research backs up and builds on many traditional techniques creating an exact science from a 'common sense' art. There is however a need for more quantifiable research into landscape design.

3.1. Climatic Characteristics

Information on the climate can be considered at three principle levels: macroclimate, mesoclimate, and microclimate. The macroclimate is applicable to geographical territories. Local conditions must however also be considered including modifications to the macroclimate of a region by topography and vegetation (mesoclimate) and the effect on the mesoclimate of the local environment (microclimate). The exact distinction between mesoclimate and microclimate however tends to vary. Jeremy Dodd for example adds a district climate at which scale small hills, copses, ponds and rivers affect climate.[9] In urban terms this may refer to a town or quarter in a larger city or a group of houses.

3.1.1. Macroclimate

A knowledge of the regional climate at different times during the day and year is essential to the designer wishing to enhance the external climate around buildings. In terms of building performance the architect must be able to quantitatively express this data. Macroclimate data describes the general character of a region. The key factors are; movement of the sun, amount of solar energy, air temperature, precipitation, and wind condition. Humidity is not generally of importance in the UK since it is almost always within the comfort range.[10] Measured values for all these 'global' factors are available from meteorological stations. They form a macroclimate database for the designer. Most data represents open level countryside and thus gives a general indication only. Such sites are more exposed than most building sites in the city and thus both radiation levels and wind levels are high. There is however little opportunity for air temperature to be raised by, for example 'trapped heat'. *Climate in the United Kingdom* gives notes for guidance on measured data.[11]

Sun Position

The position of the sun in the sky at a given time of the year and day, and thus the direction of the solar beam, is defined by the latitude of the location and described by the solar *altitude* and *azimuth* (bearing) angles:

- the altitude angle is the angle between the line to the centre of the sun and the horizontal plane;
- the azimuth is the angle between true South and the point on the horizon directly below the sun.

Tabulated values for hourly altitude and azimuth angles for Plymouth, London, Manchester, Glasgow and Aberdeen are given in *Climate in the United Kingdom*.[12] Sunpath diagrams are also available for a given latitude (0°, 2°, 4°... 52°, 54°, 56°) that enable the position of the sun to be fixed. Some critical positions are given in *Fig. 3.1.*

---

9 Jeremy Dodd, 'Greenscape 2 - Climate and Form', *Architects Journal*, 19 April 1989.
10 John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A Primer for Architects*, B. T. Batsford Ltd, 1992.
11 John Page and Ralph Lebens (eds.), *Climate in the United Kingdom*, HMSO, London, 1986.
12 ibid.

	Glasgow (lat: 55°52 N)	Manchester (lat: 53°21 N)	London (lat: 51°28N)
21 June			
max solar altitude (noon)	57.5°	60°	62°
suns path (sunrise to sunset)	270.2°	263.5°	259.3°
time of sunrise (0 altitude)	0318	0336	0348
time of sunset (0 altitude)	2042	2024	2012
22 December			
max solar altitude (noon)	10.6°	13.1°	15.1°
suns path (sunrise to sunset)	89.7°	96.3°	100.7°
time of sunrise (0 altitude)	0842	0824	0812
time of sunset (0 altitude)	1518	1536	1548
29 March			
max solar altitude (noon)	37.2°	39.7°	41.5°
suns path (sunrise to sunset)	191°	190.8°	190°
time of sunrise (0 altitude)	0542	0542	0542
time of sunset (0 altitude)	1818	1818	1818

Fig. 3.1. Critical solar altitude and azimuth angles for Glasgow, Manchester and London

Solar Radiation

The quantity of available energy due to solar radiation (critical to passive design) is a function of the irradiance. The *solar irradiance* is the amount of radiant energy from the sun falling on a square metre of the surface at any instant. It is usually measured in W/m^2 and has two components, the direct 'beam' component and the indirect 'diffuse' component.[13] The beam component depends on the path length of the direct beam, the atmospheric conditions (cloud cover, dust) and the angle of incidence on the surface. In North Europe over 60% of the radiation reaching horizontal surfaces is diffuse due to scattering from air molecules, dust particles and water droplets and absorption by water vapour, ozone, CO_2 and other gases. The sum of these two components is known as the *global irradiance*.

Clearly irradiance varies from moment to moment. Typically irradiation is thus given in kWh/m^2 per day. *Climate in the United Kingdom* gives hourly and daily incident solar radiation totals for surfaces in thirteen principle towns and cities.[14] Figures are given for:

- clear sky, overcast sky and averaged over all weather conditions;
- direct beam, diffuse and global;
- various orientations and angles of slope.

Average sunshine hours are also given for these locations. Local modifications are caused by irradiance reflected from the ground, neighbouring landscape and buildings. Annual totals of global solar irradiation on a horizontal plain vary by a factor of 1.3 from the South West of England to the extreme North of Scotland although they show greater variation for the heating season.[15] Totals for vertical surface are most appropriate for passive solar design given vertical wall apertures. During the heating season in the UK low solar angles mean higher levels on these vertical surfaces. Design to warm external spaces may also take advantage of this fact.

For all four locations in *Fig. 3.2.* from October to February the radiation totals on South-facing vertical surfaces exceeds those on the horizontal. Throughout the year totals on East, West and South surfaces are similar between Aberdeen and Manchester or London but overshading is more likely due to lower solar altitudes in higher latitudes. Specific local site characteristics are critical to available solar energy as described below.

---

[13] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A Primer for Architects*, B. T. Batsford Ltd, 1992.
[14] John Page and Ralph Lebens (eds.), *Climate in the United Kingdom*, HMSO, London, 1986.
[15] BRE, 'Climate and Site Development Part 1: General climate of the UK', *BRE Digest 350*, Watford, February 1990.

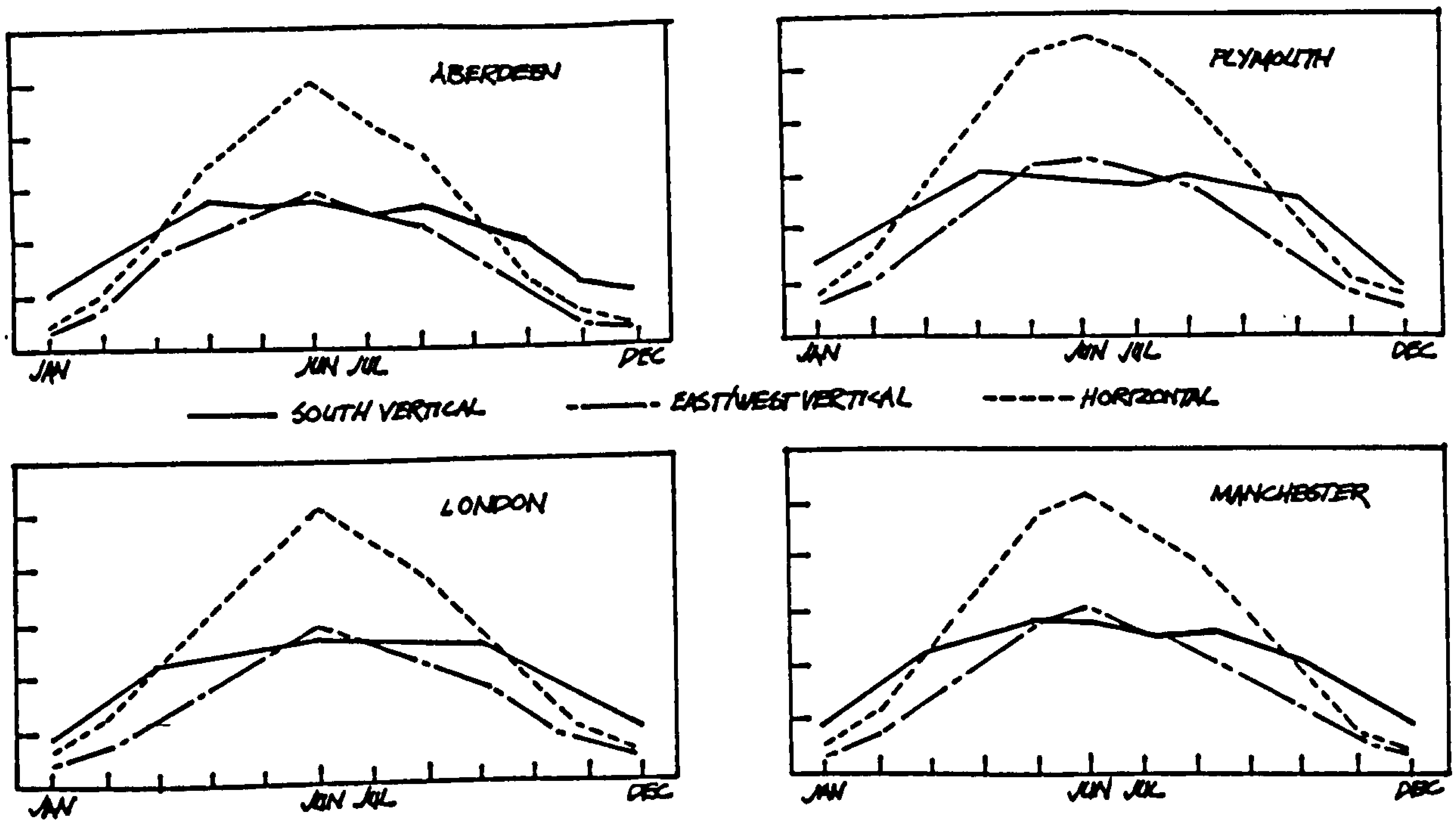


Fig. 3.2. Average daily solar irradiation graphs for London, Aberdeen, Plymouth and Manchester[16]

Wind

Wind speeds indicate the relative potential of shelter design for both energy saving and enhancing comfort. They are normally measured at a height of 10m over exposed sites. Average values reduce with distance from the coast and from the North West of Scotland to the South East of England. Values increase by 7% for each 100m above sea level and can be markedly influenced by local exposure.[17] Prevailing winds in the UK are from the SW but there is great variation. Of particular importance to the designer is wind direction and strength at different times of year. Directional data on wind is available in tabular form for the year, heating season or particular month. This data is also available in the form a wind 'rose' that shows relative frequency of wind from directions and often wind speeds proportional to length of each arm. The direction is recorded to the nearest 30° blowing from the direction of the arm. 'Wind chill' can also be plotted on a rose emphasising the direction of colder winds.

Temperature and Long Wave Radiation

Global temperature measurements are taken 1.2m above the ground in screens that allow a flow of air but protect the thermometers from precipitation, solar radiation during the day, and long wave radiation loss at night.[18] Screens are normally set above mown grass on level ground away from trees, buildings and walls.

At any instant the temperature at a site depends on incoming air flows and local climatic energy inputs. The later will modify the former depending on the wind speed. When wind speed is slow site factors particularly the heating of the ground by the sun and night time cooling exert a major influence on the air temperature close to the ground. The ground of a site is heated by incoming solar radiation and cooled by convection, long wave radiation and evaporation of water. Evapotranspiration by irradiated vegetation may be particularly important. The highest temperatures are found in hot sunny weather over dark surfaces with no vegetation cover or wind. Local inputs of climatic energy have a considerable effect close to the ground. Further from the ground the impact of diurnal ground temperature variations rapidly decreases. Temperatures measured closer to the ground will reveal bigger daily variations. The heating effect of the ground on the air determines air temperature at habitable levels. There is a daily temperature swing with maximum temperatures usually in the afternoon and the lowest at dawn. In overcast weather the swing is

16 ibid.
17 ibid.
18 John Page and Ralph Lebens (eds.), *Climate in the United Kingdom*, HMSO, London, 1986.

smaller. Under most meteorological conditions mean daily temperatures reduce with distance above the ground. At night, the surface temperature of the ground may fall below the air temperature because of the emission of long wave radiation to the sky (particularly under clear skies). If the surface temperature falls below the dew point, then (dew) or ice will form. Ground frosts are more likely to form in still air.

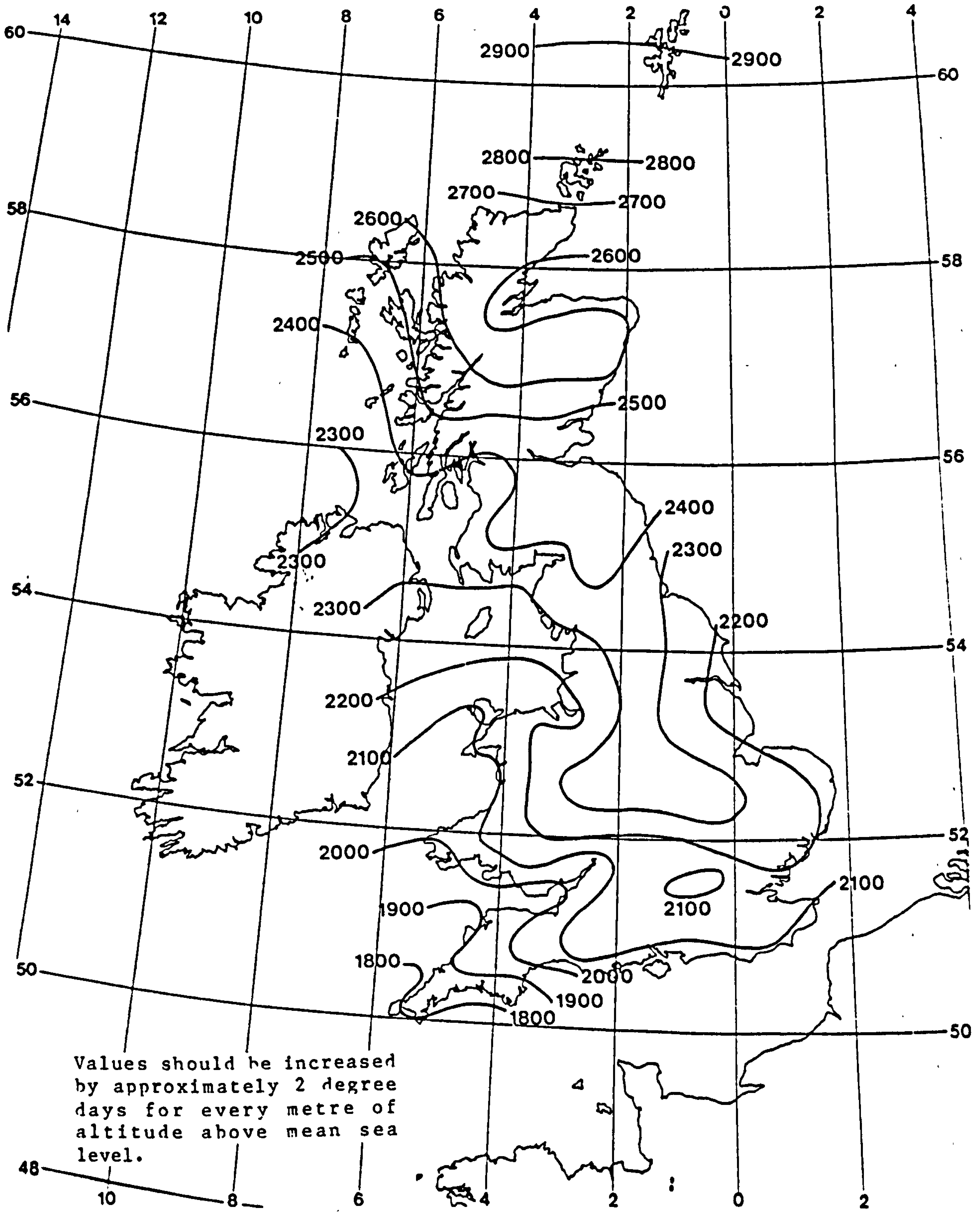


Fig. 3.3. Degree Days (base temperature 15.5°C) from September to May, 1957-76 (reduced to sea level)[19]

[19] ibid. P253

Degree days are the sum, over a stated period of days, of positive values of the arithmetic difference between a stated reference (base temperature) and the daily mean dry bulb temperature. If daily mean air temperature is above base temperature (negative values) then zero is recorded. The *seasonal accumulated temperature difference* (ATD) varies by a factor of approximately 1.6 between the South West of England and the extreme North of Scotland when values are reduced to sea level (totals are considerably increased with altitude by 200 per 100m).[20] The ATD value gives a general indication of the energy needed for space heating and includes only a small fixed allowance for solar gains.[21] Figures are for a given base temperature and calculated for the heating season.[22] Variation in heat required in space heating in different parts of the UK from September to May (the heating season) are shown in *Fig. 3.3.* for a 15.5°C base temperature. Corrections are needed for altitude (approx. 2 degree days added for every metre above sea level) and reductions for solar and wind conscious settings.

Rain
Average rainfall is largely controlled by configuration of the ground and distance from the Atlantic Ocean. For similar altitudes rainfalls are greater in the West than the East. Variations are from 50cm in the East to 200cm in the West of the UK. More local rain shadows may also be important as will driving rain and winter rain. *Climate in the United Kingdom* gives annual and monthly average rainfall, average annual rain days, annual average duration and annual driving rain indices for 30° sections.[23]

3.1.2. Mesoclimate and Microclimate Modifications

The influence of topography, altitude and vegetation alters 'global' values at the mesoclimate scale. Variations from maps and tables will be important, for assessing and adapting individual sites even if they are not quantifiable. A comprehensive table qualitatively relating geographic and topographic features to the climatic variables they influence is given in the BRE's *Climate and Site Development.*[24] An overview is given here on the factors discussed and then the urban situation in particular.

Solar Radiation
Goulding, Lewis and Steemers refer to two major factors affecting solar radiation at a particular site - turbidity and geometric obstructions. Turbidity refers to dust and suspended droplets of water in the atmosphere. Pollution from cities increases turbidity thus decreasing direct but increasing indirect radiation on cloudless days. Smoke may absorb 50% of solar energy. Vegetation may act a filter for dust. Dust particles either cling to leaves or drop to the ground below having fallen on them. Goulding describes how the air in the centre of an urban green space with plenty of trees will be purer than the air near the perimeter. Well-treed parks will reduce air-borne particles by a factor of four or five.[25]

Geometric obstructions include topography, vegetation and buildings that shade solar radiation to a greater or lesser extent. It is important at sketch design stage to assess obstruction of solar access by noting solar altitudes and azimuths, land forms and slopes, existing trees and surrounding buildings. Forms and arrangements can then be explored that give high levels of access within these constraints.[26] In an urban setting both the impact of surrounding buildings on the site and the influence of any proposed future building on the surroundings car be considered. Sun path diagrams enable shadows to be plotted on the site for various times of day and year and enabling experiments in building form to be carried out. Shading distances vary with slope, latitude and time of year and day. One possible starting point is the North/South spacing of buildings in relation to heights and slope. These are greater at higher latitudes. Mainland UK is between 50° to 59° latitude with the maximum solar altitude (noon) on the winter solstice (Dec 21) between 16° and 8°, on October 30/March 1 from 24° and 17°, and on September 30/April 1 from 35° to 28°.[27] Sunpaths can be used on specific key dates and times to look for overshading. The December solar access distance on a 10% south slope in Cornwall is 18.1m and on a 10% north slope in Aberdeen it is 121.8m.[28]

---

[20] BRE, 'Climate and Site Development Part 1: General climate of the UK', *BRE Digest 350*, Watford, February 1990.
[21] ibid.
[22] John Page and Ralph Lebens (eds.), *Climate in the United Kingdom*, HMSO, London, 1986.
[23] ibid.
[24] BRE, 'Climate and Site Development Part 2: Influence of microclimate', *BRE Digest 350*, Watford, February 1990.
[25] Jeremy Dodd, 'Greenscape 3 - Solar Architecture', *Architects Journal*, 26 April 1989.
[26] BRE, 'Climate and Site Development Part 3: Improving the microclimate through design', *BRE Digest 350*, Watford, April 1990.
[27] ibid.
[28] Jeremy Dodd, 'Greenscape 3 - Solar Architecture', *Architects Journal*, 26 April 1989.

Date	Latitude (°)	L1 (m)	L2 (m)	L3(m)
Dec 21	50	18.1	24.4	38.6
	59	29.1	49.8	121.8
Oct 30/Mar 1	50	12.8	15.7	21.2
	59	17.2	22.9	35.0
Sept 30/Apr 1	50	8.8	10.0	12.5
	59	11.1	13.21	17.1

note: L1 is for a 10% South facing slope; L2 for Level Ground; L3 for a 10% North facing slope

Fig. 3.4. Minimum north/south spacings of a 7m high east/west oriented building to achieve solar access at noon on various dates[29]

More complex manual or computer based methods of assessing cumulative effects of obstructions over a heating season or month are available. 'Sky maps' have been developed by ETSU to assess the useful direct and diffuse radiation received in a small building.[30] The area of sky seen by a vertical surface is divided into a number of cells, each labelled with useful radiation available from it. The height and location of obstructions on plan are assessed and plotted on to a sky map. The obscured squares are then added up. 'Sky maps' have been produced for surfaces facing W, SW, S, SE, E for conventional or passive solar houses.

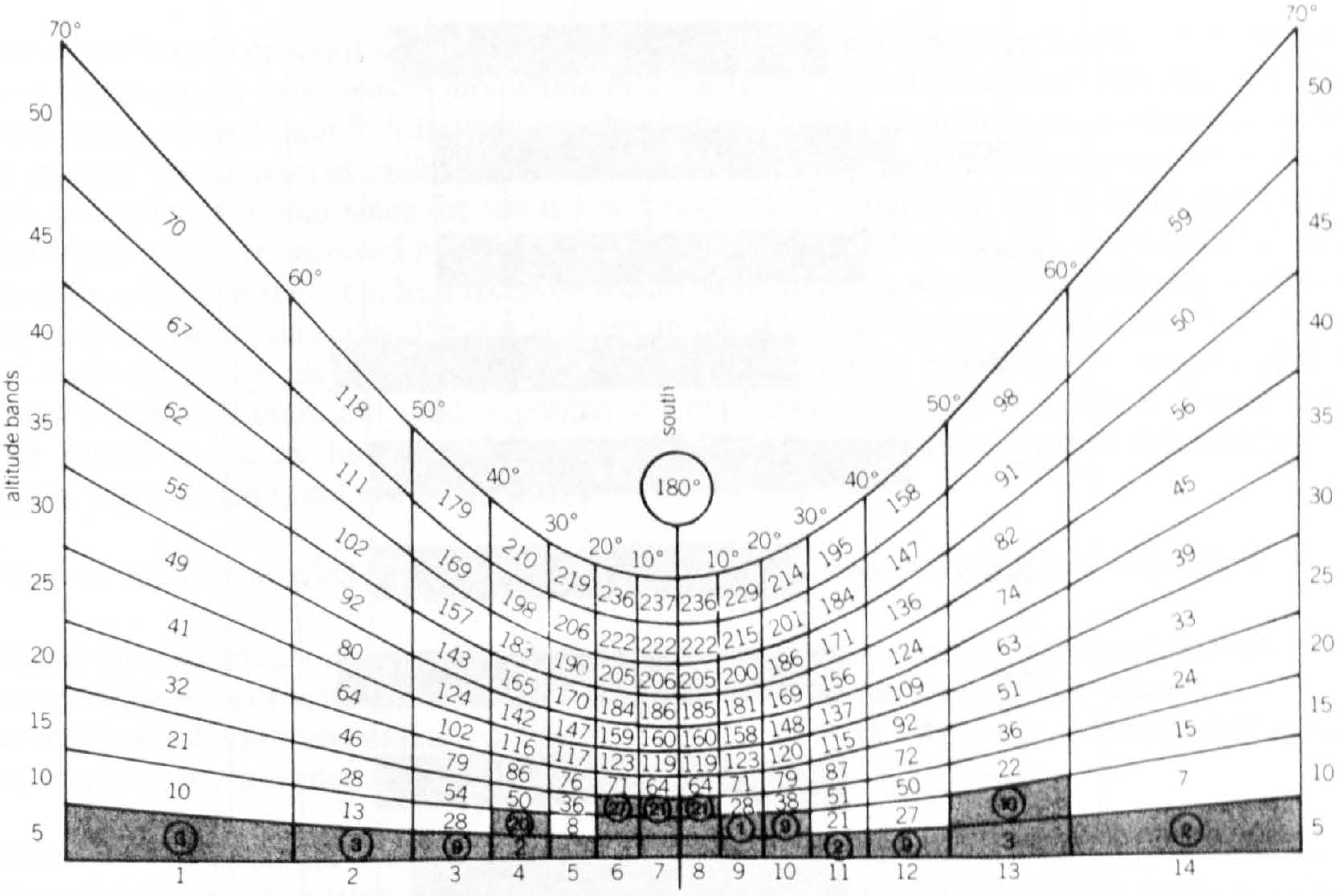


Fig. 3.5. ETSU sky diagram[31]

For accurate analysis partial shade from trees and reflected and emitted thermal radiation from adjacent buildings and other surfaces must also be estimated. The later particularly relevant in urban areas are given by factors in solar gain calculations. Transparencies are available of tree crowns obstruction of solar radiation for full-leaf and bare branch and periods of foliation for popular species.

[29] BRE, 'Climate and Site Development Part 3: Improving the microclimate through design', *BRE Digest 350*, Watford, April 1990.

[30] Energy Technical Support Unit, 'Housing estate layout - an assessment study', and 'Housing estate layout - a design aid', *Passive Solar Design Programme Leaflets*, ETSU, 1987.

[31] Jeremy Dodd, 'Greenscape 3 - Solar Architecture', *Architects Journal*, 26 April 1989.

Common Name	Transparency (% radiation passing) Full leaf	Bare Branch
Sycamore	25	65
Silver maple	15	65
Horse chestnut	10	60
European birch	20	60
European beech	10	80[a]
European ash	15	55
Locust	30	80
English oak	20	70
Lime	10	60
Elm	15	65

a: The beech tends to retain dead leaves for much of the winter reaching bare branch condition in spring.

Fig. 3.6. Transparency of tree crowns to solar radiation[32]

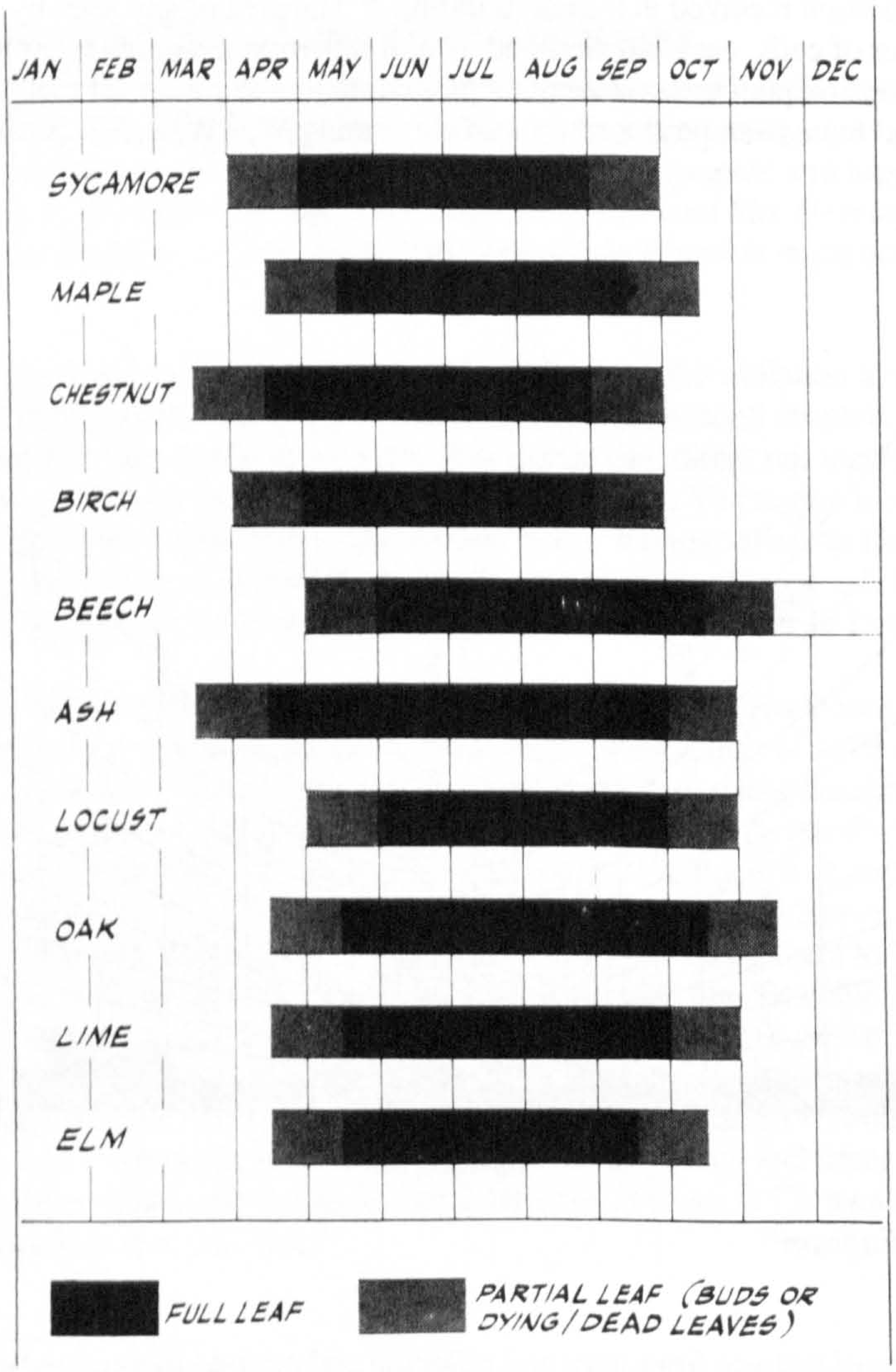


Fig. 3.7. Range of foliation periods of common tree species[33]

[32] BRE, 'Climate and Site Development Part 3: Improving the microclimate through design', *BRE Digest 350*, Watford, April 1990.p6
[33] ibid. p6

Wind

Wind speed increases with distance above ground that slows it according to its roughness. Over land the upper air wind speed may be many times greater than at ground level. Scattered trees copses and hedges slow wind to about three-quarters of that over open ground. Well wooded parkland or a typical leafy suburb reduces it to two-thirds while in city centres it is typically reduced by a half.[34]

Topographical features can provide protection to certain sites and exposure to others. They may also modify the direction of prevailing winds. Wind flow at the crest of a hill can be accelerated by as much as 70% due to compression of the air streams. In providing shelter a slope of <1:3 is needed to induce wind to continue on its path.[35] Air in touch with warm surfaces (e.g. irradiated) will rise and in touch with cold surfaces (e.g. night time radiative cooling) will fall. Several terrain configurations cause cyclical air flows due to heating and cooling of air - water and land interfaces (sea breeze), hillsides and valleys (up valley or anabatic and down valley or katabatic breezes). Care should be taken to avoid creating cold air traps at unsuitable points. A favourable 'thermal' belt occurs above pools of cold air and below exposed crests of hills. The urban heat island effect with hot air rising over the city can also cause flow of wind towards the town centre or at microclimate level similar flows may occur from parks towards adjacent buildings.

Temperature

The temperature of the air at a site is modified by topography, the nature of vegetation and nearby surfaces that intercept solar radiation. Topography influences temperature due to the angle of the ground to solar radiation, wind exposure, and flow of heated and cooled air. Surfaces tilted to solar radiation will be more strongly irradiated while wind may rapidly remove surface heat. The various flows of heat will be affected by the structure of the terrain. On sunny days valleys are generally warmer than hill tops but at night may become cooler since as slopes cool air in contact with them runs down the valleys and forms pools of cold air at the bottom.

Evidence of the benefit of south sloping land for agriculture are many. Beazley equates the need for glass-houses on Guernsey for early season production and not Jersey with the fact that Guernsey is tilted to the North and Jersey to the South.[36] Allotment vegetables can often be seen to be more advanced on south sloping ground. The amount of radiation received from the sun by a surface is proportional to the sine of the angle of incidence so that when the sun is low a slope of 10° could add half as much again to the radiation which would be received by flat land. In Edinburgh where the mid-day sun is only 11° above the horizon at the winter solstice, the heat received would be doubled. A west facing wall may receive more heat than a south facing one since the sun is lower in the sky when its rays strike it and thus closer to an incident angle of 90°. Beazley describes how in theory a place can be 'moved' in this respect ignoring other factors such as altitude and wind. A garden in Aberdeen (57°N) on a 6° southerly slope might enjoy the same warmth as one on flat ground in Somerset (51°N). Beazley notes however that slope aids the drainage of water which is not always desirable.

Ground cover can be classified into water, solid surfaces and surfaces covered with vegetation:

• lawns and shrubed areas will be cooler due to evaporation of water transpired through leaves;
• the temperature rises of solid materials set over the earth will depend on surface colour;
• water bodies ameliorate temperatures acting as thermal regulators - they reduce temperature in summer and day and increase in winter and night (increase humidity).

Dark soils will absorb all but a few percent making them able to produce earlier crops. Wooded areas will remain cool during the day (stop solar radiation gain) and warm at night (stop long wave radiation loss).

Urban Mesoclimates and Microclimates

Heat is accumulated and stored in the urban mass of a town or city. They may thus be between 3°C-5°C warmer than surroundings rising to as much as 10°C on cold winter nights with little wind.[37] The 'urban heat island' is added to by reduced evaporation (less vegetation) and rapid run off, less long-wave radiation losses to clear skies, waste heat from buildings in the heating season and industry and cars all year. The space heating degree day total in Central London is estimated to be some 10% lower than in its suburbs. Conversely cities have reduced solar gains due to shading and atmospheric pollution. Hot rising air over cities forms a rising plume of pollution over the centre that may be some 200-300m high holding traffic

---

[34] Jeremy Dodd, 'Greenscape 4 - Tempering Cold Winds', *Architects Journal*, 3 May 1989. and John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A primer for Architects*, B. T. Batsford Ltd, 1992. dig p43
[35] Jeremy Dodd, 'Greenscape 4 - Tempering Cold Winds', *Architects Journal*, 3 May 1989. dig p62
[36] Elisabeth Beazely, 'Sun, Shade and Shelter', *Landscape Design*, November 1990.
[37] Jeremy Dodd, 'Greenscape 5 - Green Cities', *Architects Journal*, 10 May 1989.

and fossil fuel pollution that reduce visible light by up to 50% and ultraviolet by up to 65%.[38] Since the Clean Air Act 1956 in London winter sunshine levels are 50% better than before but there is still a considerable and growing problem of cars. With a reduction in cars solar gain would be increased but 'mutual warmth' would still be available.

Urban microclimates vary considerably. Goulding notes that most urban microclimates are more moderate than those in the suburbs and rural areas. They are characterised by slightly higher temperatures and reduced winds (away from tall buildings). On sunny still days wide streets and squares are the warmest parts of a town. At night narrow streets may retain heat. Strong local winds however can change the temperature distribution. Large buildings or long straight avenues may be problematic. The 'street effect' refers to masking by buildings located across the street. It depends on height and distance between buildings, latitude, orientation of the street and slope. It can be expressed as a percentage of usable solar gains. Mixed use development with workshops may enhance utilisation of mutual warmth at the microclimatic level and enable housing to be raised into the sun.

3.2. Climatic Design

The effect of geography and topography of a site and its surroundings on the microclimate will usually reveal microclimate advantages and disadvantages that can be modified by the arrangement of buildings and landscape features. Site layout, built form, materials and landscape can all be modified to exploit favourable climatic influences and protect against unfavourable ones. The primary concern in the UK is to mitigate cold, wind and rain and enhance the sun in the heating season. It may also involve utilising as far as possible the 'heat island' effect present to some degree in all built up areas.

3.2.1. Scales of Design

Microclimate performance within the city will be enhanced by a range of interconnected factors at various scales. Ideally microclimate would be a factor in site choice for certain buildings. Building however is certain to take place on north facing slopes, windy ridges and frost pockets. Here microclimate design of a site will involve making the best of problems caused by surrounding sites. In this respect a larger site will increase potential. Existing buildings may reduce potential. High rise building, for example, may considerably increase energy use in surrounding low rise buildings due to shading and increased wind speed. Boston city in America imposed height limits to buildings after studies of the shadows cast by a 90m tower and its dramatic impact on surrounding buildings and streets (see *Fig. 3.8.*).

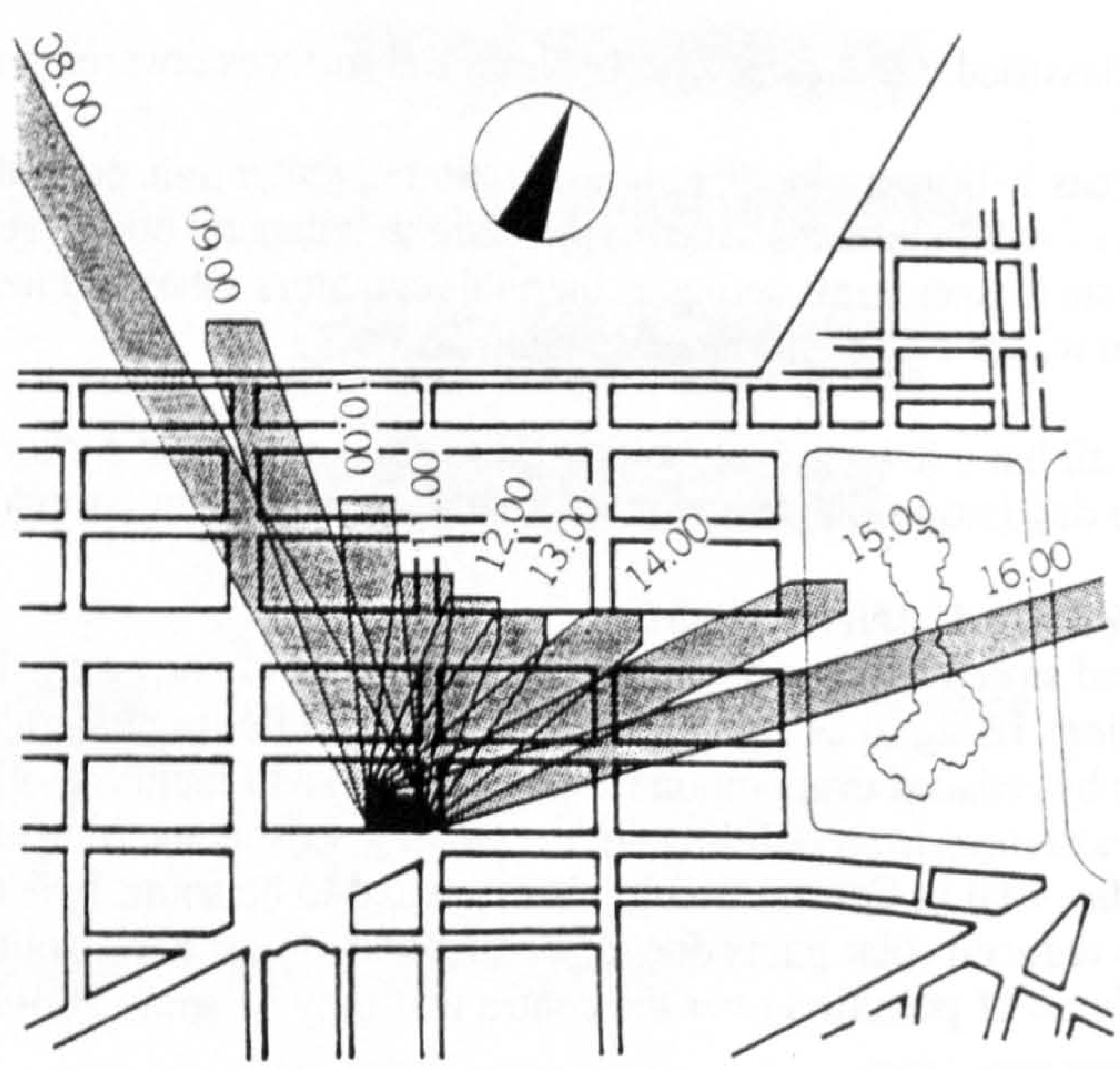


Fig. 3.8. December shadowing[39]

[38] ibid.
[39] ibid.

While architects and landscape architects normally deal with specific sites continuity of urban design can produce benefits in the overall mesoclimate and increase the habitability of cities generally. Use of the complementary requirements of different functions and their relation to the exterior may be an important consideration. Opportunities clearly exist to reflect climatic factors in planning control. The BRE lists site and layout factors influencing microclimate that may be outside the individual designer's control.[40] Many of these however are within the scope of civic design and development control. They include:

- area and local climate;
- site surroundings;
- plan shape of site;
- large-scale topographic features *e.g. form, slope, aspect of ground*;
- retained existing buildings;
- road access;
- services access;
- planning constraints *e.g. densities, building heights, tree preservation*;
- covenants restricting the form and character of development.

The BRE also lists those factors within the designer's control under three headings.

Arrangement of buildings on the site:

- spacing, orientation, juxtaposition of composite forms *e.g. courtyards*;
- road pattern and access *e.g. to plots*;
- location of open spaces, gardens, utility areas, garages, stores.

Design of Buildings:

- form, height, roof profile;
- orientation;
- fenestration and type of glass;
- insulation and thermal capacity;
- air permeability;
- cladding materials.

Other site features:

- tree cover as major wind shelter planting, local wind shelter planting, decorative planting;
- ground profiling *e.g. mounds, banks*;
- walls and artificial windbreaks;
- snow barriers;
- ground surface *e.g. paving, grass*.

Measures should be adapted and integrated to the individual site and function. The earlier the microclimate is considered in the design process the greater its potential effect. The potential for late intervention or adaptation is minimal although the detail of individual plant groups, trees and wall materials will be important is realising the full potential of microclimate designs. Clearly it will not be possible to achieve a high level of enhancement over the entire site. Parts of a site may be improved at costs to others and choices must be made on prioritisation. Recreational areas may be located in the most favourable spots and, for example, garages and refuge storage in the least favourable. The immediate boundary of a building that affects the buildings energy use along with external areas used to sit in on 'marginal' days should take priority. Consideration of functions of spaces near building and their relationship to those within will include their use as:

- connections between parts of the building (roofed arcade or sheltered walk);
- places to enjoy for a short period (to sit in the sun/shade in a work break);
- extensions to a room (living room of house);
- places to eat in the open (back yards and cafes);
- places to work (workshop activities, play group);
- places to play;
- a combination of routes with all of these.

---

[40] BRE, 'Climate and Site Development Part 3: Improving the microclimate through design', *BRE Digest 350*, Watford, April 1990.

There is a need for good direct access to such external spaces from individual rooms and from buildings generally to courtyards, terraces, verandas.

Energy Saving
Clearly consideration of microclimate design is a prerequisite for passive solar design (discussed in the next chapter). Before incidence of solar radiation on apertures of the building enhancing the microclimate can save energy for space heating. Moffat and Schiler estimate savings of up to 30% of space heating (and cooling) requirements (on exposed sites).[41] Methods include:

- increasing outside air temperature (sun and wind and materials);
- increasing surface temperature of the building (sun and wind and materials);
- reducing air change rate (wind);
- increasing surface resistance (wind, materials);
- reflecting solar radiation;
- preventing moisture reducing the thermal performance of envelope (wind and rain).

Microclimate design will usually involve a compromise between wind protection and solar access and their impact on internal or external temperature given the specific requirements of the project and its location. I now look at these measures separately and go on to look at other potential uses of vegetation.

3.2.2. Design for Shelter

The external comfort around buildings and building energy efficiency may both be improved by careful design for shelter. Although the UK is one of the windiest countries in the world, apart from physical damage caused to buildings and consequent structural design little attention has been given to designing for shelter. The importance of shelter design in the UK is however beginning to be recognised particularly with regard to its effect on energy saving.[42] I describe below the main techniques for moderating wind before impact on building surfaces, people and the air mass around buildings. These may also be used to reduce loading on vulnerable structure and fabric and create a favourable climate for plants.

Wind Chill
The 'chill factor' produced by even a light wind is something we experience almost daily. 'Sunny spots' are often spoilt by a chill draught. The effect of wind expressed as 'wind-chill equivalent temperature', suggests for example that air at 12°C when moving at 4m/s feels like still air at 9.5°C; when moving at 6m/s feels like still air at 8.0°C and when moving at 8m/s feels like still air at 6.5°C.[43] The direction of cold winds is important. Wind-chill roses describe the proportion of time that the air-flow gives a sensation of bodily heat loss (cold) by direction. For people generally to be able to sit outside in reasonable comfort the still-air minimum average temperature is 12°C. If there is a 4m/s wind the minimum temperature must rise to 14°C, for 6m/s to 15.5°C. For children the temperature is lower because of their active play, for the elderly a few degrees higher. Good shelter in a zone 2.0m high will protect people outside the building against the combined effect of wind and cold and reduce the effect of wind chill on the growth of plants. The sensation of comfort however is also increased if direct sunshine is felt directly (radiant heat) or even if it is visible from the area in shade.

Building Heat Loss
Wind of more than 13m/s will induce uncontrolled infiltration and exfiltration (by air finding its way through gaps, chinks and ventilators due to positive and negative pressure differences on the windward side and the lee sides of buildings).[44] This causes heat loss by increasing the air change rate (Ac/h) of cold air into the building during the heating season. Moffat and Schiler point out that this heat loss is proportional to the square of the wind velocity running past it.[45] Shelter to reduce heat loss would ideally trap air around the building creating a *microclimatic sheath*.[46] In addition, given still air around a building, solar energy can build up and be stored in the external mass of the building and floor increasing air temperature. This 'trapped heat' will decrease the temperature differences and thus further reduce heat loss (reducing degree days). Mass thermal store can also release heat after the air cools in the evening. Good shelter can reduce heating costs in unexposed areas by at least 5% and is more effective as general

---

41 Anne Moffat and Marc Schiler, *Landscape Design that Saves energy*, William Morrow and Company, 1981.
42 M Finbow, 'The contribution of shelter planting', in J. S. Dodd (ed.), *Energy Saving through Landscape Planning*, Vol 3, Property Services Agency, 1988.
43 Jeremy Dodd, 'Greenscape 4 - Tempering Cold Winds', *Architects Journal*, 3 May 1989.
44 ibid.
45 Anne Moffat and Marc Schiler, *Landscape Design that Saves energy*, William Morrow and Company, 1981.
46 Jeremy Dodd, 'Greenscape 2 - Climate and Form', *Architects Journal*, 19 April 1989.

exposure increases.[47] In certain circumstances wind shelter alone might save up to 20% of annual fuel costs.[48] Creepers on frames are another effective means of slowing heat loss since they provide a free insulating blanket of air. Deciduous creepers can be trimmed around windows and allow sun on the wall in winter while still trapping some air.

The Urban Built Fabric and Wind

Wind speeds depend on the general roughness of ground cover and on the degree of perturbation or redirection of the air flow induced by obstructions. While wind speeds are generally reduced in urban areas they are more turbulent and changeable. Over towns due to their irregular upper surface the wind is constantly being diverted up, down or sideways. Much colder high winds are brought down the side of high slab buildings causing turbulence and the creation of uninhabitable zones. Extreme local highs may occur around poorly designed especially tall buildings. Wind will maintain speed down smooth facades but slow down given small projections. Down draughts induced when wind strikes the face of a slab block of five storeys increase wind speed by 20% and 16 storeys increases wind speed by 50%. Wake effects also increase speed near the ground of tall buildings as do slots and funnelling effects.[49]

Urban Design

Dodd and Beazley advocate dense but low 'fine grained' fabrics of slightly uneven roofline as ideal in increasing shelter generally.[50] It should then be possible to create a sheltered zone in the first 5m or so above the ground. Achieving this requires attention on the form of individual buildings, their arrangement and use of hard and soft landscape. If taller buildings are introduced they need to be stepped forming a 'smooth hill'. Vegetation may be used to give local protection or increase ground roughness generally throughout an area. Pocket parks dotted around a city will aid general reduction while reducing air pollution. Trees and bushes can be placed between buildings whose spacing is greater than that desirable for wind shelter or where roads may create channels for wind. Care must be taken to consider the influence of trees on foundation design.[51] At this scale it may be important not to block solar radiation. Deciduous and evergreen trees can be mixed to provide year round shelter or access to winter sunlight.

While shelter belts of trees may effectively be used on the edge of urban areas built up areas may also have pockets of exposed land. To shelter exposed surfaces tall trees may be used in a series of parks, as for example, around a Central Business District (CBD). Such belts may require 'under planting' as they grow to prevent wind speeding up around their stems. With underplanting shelter belts of trees can give protection down-wind for a distance of 10 to 20 times their own height, reducing the wind speed by up to 50%.[52] Such belts have a long history in agriculture.

Vegetation and Shelter

The most effective type of direct wind barrier is one that is semi-permeable not solid because it breaks the force of the wind and allows the air to percolate through instead of causing turbulence and eddies (no reflection or local increase). Beazley argues that a proportion of about 60%/40% solid/void has been found to be effective. Dodd notes optimum permeability between 40-50% decreasing from top to bottom (nb agricultural wind breaks may have a gap at the base to prevent trapping of cold air and thus frost damage). Vegetation is thus an important tool in wind control due to its malleable and porous character. While artificial wind breaks can provide 'instant' shelter, permanently or until the growth of vegetation solid walls tend to create turbulence in their wake so that protection over a wider area is best provided by permeable walls or fences. Dodd notes porosity of fences of 0% for close boarding to 95%+ for woven wire.

It may be important to use landscape features according to the ecological character of the site, for example, the height of trees and other plants is dependent not only on species but also where they are planted. Effective wind protection by vegetation depends on soil type, soil moisture availability, climate, pattern of protection sought, design to grow in successive stages (quick growing initially to offer protection and acting as 'nursery' stock to protect slower growing trees). Clearly linear shelter belts are OK if cold winds are one directional otherwise several directions and interlocking patterns will be needed. As noted vegetation will be of limited effect in early years since even quick growing trees take up to 10 years to provide useful protection. Use of vegetation thus needs added emphasis on process and maintenance (see also *6.3. Ecological Landscaping*). Dense planting rows close to and upwind of a building will divert wind over the structure but also blocks sunlight. Such a strategy using coniferous

---

47 Jeremy Dodd, 'Greenscape 4 - Tempering Cold Winds', *Architects Journal*, 3 May 1989.
48 J. S. Dodd, *Energy Saving through Landscape Planning*, Vol. 1, 1988.
49 Jeremy Dodd, 'Greenscape 4 - Tempering Cold Winds', *Architects Journal*, 3 May 1989.
50 Elisabeth Beazely, 'Sun, Shade and Shelter', *Landscape Design*, February 1991.
51 BRE, 'The influence of trees on house foundations in clay soils', *BRE Digest 298*.
52 Kevin Lynch and Gary Hack, *Site Planning*, MIT, 1984.

plants may be useful on north facades but may need seasonal, purpose made, de-mountable breaks to the south.

Shelter Methods
Shelter design may utilise any of the following techniques depending on the specific circumstances:

- Arrangement of buildings in an irregular pattern, rather than regular lines or grids. Long, uninterrupted passages between buildings, through which low-level wind could be channelled, should be avoided as should placing large walls at right angles to a dominant or critical wind directions.
- Keeping the heights of the buildings in a group as uniform as possible and avoiding abrupt changes of height, because they can induce downdraughts.
- Keeping the distance between buildings fairly small, ideally in the range 1.5 to 2.5 times their overall height, but avoiding small gaps (e.g. up to three metres) which can act as wind 'funnels'.
- Overlapping the ends of blocks that 'meet' at an 'angle', to limit the funnelling effect.
- Creating courtyards where maximum shelter is required; orienting partly open courtyards for optimum shelter from dominant or critical wind direction (but also with regards to the needs for solar access).
- Limiting the maximum length of blocks, especially those of 'plain' form, to about 25m. Where straight streets are unavoidable gaps of three to five metres should be provided between blocks and steps and staggers introduced into facades.
- Avoiding tunnels through blocks and if essential orientating them for minimum wind sensitivity, and/or coupled with windbreaks.
- Landscaping to maintain ground roughness in any open parts of the site, and to provide local wind shelter for buildings and open spaces. Earth mounding, trees, bushes, fences and open or porous walls can all contribute. Mature trees with open space around their trunks may need extra, low-level planting to avoid channelling wind at ground level.
- Walls used to enclose sites or link close buildings provide excellent shelter provided the protection is not required more than four or five times its height away.[53]

Individual buildings should present least resistance to passage of air over and around them. For rectilinear buildings this suggests a form (or roof form) close to a pyramid not cubical or slab like since these can generate undesirable wind effects near ground and turbulence and high wind speeds at the corners of buildings.[54] Reducing the sensitivity of individual buildings to the wind involves:

- Reducing the dimensions, especially the height, of the uninterrupted external walls, particularly those exposed to a dominant or critical wind direction.
- With multi-storey buildings, facades should be stepped back progressively with height.
- Flat and low-pitched (up to 10°) roofs should be avoided, especially in low rise construction. Medium pitched roofs (22° to 45°) are ideal.
- Hipped roofs are preferable to gable-ended roofs.
- Where high wind speeds at the corners of a building cannot be avoided, planting or windbreaks can ameliorate conditions.[55]

It should be noted that shelter from the wind may mean preventing warm as well as cold winds and more importantly may mean preventing advantageous summer breezes. In certain built up areas breeze may be important to remove pollutants (generally from cars). Except very cold but less frequent North winds there is little difference in UK between winter and summer wind directions so that it is difficult to satisfy both shelter and breeze requirements. Considerable variations exist within the UK and local knowledge may be important. I expand on such benefits of participation in the following chapters. Conflicts with solar demands and between winter and summer winds from same direction must be left to specific cases. In conclusion clustering similarly scaled buildings is the preferable city strategy. Such a strategy can reduce general wind levels and prevent extremes allowing buildings to be open to winter sun. Development height controls will be important in relation to shelter. A general design principles is to occupy the entire site area using *open courts* or *wide closed atria* retaining solar access rather than raising buildings into the sun and wind.

---

[53] Jeremy Dodd, 'Greensape 4 - Tempering Cold Winds', *Architects Journal*, 3 May 1989.
[54] BRE, 'Climate and Site Development Part 3: Improving the microclimate through design', *BRE Digest 350*, Watford, April 1990.
[55] ibid.

3.2.3. Use of the Sun

In the UK making the most of solar warmth into and around buildings is desirable throughout the long heating season (seven months from mid-September to mid-April in Southern England and ten months from August to May in Northern Scotland).[56] In this period the sun is at its lowest altitudes allowing solar penetration through vertical glazing but increasing the potential for obstruction. The orientation and altitude of the sun along with the elevation and angle of tilt of any surface in relationship to neighbouring obstructions will determine whether, when and to what intensity a space or surface will be sunlit.[57]

Solar radiation can be used internally by collecting solar energy passing through glazing. Internal solar gains are discussed in the next chapter but are clearly influenced by the solar radiation incident on the glazing and thus microclimate design that avoids shading specific areas of glazing (usually S±45°) for specific periods. In addition as already noted solar heat absorbed and re-emitted by external surfaces will increase average air temperatures around a building, reduce the daily range of air temperature and increase radiant heat thus reducing the demand for space heating that depends largely on inside/outside temperature differences and radiant exchanges. Particularly significant reductions in heating demand may be achieved at the beginning and end of each heating season with higher solar angles and increased irradiation. It should also be noted that passive solar gain as an energy strategy can be complemented by highly insulated 'solar rejecting' designs that may focus on external microclimate improvements instead.

In cold conditions human comfort in external spaces is increased by radiant heat received directly and re-radiated and reflected from surfaces.[58] Maximising the benefits of solar heat both internally and externally requires good solar access to external spaces and surfaces and appropriately massive building and landscape materials that can absorb and store heat - walls, buildings and paving. Critically, external temperature build up will depend on wind shelter as discussed. Such spaces will usually only receive direct sun for part of a winter day. The arrangement and intended use of spaces should therefore reflect the time of irradiation. Different spaces will require sun at different times. A play group, for example, requires sun in the morning, a cafe or restaurant at breakfast, lunch time or evening depending on its type. Sun will be appreciated in the backyard of a house at times according to the individuals concerned or perhaps the horticultural use of the space. Beazley describes how a wall on which fruit is grown may be best oriented East of South for early sun the heat from which can be re-radiated to the plants in the afternoon when the sun has moved on.[59] The orientation of various spaces is thus complex and site specific especially when considering the relationship to interior spaces and energy saving. Generalisations cannot be made and there are no perfect solutions but specific cases must be analysed.

Materials

Surfaces vary considerably in their ability to reflect or absorb the suns rays. As described the effects of these features are particularly noticeable near the ground in and around buildings. Material choice may vary according to requirements to reflect radiation inwards for solar gain or absorbing it outside for external comfort. The sense of warmth of a space both at the time in question and some hours later can be controlled by careful choice of materials. The albedo of a material is a measure of the ratio of reflected and absorbed light, dark granite typically reflects 5%, white Grecian marble 95%. Beazley describes how brownish-red brick has been used to line garden walls in areas where the predominant building material is stone since they absorb and conduct heat easily slowly radiating heat back as the ambient temperature falls.[60] The time lag is a product of the material and its thickness and the temperature swing of the air and surfaces around it. Attempts to maximise daylight in buildings for visual comfort and energy saving by reduced artificial lighting may conflict with external microclimate needs for darker absorbent materials.

Overheating

In the UK reducing summer radiation impact is usually of secondary importance. Internal gains may however be a problem in buildings with large South, East or West facing glazing. Overhangs from buildings can shade high summer sun from interiors while allowing winter internal solar gain or solar access to external terraces. Some blockage of solar access to the interior may be beneficial at beginning and end of heating season to avoid overheating but not to the exterior where it may be critical to habitability. East and West facing elevations particularly will receive low sun in the mornings and evenings at the end of and outside the heating seasons that can be problematic. Again vegetation may be an important control. Moffat and Schiler describe how even leafless deciduous cuts out 25% of the solar

---

56 ibid.

57 Elisabeth Beazely, 'Sun, Shade and Shelter', *Landscape Design*, November 1990.

58 John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd, 1992. p61

59 Elisabeth Beazly, 'Sun, Shade and Shelter', *Landscape Design*, December 1990/January 1991.

60 ibid.

beam.[61] Dense leafed trees block out as much as 95%. Trees can be usefully located according to sun paths and altitudes on different sides of house depending on house design, occupants projected use and type of tree. Leafless trees block out between 20-40% of solar radiation. Solar penetration may vary from 20% to 85% between deciduous species and by up to 20% for each species.[62]

As noted specific species/shapes of tree are crucial. For shading ground surfaces low wide trees may be preferable because tall narrow trees shade more in winter than summer. For shading buildings tall trees are necessary. A high crowned, dense, tall, columnar, deciduous tree very close to the house will only cut out summer sun. As described late evening sun in summer may overheat a house - trees can filter not block the sun thus reducing overheating but maintaining a visual connection with the sun internally and on terraces. Shading needed in summer to prevent solar gain is best achieved externally and thus may also create cool external space. Trees divided into deciduous and evergreen can be used for shading interiors instead of new glazing or blinding solutions. They may be more effective and reliable, cheaper and 'in tune' with the local environment [tinted glazing gives fake interior and poor light]. The dynamics of seasonal foliage and its use can provide automatic thermostat control plus constant aesthetic change . In Indian summers leaves last longer and in cold springs arrive later (native plants will be most adapted to local conditions). Importantly however such techniques will not always be applicable and the form of the city as a whole will affect their potential.

At a smaller scale an arbour, a trellis or a pergola covered with deciduous vines can effectively protect south elevations simultaneously providing shade and the cooling effect of evaporation in summer. Deciduous vegetation close to the fabric can shade walls from sun in summer but allow it to warm walls in winter (particularly beneficial on west facades). If mortar attack is a problem a frame can be used away from the wall. Evergreen vegetation will protect the fabric from wind and help maintain a stable sheath if wind exposure is great or there is no requirement or possibility of sun. Pot plants can be used without destroying foundations. Coniferous trees may be best planted to the North and deciduous to the South. Again plant combinations over time may be important (rapid growth for immediate impact gradually replaced). Rapidly growing deciduous vines can grow 3-10m in a single season. Consideration of the design never finishing but a continual process.

Building for Solar Penetration

The RIBA suggest that estate planning to maximise solar gains may save up to 10% of fuel bills.[63] This is the equivalent of turning off 1.5 mil one bar electric fires for the whole year. The BRE give estate layout to maximise solar gain.[64] As I will emphasise in the next chapter such recommendations often consider solar gain only. Clearly given large suburban plots road layout, plot shapes can maximise solar gain. Obvious dwelling types and forms to limit overshading include, higher blocks to the North of a site (place two storey houses to north of single). In the existing city fabric the ideal layout will not be achieved but compromises must be made. BRE Digest 350 suggests East -West orientated terraces. As I will note in *Chapter Four* however efficient solar forms have been produced for North - South terraces while there is evidence that dense fabrics benefiting from mutual warmth and wind shelter are more appropriate to the UK climate. I have already noted the transport efficiency of such forms.

3.2.4. Temperature and Water

Since dry air is a poor conductor of heat, materials such as dry sand will heat up quickly at the surface given exposure to sunlight but not conduct the heat. Water is a good conductor of heat so that wet soil will conduct heat easily and absorb it cooling the air above the ground. In addition standing water may cool an area due to evaporation. Swift drainage of rainwater from the ground as well as from roofs in courtyards and other hard areas close to dwellings means that they heat up more quickly. Maintaining dry walls will also reduce heat loss from buildings by reducing evaporative cooling and conduction.

Planting and ground covers such as grass reduce temperatures and increases humidity due to evaporation of moisture from their leaves. Beazley points out that a full grown deciduous tree might evaporate a hundred gallons of water on a sunny summers day. Warm air may however be trapped beneath a canopy. Temperatures over grass can be 5° - 8° lower than over bare soil.[65] The length of grass is also important with higher grass reducing temperatures further. Since grass does not grow below 6°C this feature may be

---

[61] Anne Moffat and Marc Schiler, *Landscape Design that Saves energy*, William Morrow and Company, 1981.
[62] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd, 1992. p158
[63] RIBA, 'How layout can affect solar gain', *RIBA Journal*, October 1983.
[64] BRE, *Estate Layout for Passive Solar Housing Design*, ETSU S 1126, 1986.
[65] Anne Moffat and Marc Schiler, *Landscape Design that Saves Energy*, William Morrow and Company, 1981.

equated to the natural advantages of deciduous trees letting sunlight through in winter. Trees and plants generally act to stabilise temperature since they are slow to absorb and release heat. Concrete slabs on the other hand will heat up and cool very quickly. They will also reflect direct sunlight unlike planting. This reflected heat will depend on the angle of the sun and may be reflected onto a wall or through a window. Water will also reflect especially low angle sunlight

Buildings can form local 'rainshadows'. Courtyards and ground close to walls may experience near desert conditions due to rainshadows particularly due to overhanging eaves. Brick walls also absorb groundwaters. Neither will dew usually form near buildings. There may thus be a need for water for vegetation near walls and buildings and in courtyards. Pitched roof sloping towards courtyards may be designed without gutters or water can be collected and used in the appropriate areas (potentially collected from roofs or houses). Rain-water is preferable to untreated grey-water and especially pure tap-water (see *6.2 Water Systems*). Additional shelter from rain can be provided by verandas, colonnades and porches that retain access to low sun and provide shade with high solar altitudes.

3.3. Vegetation

Vegetation clearly plays an important role in microclimatic design both in terms of solar design and wind control. Deciduous and evergreen trees shrubs, vines, creepers and ground covers can also reduce reflection and glare, provide fruit and flowers, purify air and water. They have a psychological effect on well being.[66] They have an elastic response to human energy and comfort needs and continual transition of colour and texture.

Trees and Plants for Air Treatment

Many plants not only withstand pollution but also purify the air of particulate dust, sulphur dioxide and carbon dioxide thus contribute to health (urban health and global health). In photosynthesis CO_2 is removed from the air and combined with water from the roots to make glucose for the trees (plants) metabolism. As part of the process plants also enrich the air with oxygen. A large forest like oak, beech, maple, ash or Hornbeam with a crown diameter of 15m and height of 25m can take 10kg of CO_2 out of circulation in one day. Although one-third to one-fifth is respired at night 2.7 metric tonnes are removed every year. Carbon is half the weight of trees and is locked up until burnt, converted into paper or the dies and rots on the forest floor. *If the tree is used as a structural material CO_2 will be retained as Carbon.* In *Chapter Six* I look at economic benefits of urban fringe timber production, the potential for reduction of energy use in transportation, and the recreational benefits of city forests and use of woodland or shelter belts to aid in water treatment particularly of grey water.

Pocket green spaces and trees over the entire city will reduce pollution generally increasing the cities habitability before individual designs are considered. At the other end of the scale indoor plants can purify ventilation or stale air. Toxic particles, such as those in lead, are trapped on the film of moisture on some leaves and drop to the ground. Plants also remove dust. Moffat and Schiler give the example of a greenbelt placed adjacent to a railway station that had only 300 dust particles per litre of air although the neighbouring terminal registered 5000 per litre. They also note a study that showed that the air above a road carried 10,000-12,000 dust particles per litre while the air above a nearby tree shaded street carried only 1000-3000. Particularly suitable plants include the European Linden or any plants that are particularly hairy.

In cities as in other eco-systems health of the whole is dependent on a complex web of checks still not fully understood. Resistance to pollution and reduction of pollution by plants is in constant flux. Both photochemical smog and acid rain undermine woodland ecosystems decreasing their ability to fix CO_2. Photochemical smog is formed by the interaction of nitrous oxides and hydrocarbons in the presence of sunlight and is concentrated rather than dispersed by the urban heat island effect.[67] Acid rain deposits 30 or 40 times the 'natural' levels of sulphates and nitrates on leaves. SO_2, a bye product of most combustion and a key ingredient of smog can also be removed from the air by plants although conifers are especially vulnerable to damage from SO_2. Moffat and Schiler suggest London Planes are SO_2 resistant. Choice of species must consider resistance to nearby sources of pollution. Plants unable to tolerate pollution are usually injured through their leaves. This is more common in evergreens than deciduous species since the former carry their leaves longer. Deciduous trees may lose their leaves but they are regenerated every year.

66 Charles A. Lewis, 'Healing in the Urban Environment', *APA Journal*, July 1979.
67 ibid.

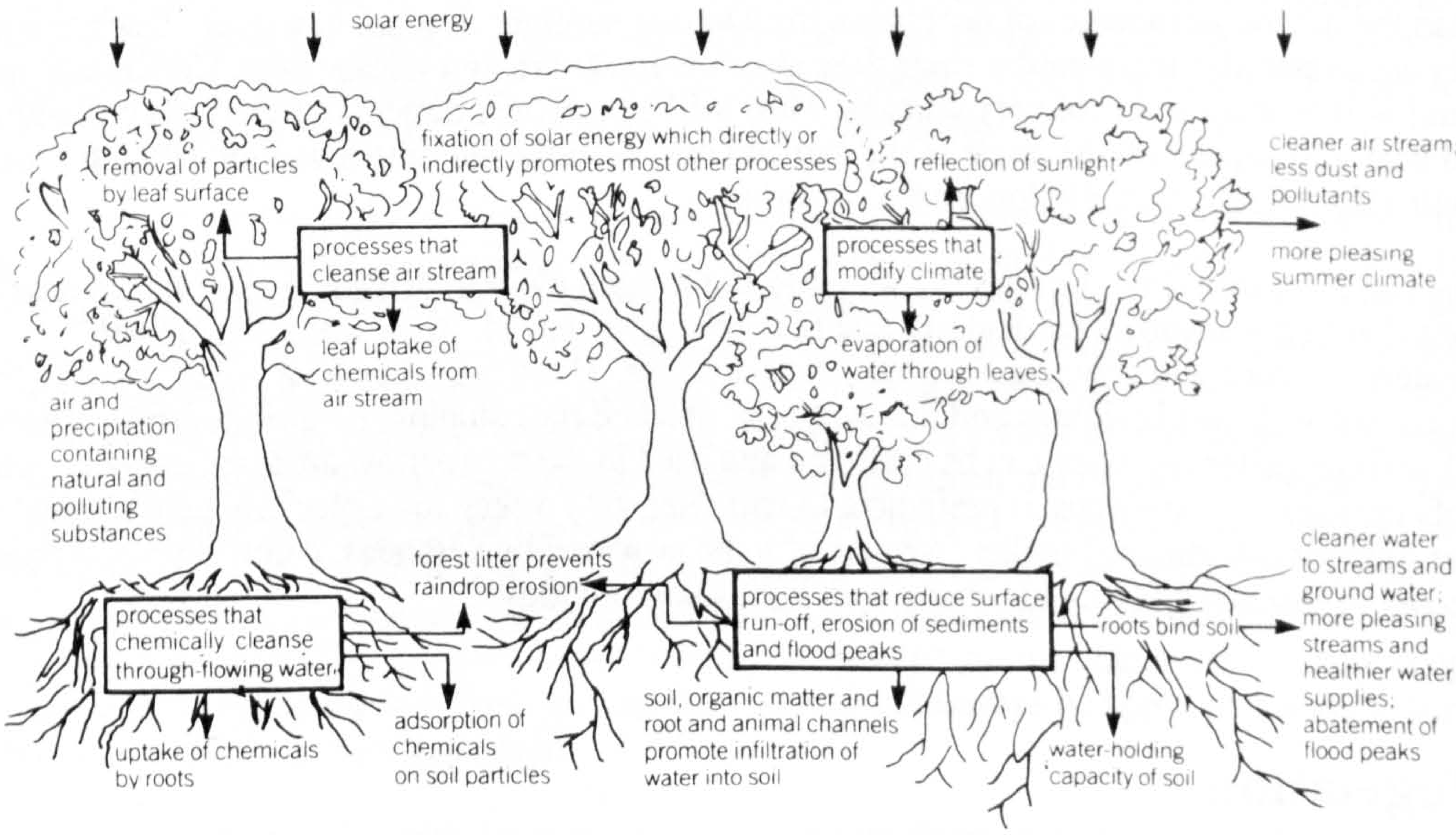


Fig. 3.9. The ecological contribution of trees[68]

Other Benefits
Plants are ideal for reducing glare and reflected glare and relatively inexpensive compared to traditional screens - aluminium, wood, fibre glass and canvas. Neither do they collect and re-radiate heat like heavy materials.[69] Careful selection of shape, size and density of foliage can fine tune the screening of light. Plants selectively filter out reds and blues which are most objectionable to the human eye (another case of adaptation to the needs of people). Trees and vines on a trellis screen the sun to provide a gradual change of brightness and eliminate sharp changes. There are three points at which to control natural light - before, on or after the reflective surface. Planting can also provide privacy for patios, terraces in the city. Used as screening vegetation provides a rich changing diversity of form, texture and colour. Although plants generally have insufficient mass to provide acoustical barriers they can screen noise in thick belts and change its character in thinner ones. Creepers grown on more substantial barriers can prevent sound reflection. Vegetation may make a degree of masking sound (white noise) in the slightest breeze that has a pleasant psychological effect. It will also scatter noise into the ground to some extent.

Trees
There is a need to make sufficient floor area available to allow tree planting in groups and along streets. Appropriate trees (appropriate to local climate and ecology) of adequate size should be used. Planning and choice of appropriate species may reduce maintenance requirements. The space needed is a shallow cylinder with its size dependent on species. Oak or Beech with a canopy diameter 15m have a root run of 16m and 2m deep. At least the central 5m by 5m pavement area should be open to the elements and can be gridded over to prevent soil being trampled since this denies free passage of air and water.[70] Reallocation of land on streets with reduced or calmed traffic provision may allow for trees to be planted to the north, or pockets of trees as shelter (see *Fig. 3.10.*).

Urban Planting, Climatic Planting and Ecosystems
Various uses of vegetation must be combined. Trees can be used to bringing together variety of add hock buildings, link them to human scale and restoring a person/nature relationship in the city. Conservation of existing mature trees may be important in maintaining sense of place. Retaining existing landscape features integrated into the design is however a rare occurrence in development that usually starts with site clearance. Climatic uses may conflict with 'urban' needs and ecological principles. There is often a need for a degree of 'urban use' of vegetation for security as for example trees without lower branches and creation of habitable *urban* places. This may conflict with introducing natural process into the city and the benefits of utilising specific climates, soil types and plant succession. I discuss 'ecological landscaping' in *Chapter Six*. In *Chapter Six* I also discuss the benefits of a co-ordinated urban forestry policy that combines planting at various scales and for various functions.

---

68 Jeremy Dodd, 'Greenscape 5 - Green Cities', *Architects Journal*, 10 May 1989.

69 Anne Moffat and Marc Schiler, *Landscape Design that Saves energy*, William Morrow and Company, 1981.

70 Jeremy Dodd, 'Greenscape 5 - Green Cities', *Architects Journal*, 10 May 1989.

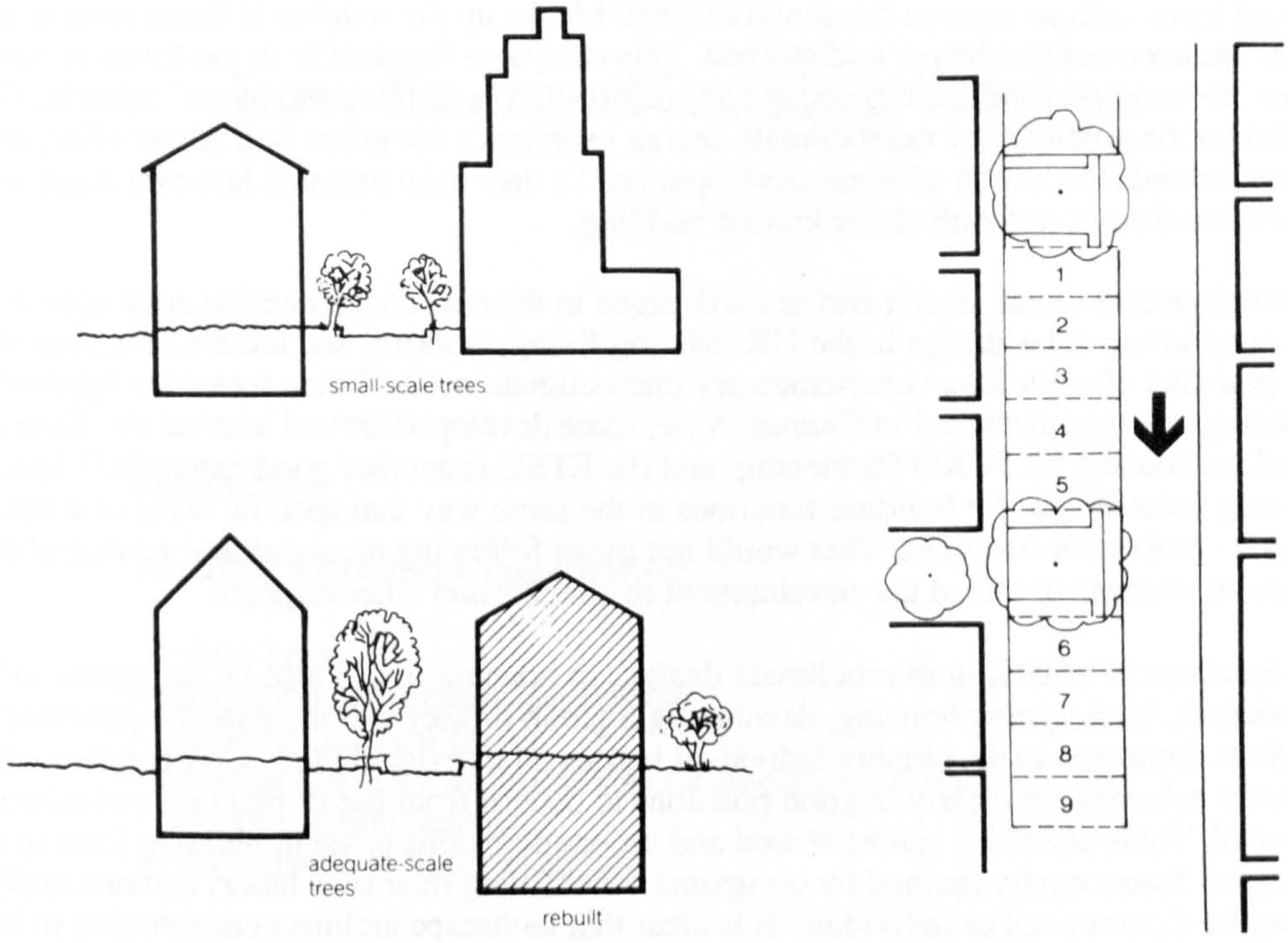


Fig. 3.10. Appropriate trees and potential of one-way street design[71]

Conclusions

With a knowledge of regional and local climate information and with the addition of reliable local experience it is possible to appreciate 'positive' and 'negative' climatic influences which can be modified to improve the microclimate of the site around a building and connecting buildings. Microclimate design principally involves balancing solar access and wind shelter with reference to specific uses of internal and external spaces and appropriate choice of materials and vegetation. It can reduce heat loss from buildings, improve habitability of specific external spaces, and is a prerequisite for utilising passive solar gains. It can also improve conditions for planting around buildings. Such planting can reduce local and city wide pollution levels.

Microclimate design can contribute to the development of sustainable cities by improving the external environments and increasing the attractiveness of city living and working. It can play a role in developing people friendly public and private space, around public buildings and along streets. Design changes at the microclimate level can produce significant individual benefits while through civic design the mesoclimate of cities may give background comfort levels that enhance the habitability and energy efficiency of cities. A city designed with the microclimate in mind may be one of increased external activity even in northern cities particularly if associated with provision to reduce car use. In the city centre policies could increase provision of external seated areas at appropriate locations and connected to appropriate functions. Creating sheltered routes by combing arcades, colonnades to protect the edges of open areas and using shelter of trees could encourage pedestrian use of cities. Public building complexes (hospitals, local government, universities) are particularly suited microclimate design. Planning and development control could differentiate local plans so people and appropriate spaces receive solar gains not storage buildings, roads or parking areas. To be most effective microclimate design requires early consideration in each project but preferably at the urban design level. Road layout is however, at present, often the first determinant in housing schemes. This produces cities shaped around the car that I have argued are both inefficient and unhealthy. Again reduced use of cars increases the possibilities for microclimate design that makes cities attractive to walk around.

Microclimate consideration will have a considerable effect on size, form, massing and orientation of buildings and on the form and planting of parks and squares. Clearly different forms and facades may belong to different microclimatic regimes, giving rise to a different architectural expression. Avoiding the creation of problems for surrounding buildings generally limits the height and volume of a project. Optimum densities in the UK however will not be suburban. Microclimate design with its consideration of all climatic elements and compromise between wind and sun suggests denser forms such as courtyards.

[71] ibid.

The traditional town with an uneven but low roofscape breaks up the wind as it blows over it leaving the warm air that has accumulated below undisturbed. This compares favourably to the forms postulated by Le Corbusier, for example, and the city today with its hostile city centres and 'open' suburbs. Given reduced pollution the potential for microclimate design to enhance the urban heat island effect during the heating season extends the notion of dense development. To date most research however deals with detached suburban houses not with closer knitted building.

Courtyard developments create shelter and as I will argue in the next chapter enable solar access appropriate to optimum solar design in the UK. Mixing living, working and leisure functions would increase the potential of exploiting complementary microclimate needs. These forms are approached in many co-housing schemes discussed in *Chapter Nine*, some developed around internal streets or atria. Spinney Gardens housing by PCKO Partnership and the ETSU is another good example.[72] Specific sites may climatically benefit specific building functions in the same way that specific areas of a site will benefit specific component functions. This would not mean following monocultural zoning of functions since there are advantages of mixed use development in climatic and other respects.

Prioritising functions is critical in microclimate design. In housing it will also be important to know the desires of residents. In designing housing, developing a group project will increase the potential of using the microclimate compared to developing individual houses on individual plots. Co-operative schemes or any participative schemes are clearly in good positions to benefit from use of planting and microclimate design in general. Tools and skills can be shared and accommodations made in building form to suit varying lifestyles. Sweat equity (gained by occupants contributing their own labor) is more easily gained in landscaping be it communal or individual. It is clear that landscape architect consultation in housing schemes would be valuable with advice preferably continuing after design is completed. Where the eventual owner or occupier is not known the potential is reduced. Dodd argues that integrated landscape planning at the local scale is still relatively rare. Further privacy distances of 21 m between backs of houses based on solar access enforced under planning permission are a distortion of the Tudor Walters Report 1918 concerned with solar access not privacy. Maintenance of privacy is dependent on detailed design and depends critically on the social relationships developed in a project.

[72] BRE, 'Climate and Site Development Part 3: Improving the microclimate through design', *BRE Digest 350*, Watford, April 1990.

Chapter Four:

Low Energy Housing Design

Introduction

Here I look at low energy and solar techniques with particular reference to housing in the UK and restrictions imposed by city sites. The effectiveness of the principal techniques is evaluated quantitatively. I attempt to demonstrate the potential of different techniques and the consequences for planning and construction. They can then be placed in relation to broader city issues such as the qualitative benefits of certain techniques, the energy capital of appropriate materials and of the existing city fabric, and the importance of participation. I suggest benefits of utilising the full range of low energy options available within a given housing development. This will enable optimum use to be made of complementary user requirements and heating schedules. Mixed use development within a dense city fabric will increase the possibility of utilising complementary demands of different functions as well as reducing energy use in travel. In *Chapter Five* I go on to develop a strategy for adapting our built environment.

Here I look at low energy design to explore the following key issues:

- feasibility of energy efficiency and solar design in northern latitudes;
- applicable methods and rules of thumb for UK climates;
- relative contributions of the 'free' elements of passive solar design (e.g. spatial arrangement techniques within buildings and groups) as opposed to increasing insulation;
- appropriate urban density for utilising solar gain and conservation;
- appropriate construction materials and methods.

In *Chapter Five* I place the techniques in relation to:

- the contribution of the built environment to UK energy consumption;
- the qualitative potential of different methods;
- the 'energy capital' and impact of extraction and manufacture of materials;
- the relative potential of the existing fabric and thus future strategies (new build or conservation);
- user effects on performance and the benefits of participation;
- consequent notions of district and city scale design and adaptable 'supports'.

The following discussion is based around the basic equation for energy conservation and utilisation of solar radiation in use.[1]

Solar Gains	+	Incidental Internal Gains	+	Auxiliary Heating Requirement	=	Fabric Loss	+	Ventilation and Infiltration Loss
(Heat Gain)					=	(Heat Loss)		

Here I deal mainly with housing, but later suggest the potential for mixed use development that offers benefits of complementarity.[2] Three basic architectural approaches to energy-efficiency in housing have emerged:

- compact well insulated form with small window openings excluding the impact of the external environment and requiring a well designed ventilation system (possibly with heat recovery) to control the internal environment and the risk of condensation;
- a passive solar approach that combines the beneficial climatic impact of solar gain, natural ventilation and wind shelter with increased levels of insulation to maintain gains in the fabric;
- active design that adds remotely collected solar energy to the auxiliary heating system again within an insulated fabric.

Within the context of this thesis passive solar, active solar and superinsulated design are seen as a continuum of consideration following microclimate analyse (see *Chapter Three*). Although these three methods are distinct they are clearly linked and overlap. Many passive systems are hybrids of passive and active technologies and have increased insulation values. The best use of any combination of the three will depend on the particular situation. A major problem in implementation of all the techniques is the gap between economically viable savings and technically possible savings.[3] Passive solar design is

---

[1] Ralph Lebens, *Passive Solar Architecture in Europe*, Architectural Press, 1980.
[2] Donald Prowler and Douglas Kelbaugh, 'Building Envelopes,' in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.
[3] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991. p 91

discussed in more detail here since it is a limiting factor in planning (it requires solar access). Further using 'free' energy from the sun seems potentially our most benign solution also involving minimum material input. In city situations use of solar energy locally will not always be possible or desirable. A shaded corner site, for example would necessitate well insulated or active solar design or reliance on some neighbourhood or more centralised renewable production. Individual building design depends on decisions at the level of urban morphology. Who lives where, how different functions are related on the city or community level, and the arrangement of buildings in relation to the microclimate will all influence the potential low energy design of an individual building.

4.1. Heat Loss and Conservation

The first requirement for energy efficient design and the effective utilisation of passive solar energy, in temperate climates, is reduction of heat loss so that heat originating from solar gains, internal gains and auxiliary heating systems can be retained within the building for as long as possible. Heat loss from a buildings is due to either, the thermal transmittance of the building envelope (fabric loss), or penetration of outside air (infiltration and ventilation loss).

4.1.1. Fabric Loss

Transmission losses are stated in terms of heat flow through the envelope per unit of time (J/s or W). They result from conduction through, and convection and infra-red radiation from, external building components. Fabric loss is proportional to the difference between internal and ambient temperature, surface areas and the thermal resistance of the fabric. The thermal resistance of a fabric element is equal to the sum of the thermal resistance's of its components and coefficients of the wall-to-air films at the two faces of the element. The thermal resistance is the reciprocal of conductivity. Conductivity (W/mK) is a measure of the heat that will pass through a unit thickness of material in one second if the temperature difference is 1K (°C). Conductivity is influenced by density, water content, pore size and type of material around the pores. The best common insulation material is air provided it remains dry and still. Dry, porous materials with many small air pockets are thus good insulator's. The thermal conductivity of air is 0.026W/mK compared with water 0.58W/mK.

Film coefficients contribute to thermal resistance because heat has to change its mode of propagation from conduction to convection and radiation or vice versa at each side of the wall or fabric element. Factors influencing film coefficients include roughness of the surface, temperature difference between the wall and the air, air speed, direction of heat flow and the radiation characteristics of the surfaces under consideration and adjacent surfaces.[4]

There are thus several ways of reducing transmission losses.

• Reducing the indoor outdoor temperature difference; by reducing indoor thermostat temperature (dependent on environmental awareness and lifestyle as well as the quality of internal heat [preferably radiative]), building underground or using *microclimate* design to increase external temperatures. Zoning, as for example, adding unheated buffer spaces around heated zones is also a way of reducing temperature differences (these may be stores or, occasionally and seasonally occupied solar spaces).
• Reducing the external area of the building (in relation to volume) by maintaining a simple and compact plan form.
• Increasing the thermal resistance of the fabric or the surface air films adjacent to them. This is achieved most commonly by adding or increasing insulation thickness and using double glazing thus adding an air gap. As noted microclimate shelter design can increase thermal resistance of surface/air film by keeping air still. It may also prevent or reduce periods of saturation of a fabric element and thus prevent higher conduction levels (conduction is increased if pores are saturated with water).
• Adding barriers to radiative heat flow by, for example, placing reflecting materials such as silver foil behind radiators or using low emissivity glazing. These reflect back long wave radiation.

---

[4] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A primer for Architects*, Batsford for Commission of European Communities, 1992.

Thermal Resistance of Opaque Elements
The normal indicator of thermal resistance of a construction is the U-value, calculated by taking the reciprocal of the sum of the thermal resistance's of each of the elements that make up the cross section (including surface resistance's). For compliance with statutory requirements and comparing constructions the U-value through the main insulated part of the fabric will be sufficient. For assessment of building energy requirements however an average value for each building component is required. This will area weight the U-value across studs, joists lintels etc. Heat loss through roof, walls and floor can then be compared. For given U-values heat loss from the roof, floor, walls will vary widely depending on relative area and thus house type, for example, roof loss will be high in a terraced house compared to a detached house. When adding insulation it may be best to insulate according to percentage of heat loss or insulate areas with perhaps less effect but that are difficult to upgrade (e.g. floor if taken up anyway).

Advantage of Timber Frame
The lowest U-value is usually set by economic factors. Frequently the limit is set not by cost of additional insulation but by changes to standard construction to accommodate additional measures. Timber frame is more appropriate than brick construction in this respect. Pitts gives cost effective U-values in timber framed buildings as: roof 0.25 - 0.15W/m^{2}K; wall 0.45 - 0.20W/m^{2}K; floor 0.45 - 0.15W/m^{2}K.[5] A brick/lightweight block cavity construction with lightweight plaster and 50mm polystyrene slab gives a U-value of 0.4W/m^{2}K.[6]

Thermal Resistance of Transparent Elements
Reducing heat loss is ideally achieved by designing all elements with a similar U-value.[7] This is impossible for windows. The recommended wall U-value in the 1990 building regulations revisions is 0.45W/m^{2}K, achieved typically by a brick/block cavity wall: brick 110mm, cavity 55mm (filled with insulation), concrete block 100mm (650kg/m^3) and plaster 13mm.[8] Single glazing in a timber frame (10% of area) under normal exposure has a U-value of 5.3 W/m^{2}K.[9] For energy efficient designs (not using solar energy) the window area is thus minimised.

A single glazing U-value of 4.5W/m^{2}K suggests a heat loss 15 times that of the typical insulated value for elements of timber frame construction (U-value 0.3W/m^{2}K). Single glazing is thus not a realistic option in low energy housing. The internal temperature of the glazing will also be much lower than other internal surfaces producing body heat loss by radiation to these surfaces and encouraging down draughts and condensation. Increasing layers of glazing decreases the U-value principally by trapping air. A heavy gas can be placed in the cavity further reducing convective heat losses (e.g. argon) and a selective surface (low emissivity) added to the glass that is transparent to solar radiation but reflects long-wave radiation. Double glazing with a 6mm air gap has a U-value of 3.4W/m^{2}K and with a 12mm air gap 3.0W/m^{2}K.[10] TRADA argue that double glazing should be a minimum requirement but for principle habitable rooms further measures may be taken. Low emissivity, argon filled, double glazing has a value of 1.8W/m^{2}K.[11] Triple glazing has a similar value. Adding 50mm of wood wool slab in an insulating shutter to the double glazing value above would give a U-value of 0.9W/m^{2}K when closed. All these figures vary with frame material, frame area and exposure. The *energy balance* of windows taking into account solar gain (thus orientation) and movable insulation is discussed below (*4.2.2. Useful Solar Gain*).

4.1.2. Infiltration and Ventilation losses

Renewal of air is critical to maintain comfort levels of oxygen and humidity and to control pollutants. Typical domestic levels of air change rates are 0.5 to 2 ac/h.[12] Infiltration and ventilation losses however account for 30-35% of heat losses in housing. In well insulated houses this goes up to about 50%, even with draft-stripping. These losses are largely determined by the lifestyle and behaviour of the occupants. BRE research has suggested that total space heating energy consumption of identically constructed dwellings will vary by as much as 4:1.[13] An important feature of controlling ventilation and infiltration losses is *effectively* informing occupants of possibilities and providing controls they can use.

---

[5] Geoffrey Pitts, *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989.
[6] ibid.
[7] Jake Chapman, 'Energy Efficient Houses The Principles', *Architects Journal*, 9 November 1988.
[8] Peter Burberry, 'Building Regulations 1990 Revisions: Part L', *Architects Journal*, 29 February 1990.
[9] John Page and Ralph Lebens, *Climate in the United Kingdom*, HMSO, London, 1986
[10] ibid.
[11] David Turrent and Koen Steemers, 'Domestic Low Energy - 4 Beyond the Regs', *Architects Journal*, 11 April 1990.
[12] ac/h = air changes per hour: the volume of fresh air introduced as a ratio of the building space under consideration, ibid.
[13] Ralph Lebens, *Passive Solar Architecture in Europe*, Architectural Press, 1980.

Infiltration
Infiltration refers to accidental ventilation and results from open windows, chimneys and ventilation ducts, gaps between building components, joints around movable elements and penetration of air through building components under pressure from wind. The degree of infiltration loss will also depend on wind speed, resulting pressures due to fabric form and temperature differences between internal and external air. The general strategy for low energy housing is to reduce uncontrolled ventilation allowing minimum controlled ventilation (air change) as required at specific times and locations. Poured concrete inner leaves, cavities filled with insulation, windows fitted with cavity closers, buffering doors and porches, weather striping doors and windows and sealing around services may all reduce loss. Since vertical air paths are usually the dominant form of uncontrolled infiltration due to the stack effect draught proofing any loft hatch's is important.[14] Microclimate shelter design as discussed can reduce infiltration heat loss by reducing wind pressure and creating still air pockets at critical points of a building. Building shapes will affect pressure differences. Draught lobbies can be used and openings kept away from building corners. It should be noted that, for example, poured concrete inner leaves, involves changes in site techniques and process.

Ventilation
In well insulated, well sealed houses with low rates of air infiltration problems of condensation and the need for good air quality are increased. Turrent and Steemers note that in well sealed houses background infiltration rates of 0.2 ac/h have been recorded.[15] These levels make controlled ventilation essential. Minimum rates of between 0.6 and 1 ac/h are recommended to avoid problems of condensation. Higher ac/h will be needed in high contamination areas or at specific times. If whole house mechanical ventilation is not used humidistat controlled extract fans can be used in moisture producing areas such as kitchens and bathrooms. Provision of small openings separate from windows (trickle vents) can give greater ventilation control (easily adjusted and sealed when closed) and should be provided in all habitable rooms.

Ventilation losses can be further reduced mechanically by pre-heating ventilation air in a heat exchanger (necessary in superinsulated houses) or by drawing outside air through a space or over a surface heated by solar energy (see sunspaces). Whole house mechanical ventilation with heat recovery is a rarity in the UK although standard in the Scandinavia.

Passive ventilation can be enhanced by the 'stack' effect - a strategy that uses buoyancy of solar or otherwise heated air extracted at high level. Tall volumes through buildings such as stairwells, double height sunspaces/atriums or chimneys will induce natural ventilation. The outlet should be independent of wind direction that may reverse flow. Passive stack ventilation can be used to ventilate each room independently via a duct linked to a ridge vent.[16] Outlets to kitchens and bathroom suitably placed can prevent water vapour and odours being distributed around the house. Heatwise in Glasgow used a combination of location of washing machines in added sunspaces, and stack ventilation to reduce condensation risks.[17] In addition with increased airtightness it is important to reduce potential for internal pollutant build up or introduction of contaminated ventilation air.

4.1.3. Incidental Internal Gains

Incidental heat gains are caused by the processes of living in a building. These include cooking, water heating, lighting and washing. Most forms of energy use, electrical or mechanical, result in heat inputs along with those from people (as much as 1000 Watts per adult per day). In a well insulated (superinsulated) building these gains can provide a significant proportion of heating demand. The distribution of internal gains throughout a building will vary considerably from one building to another depending on occupancy and type of use. This chapter is concerned with housing (skin load dominated buildings) where contributions tend to be less but even in the domestic sector, the pattern generated by one family will differ from another. Heat generating activities such as laundrettes may, on a community scale, produce heat for use elsewhere with condensation problems dealt with outside each house. In their entry to the First European Passive Solar Competition Jourda and Perraudin grouped heat generating equipment in a central core for winter occupancy thus maximising their benefit. The variation of particular sources with time of day may be utilised.

---

[14] Jake Chapman, 'Energy Efficient Houses The Principles', *Architects Journal*, 9 November 1988.
[15] David Turrent and Koen Steemers, 'Domestic Low Energy - 4 Beyond the Regs', *Architects Journal*, 11 April 1990.
[16] BRE information paper, *Passive stack ventilation of dwellings*, IP 21/89.
[17] Brenda and Robert Vale, *Towards a Green Architecture*, RIBA Publications Ltd, 1991

	kWh/day
Occupants	4.0
Lighting	1.5
Appliances and Cooking	6.5
Hot Water	3.0
Total	15.0

Fig. 4.1. Kitchen and typical house hold gains for a house with three bedrooms[18]

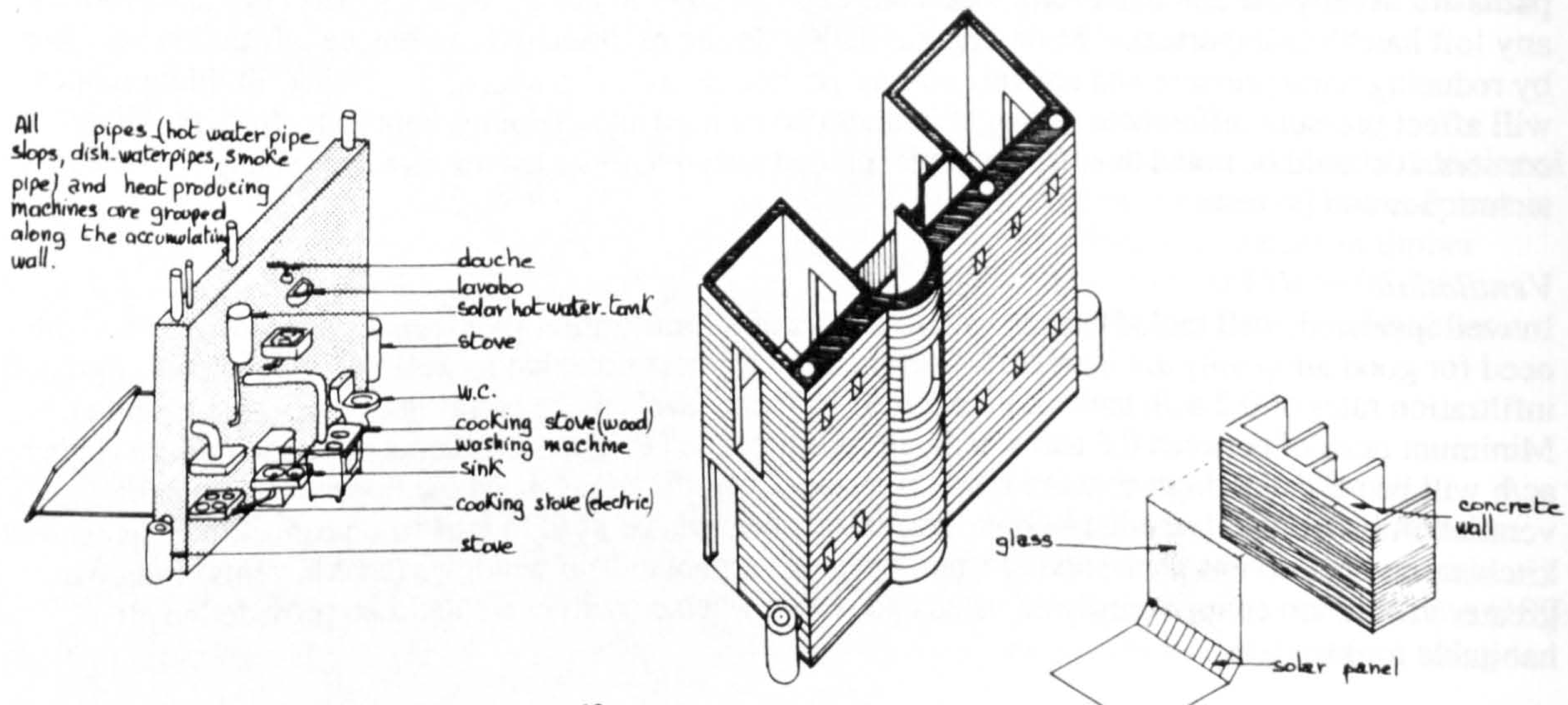


Fig. 4.2. Jourda and Perraudin design[19]

4.1.4. Thermal Capacity and Response for Energy Efficiency

The thermal capacity of a building component is a measure of its capacity to absorb and store heat. It is usually expressed in terms of specific heat capacity (kJ/kgK) the amount of heat added (kJ) to a quantity of material (Kg) to raise its temperature by 1K. A high specific heat means more energy stored for less temperature increase in the material. The storage capacity of building material is mainly dependent on the density of the material thus in general terms the higher the mass the greater the thermal capacity. The volumetric heat capacity or thermal capacity may be more useful in considering construction.

Volumetric specific heat (kJ/m^3K) = Specific heat capacity (kJ/kgK) *density (kg/m^3)

Material	*Density (kg/m^3)*	*Volumetric specific heat (Wh/m^3K)*	*Temperature rise (K) from application of 1kW to $1m^3$ for 1h*
Concrete	2100	490	2.0
Brickwork	1700	380	2.6
Lightweight concrete	1000	280	3.6
Plasterboard	950	220	4.5
Timber (softwood)	600	200	5.0
Plywood	530	200	5.0
Fibreboard	300	80	12.5
Mineral Wool	12-40	10	100
Water	1000	1160	0.8
Air	1.2	0.03	3030

Fig. 4.3. Volumetric specific heat for building materials[20]

[18] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A primer for Architects*, Batsford for Commission of European Communities, 1992. p86

[19] Jourda and Perraudin, 'First Prize, Category C - Single Dwelling', in Ralph Lebens, *Passive Solar Architecture in Europe*, Architectural Press, 1980.

[20] Geoffrey Pitts, *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989. p39

The thermal response of a construction is the time taken for the surface temperature and the associated room temperature to reach a given level. Response time is rapid if insulation is close to the room surface (low thermal capacity construction) which warms quickly to comfort temperature with heat input. High thermal capacity construction will warm up slowly since energy is needed to heat the high mass. High, medium and low thermal capacity constructions are usually defined.

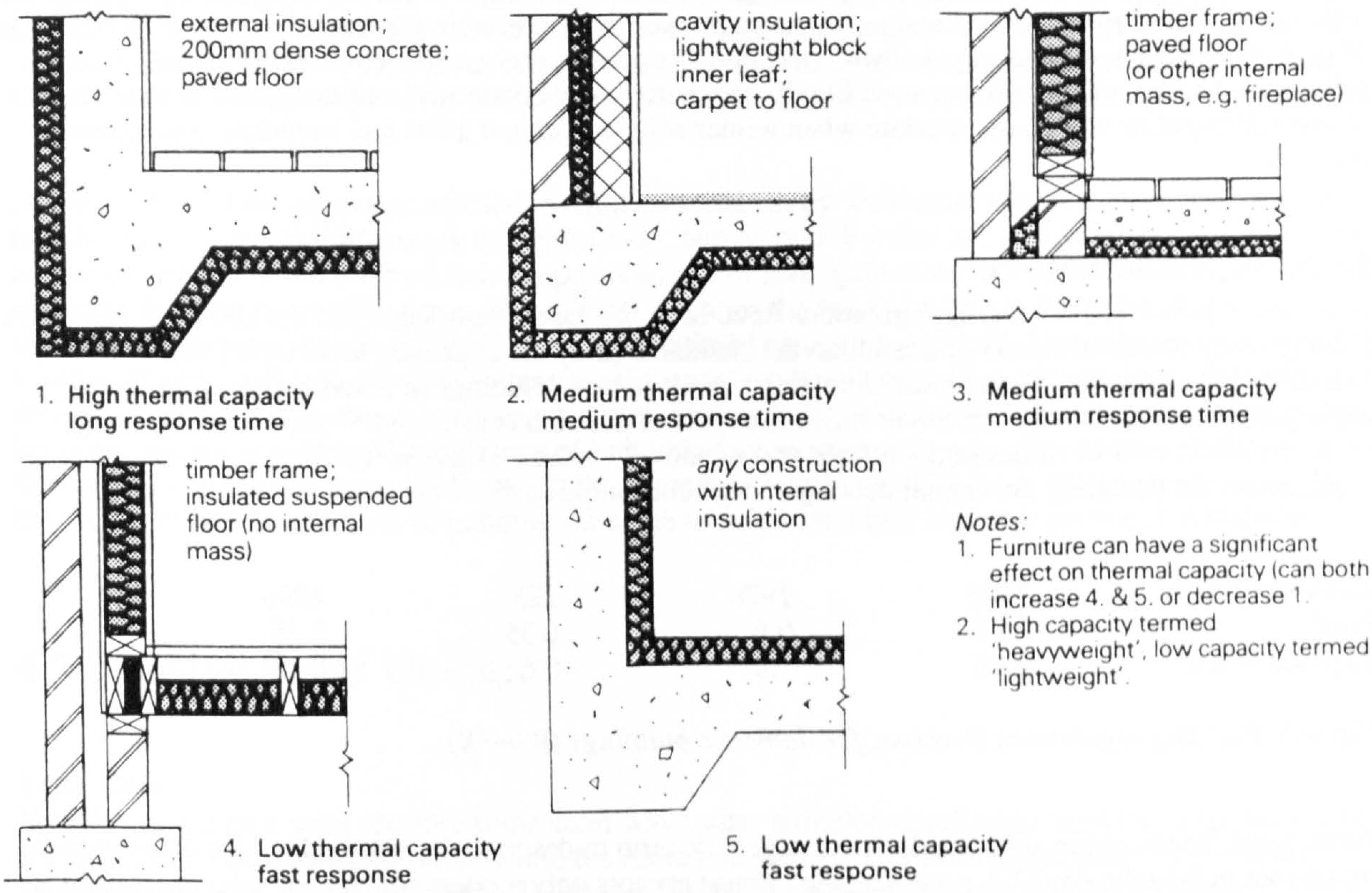


Fig. 4.4. Definitions of thermal capacity[21]

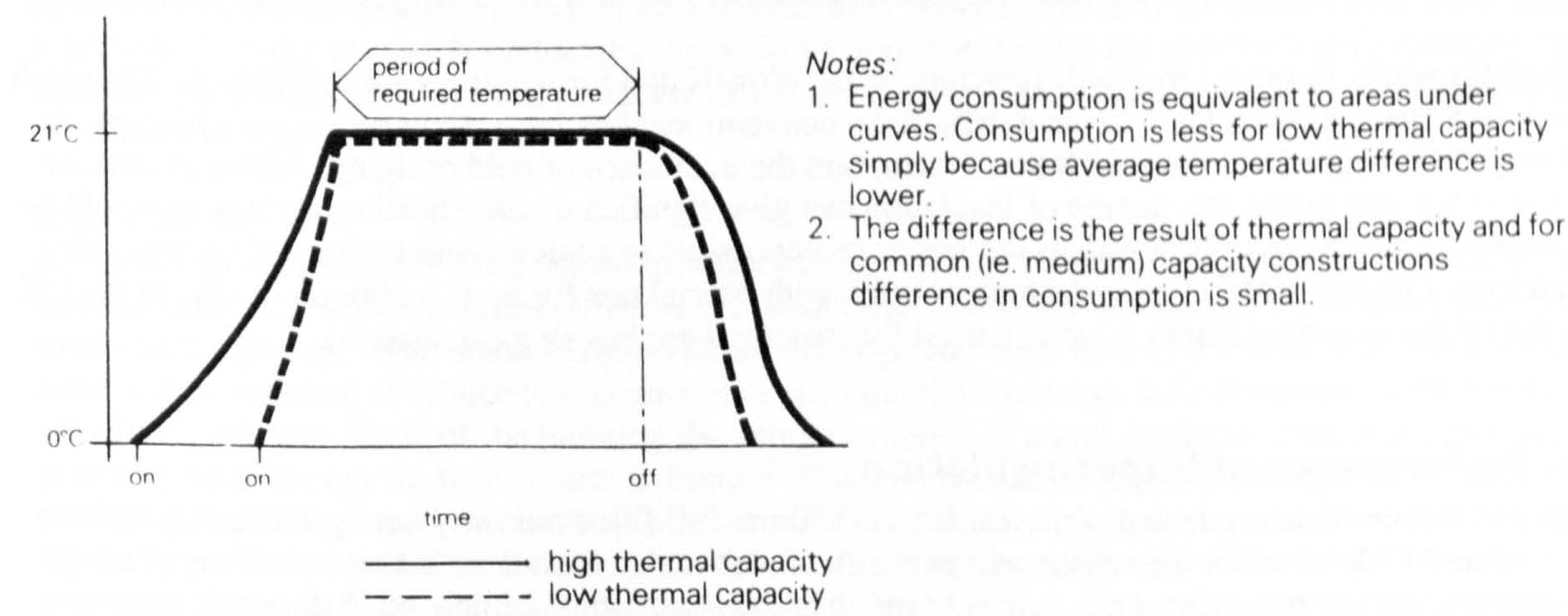


Fig. 4.5. Time/temperature curves for thermal capacity variation[22]

The total thermal resistance does not affect the thermal capacity but the position of the insulation does. Only those materials internal of the insulation influence the thermal capacity of a construction. External insulation increases the thermal inertia. In the UK any thermal capacity combined with any heating and occupancy pattern can provide comfort but not all combinations will be energy efficient. For energy efficiency the level of thermal capacity and response time should be appropriate for the occupancy/heating pattern, orientation, building form and internal planning. Heating patterns are normally intermittent to some degree and typically range from morning and evening only (single

---

[21] ibid. p41
[22] ibid. p41

person/working couple) to continuous for most of the day but not overnight (parents with young children/elderly people). A very heavy construction is inappropriate for intermittent heating as heat will be required for a longer period before occupation but will not be used from storage after occupation. The longer the heating is on the greater the heat loss. While the heavyweight construction will store heat residents are unlikely to switch off before they actually leave the house because temperatures will fall slightly i.e. the residual heat is not always useful. With more continuous heating thermal response will be less important and resistance critical as the average internal temperature is relatively constant. Knowledge of type of housing and occupants is then important to optimise energy efficient design. In most cases occupancy will be somewhere between highly intermittent and continuous and thus some medium level of thermal capacity will be appropriate when winter solar and casual gains and summer overheating is considered.

4.1.5. Superinsulation

U-values required in the building regulations have been increased significantly in the UK since the 1960's although they remain far short of Scandinavian standards (they are at present level with 1935 Scandinavian standards). A common U-value for walls in new buildings in Sweden is $0.2W/m^2k$ and triple glazing is standard. A typical air infiltration rate of 0.1 ac/h is achieved.[23] The Finish Building Code stipulates wall U-values $<0.28W/m^2k$ and window U-values $<1.8W/m^2k$. There is also a requirement for declaring the annual heating energy consumption.[24]

Element	*1965*	*1976*	*1985*	*1990*
Roof	1.47	0.6	0.35	0.25
Exposed Walls	1.56	1.0	0.6	0.45

Fig. 4.6. Building regulations U-values for domestic buildings (W/m^2K)

Turrent and Steemers use superinsulation as a generic term to describe the standards of insulation which are current in Scandinavia.[25] A superinsulated house accepts only modest amounts of solar energy but is highly insulated and airtight so that it is kept warm almost entirely by casual internal gains. Insulation is increased by reducing window areas to a minimum. William Shurcliff defines a superinsulated house as one where the south facing window area does not exceed 8% of its floor area since, if the area is much greater, intake of solar energy may be as important as conserving heat from various internal sources.[26]

U-values for walls, floor and roof will typically be $0.2W/m^2K$ and for windows $1.4\text{-}1.8W/m^2K$. The result is a very low space heating load, to the extent that a conventional heating system becomes redundant. As noted care must be given to the ventilation system and the avoidance of cold bridging. Although not cost-effective at UK gas prices this degree of insulation can give significant space heating savings (it would be encouraged by a fuel tax). These values are however impossible to achieve with traditional cavity wall construction. Construction is timber framed or brick with special ties for up to a 300mm cavity. In the UK when the cavity exceeds 150mm there is a need for structural engineering calculations.

4.1.6. Performance of Superinsulation

Brenda and Robert Vale argue that superinsulation (150mm full-filled masonry cavity walls, 300-400mm in the roof and 150mm under the whole area of the floor slab and at least double low-emissivity glazing) can reduce the energy usage for space heating (and thus CO_2 emissions) of new build domestic scale (building regulation) buildings by 80%.[27] Air-tightness would also be required with use of pre-warmed ventilation air drawn through a conservatory or through a mechanical heat recovery system. These levels meet Swedish Building Regulations and timber framing can easily accommodate such levels.

---

[23] Jan Gustén, 'Energy Efficient Building: Sweden', *European Directory of Energy Efficient Building*, James and James Science Publishers, London, 1993.
[24] Reijo Kohonen, 'Energy Efficient Building: Finland', *European Directory of Energy Efficient Building*, James and James Science Publishers, London, 1993.
[25] David Turrent and Koen Steemers, 'Domestic Low Energy - 4 Beyond the Regs', *Architects Journal*, 11 April 1990.
[26] William Shurcliff, *Super Insulated Houses and Air to Air Heat Exchangers*, Brick House Publishing Company, 1987.
[27] full specification in Brenda and Robert Vale, 'Building the Sustainable Environment', Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London 1993.

Given such high levels of insulation Brenda and Robert Vale argue that solar gain can provide 20% of the space heating energy in buildings orientated within 30° of South. As a universal principle however there are several problems to superinsulation and the reduction in window areas and 'tightness' that it implies. These mean that the equivalent levels of performance achieved not by reducing window size but designing for solar gains will have a significant role to play. As I will describe useful solar gains can be gained from windows within 45° east or west of south. Chapman argues that in energy efficient houses (wall U-value 0.3W/m^{2}K) solar gains can provide 1/4 to 1/2 of space heating averaged over the heating season. This means up to 3/4 at the start and end of the heating season although the danger of overheating is consequently high.[28]

I have mentioned the insulation restrictions of traditional cavity wall construction. Linked to this is the fact that most of our building stock involves brick construction. Further as I will go on to note increased insulation over an optimum level reduces potential use of solar gain since it reduces the effective heating season to the least favourable times (mid winter). Perhaps the most significant problems involved with superinsulation however are qualitative. A superinsulated air tight house with its mechanically controlled ventilation and small area of window despite efficiency can be questioned in terms of amenity value. The defined small area of glazing cuts down on views, natural light and sunlight, and the spatial relationship between inside and outside. Air-tightness of buildings is a problem in terms of internal pollution. Superinsulation may be more applicable to the climate in Sweden and Finland. Alternatively it may be the only energy efficient form of building for some locations and best suited to particular occupants.

4.2. Passive Solar Design

Solar Gain

With incidence on a solar aperture some short wave solar radiation is reflected from the outer surface of the glass, some is transmitted directly into the room and some is absorbed by the glass itself. Of the absorbed proportion about 1/3 eventually appears in the room and 2/3 is released to the outside through convection or as long wave radiation.[29] Exact proportions depend on temperatures of the air and the translucent and adjacent surfaces and on the air speed on both sides of the glazing.[30] A small fraction of transmitted radiation is reflected back out again but most is subsequently absorbed by the walls floor and other solid elements which heat up and then re-emit long-wave (infra-red) radiation. Long wave radiation is prevented by the glazing from leaving the building and thus creates the opportunity of reducing the need for space heating. When this radiation strikes the glazing part is reflected and part is absorbed and re-radiated to both surfaces.[31]

Solar Design

All buildings are passively solar heated to some extent. In highly insulated envelopes with little internal thermal mass (e.g. superinsulated timber frames) care must however be taken to avoid using too much south-facing glazing. With south-facing window areas greater than 10% of the floor area some thermal mass will be required to reduce temperature swings. Patrick O'Sullivan defines passive solar design as the use of the form and fabric of the building (building elements) to admit (collect), store and distribute primarily solar energy for heating and lighting.[32] This involves three primary configurations: direct gain, indirect gain and isolated gain. In the purest forms of passive solar design, the processes of heat transfer occurs by natural convection, conduction and radiation using the subtleties of the energy transfer properties of the building materials. Systems may, however be designed with an 'active' element such as a fan to assist circulation of air or carry air to a storage medium. This is then referred to as a 'hybrid' system.

[28] Jake Chapman, 'Energy Efficient Houses The Principles', *Architects Journal*, 9 November 1988.
[29] Neil Milbank, 'Housing: The Passive Solar Approach to New and Existing Domestic Buildings', in Patrick O Sullivan (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985.
[30] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A primer for Architects*, Batsford for Commission of European Communities, 1992.
[31] ibid.
[32] Patrick O'Sullivan, 'Passive Solar Techniques and their Application in Existing and New Technology', in Patrick O Sullivan (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985.

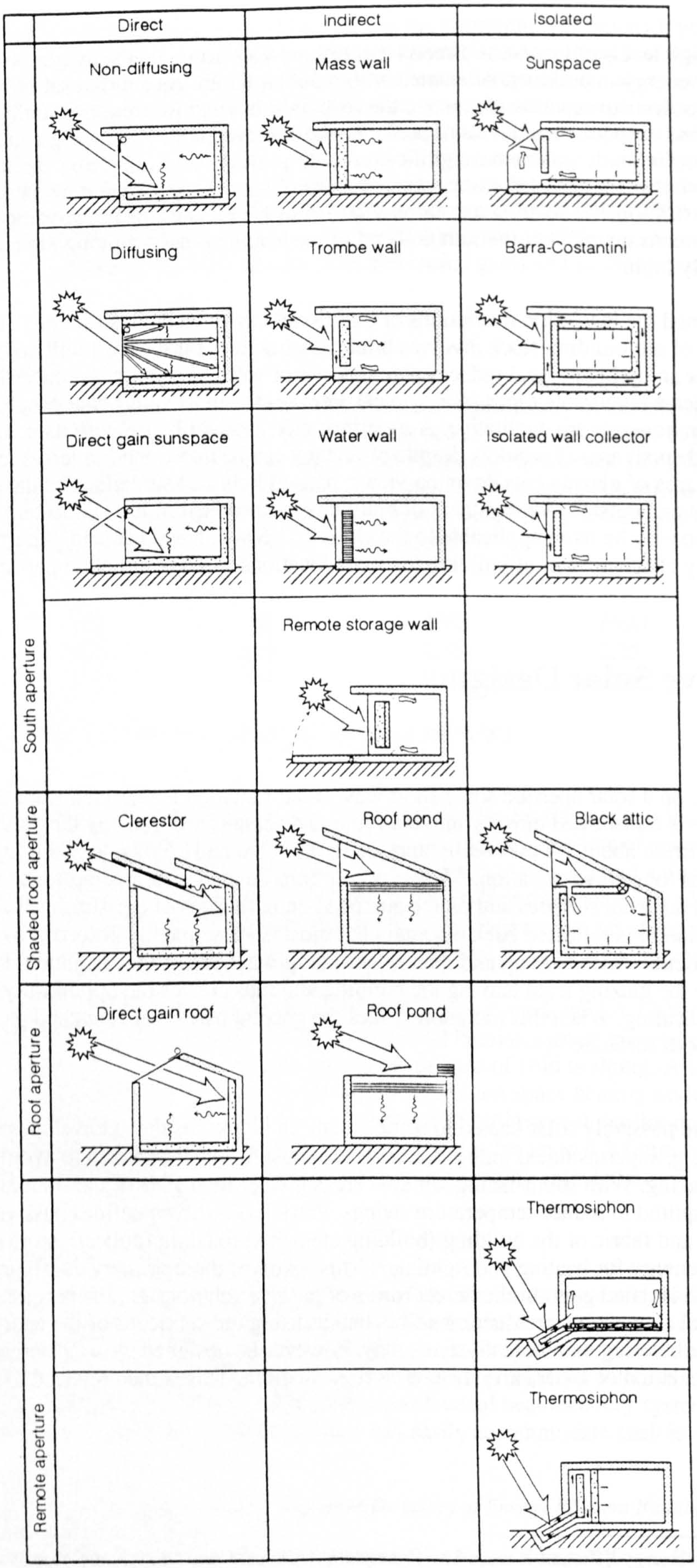


Fig. 4.7. Generic passive solar types[33]

[33] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C.E.C, 1992. p66

4.2.1. Direct Gain: Principles

Direct gain systems are the simplest form of solar design consisting basically of a well insulated house with south facing glazing that admits low angle solar rays. Direct gain systems use the envelope of the occupied spaces of the building to *collect, store and distribute* solar heat. Since a direct gain system is basically 'a live in collector' some thermal mass is essential to reduce temperature swings as well as to retain some heat for evening use. In making appropriate use of direct gain the plan will be manipulated to enable the main living areas (living rooms and main bedroom) to face as near south as possible with kitchens bathrooms and stores to the north. Most existing houses have a reasonable proportion of south facing windows and have a solar contribution of over 10%. It is however often the lack of controlled planning, appropriately located thermal storage and low insulation values that prevents them from benefiting fully from solar gains.

4.2.2. Useful Solar Gain

The aim of a passive solar system is to maximise solar gain during the heating season to provide comfort conditions without causing overheating. If overheating occurs energy will be thrown away and thus the solar gains are not 'useful'. 'Useful' solar gains are those that reduce the space heating load either at the time the gain is received or later after storage. It is useful solar gains that were referred to in the solar equation that appeared at the start of this section. Factors determining the 'usefulness' of solar gain include:

- latitude and weather,
- orientation and tilt of the glazing external reflectors and overshadowing,
- transmission characteristics of the glazing system (solar radiation in, thermal radiation out),
- area of glazing,
- thermal insulation standards,
- thermal mass and building contents,
- distribution system and zoning,
- pattern of occupancy and demand,
- responsiveness of heating controls and systems,
- control by occupants and thus effective feedback.

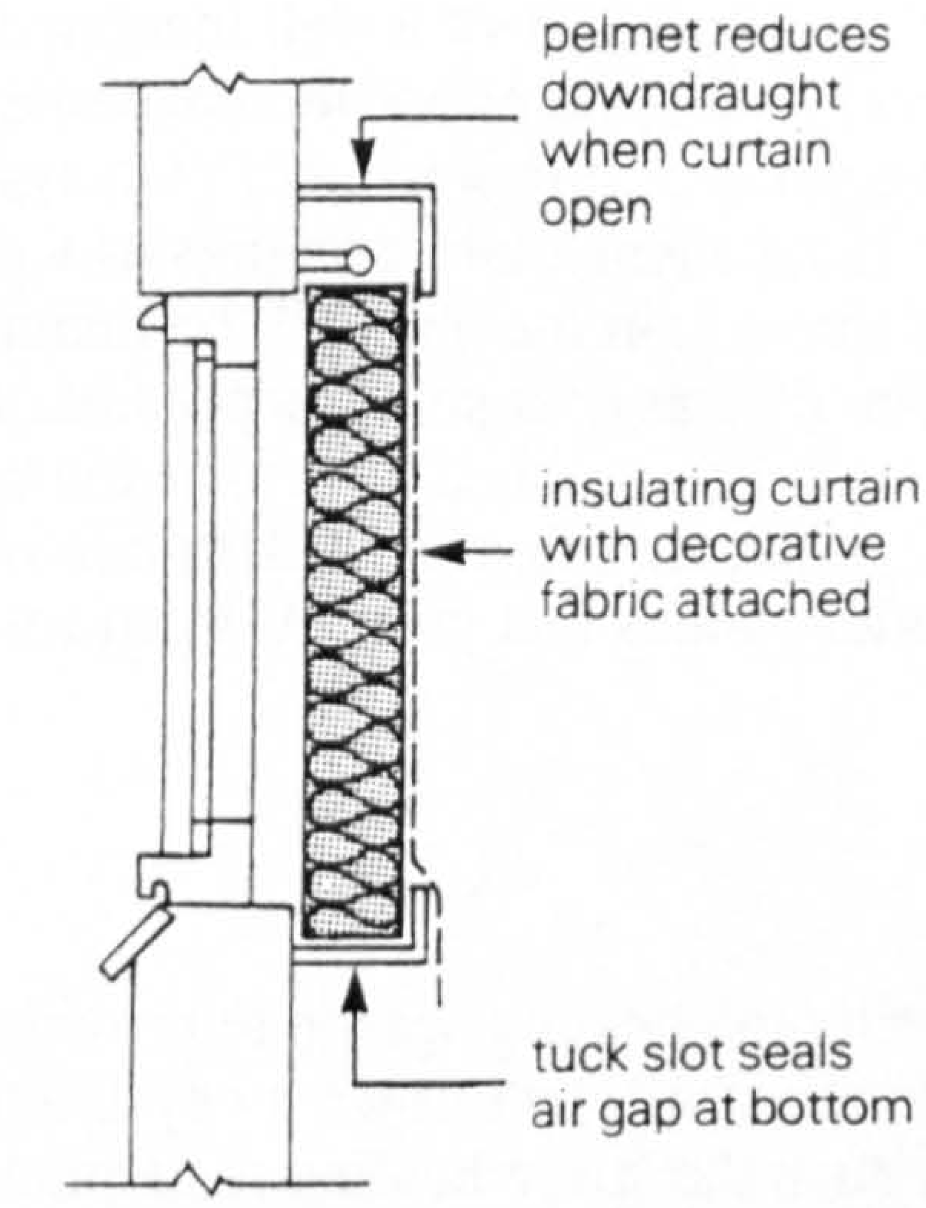
Glazing Type

Design should ideally maintain efficient transmission of solar energy and reduce heat loss. With double glazing the total transmission is lower than single glazing but insulation is considerably increased. With double low-emissivity glazing the transmittance will be lower still but since it inhibits long wave radiation a greater proportion of thermal energy will be retained in the building.

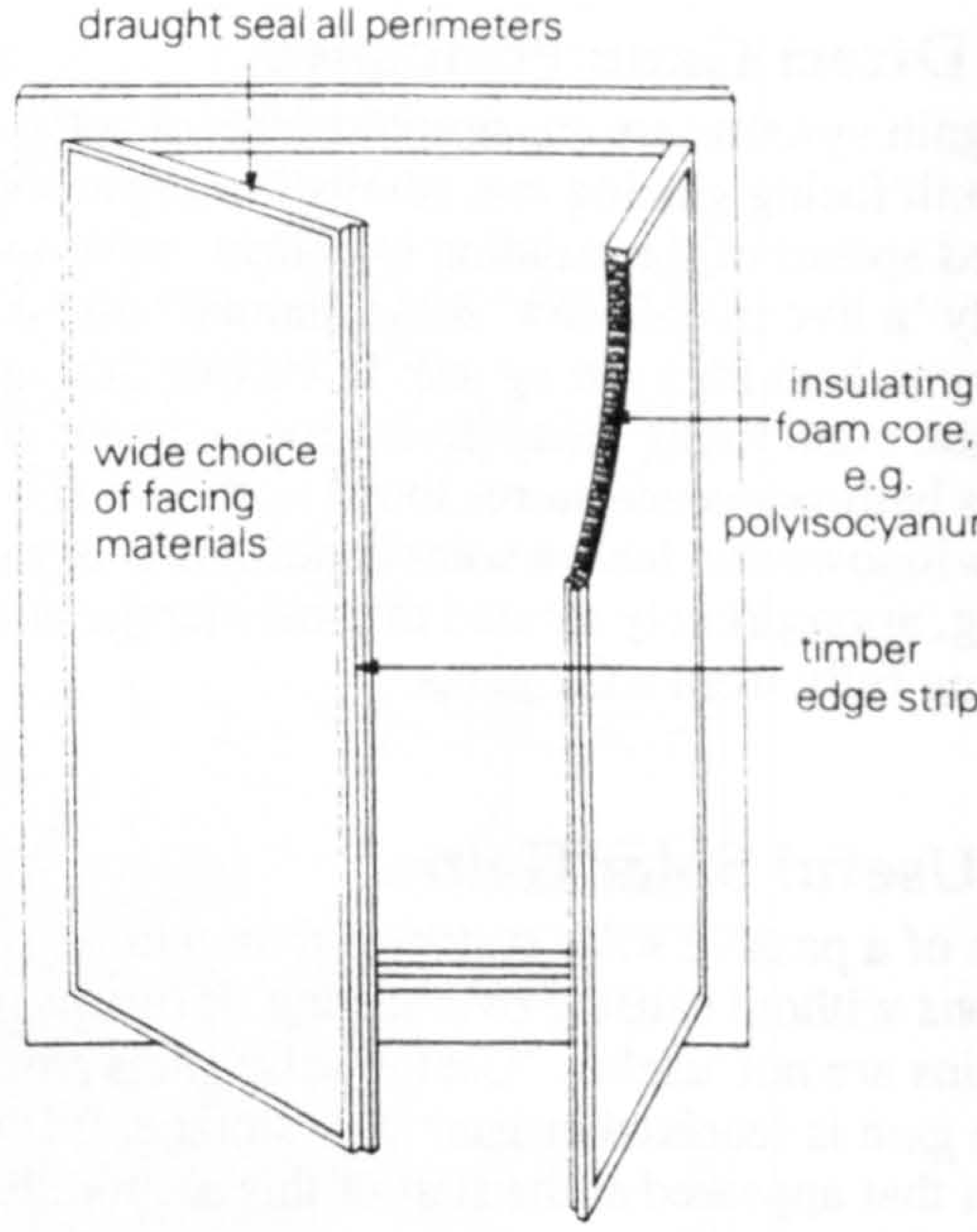
Movable Insulation

Movable insulation can be used instead of windows with fixed thermal characteristics. It can considerably improve performance of glazing by increasing U-values at night and in cloudy conditions although in the later case with consequent reduction in daylight. It will also increase comfort near windows on winter evenings. Insulating shutters covering half the window area may be used for winter cloudy days when light is still needed. Seasonal insulation may be used for mid winter. Movable insulation may be external or internal, roller blinds, quilts or boards. The simplest form is a curtain to which low emissivity layers and insulating linings can be added. Careful attention to edge conditions to improve thermal resistance is however important. Internal shutters will be dry and easy to adjust but condensation may form on the internal face of the glazing. Thermal stress may also be produced in the glass if the insulation is not removed in the sunshine.

External shutters must withstand the elements to trap a layer of still air between the glazing and movable insulation. These seals are critical to insulation but difficult to achieve with movable insulation. External insulation however can be used in summer for shading, will keep wind off the window and avoids the problem of condensation. A key feature is the time commitment and knowledge of the user in opening and closing most of the systems. Movable insulation whether internal or external will need to be made easy to use. They should be able to be operated without opening windows and fitted so as to not obscure solar radiation when open.



Notes:
1. Insulation should be flexible mineral wool in, say a quilted cover.
2. Decorative fabric should be removable for cleaning.
3. U-value for double glazing with 60mm mineral wool curtain is 0.6W/m²k.
4. Curtain should be sealed at sides and centre (say with 'velcro' strips)
5. Edge over-run must be greater than for ordinary curtains due to greater bulk.
6. Controllable ventilation located in walls rather than windows.



Notes:
1. U-value for double glazing with 25mm polyisocyanurate core is 0.6W/m²K.
2. Shutters can be side hung, bottom hung, sliding or simple friction fit.
3. A wide variety of core materials and decorative facing materials may be used.
4. Controllable ventilation can be via slots in the window frame rather than in sashes or additional vent in the shutter.

Fig. 4.8. Insulating curtains and shutters[34]

Energy Balance
Net solar gain is the amount of solar energy collected less heat loss from the building through the *collector apertures*. Milbank gives figures for the monthly energy balance through *unobstructed* south facing glazing at Kew (London 51°N).

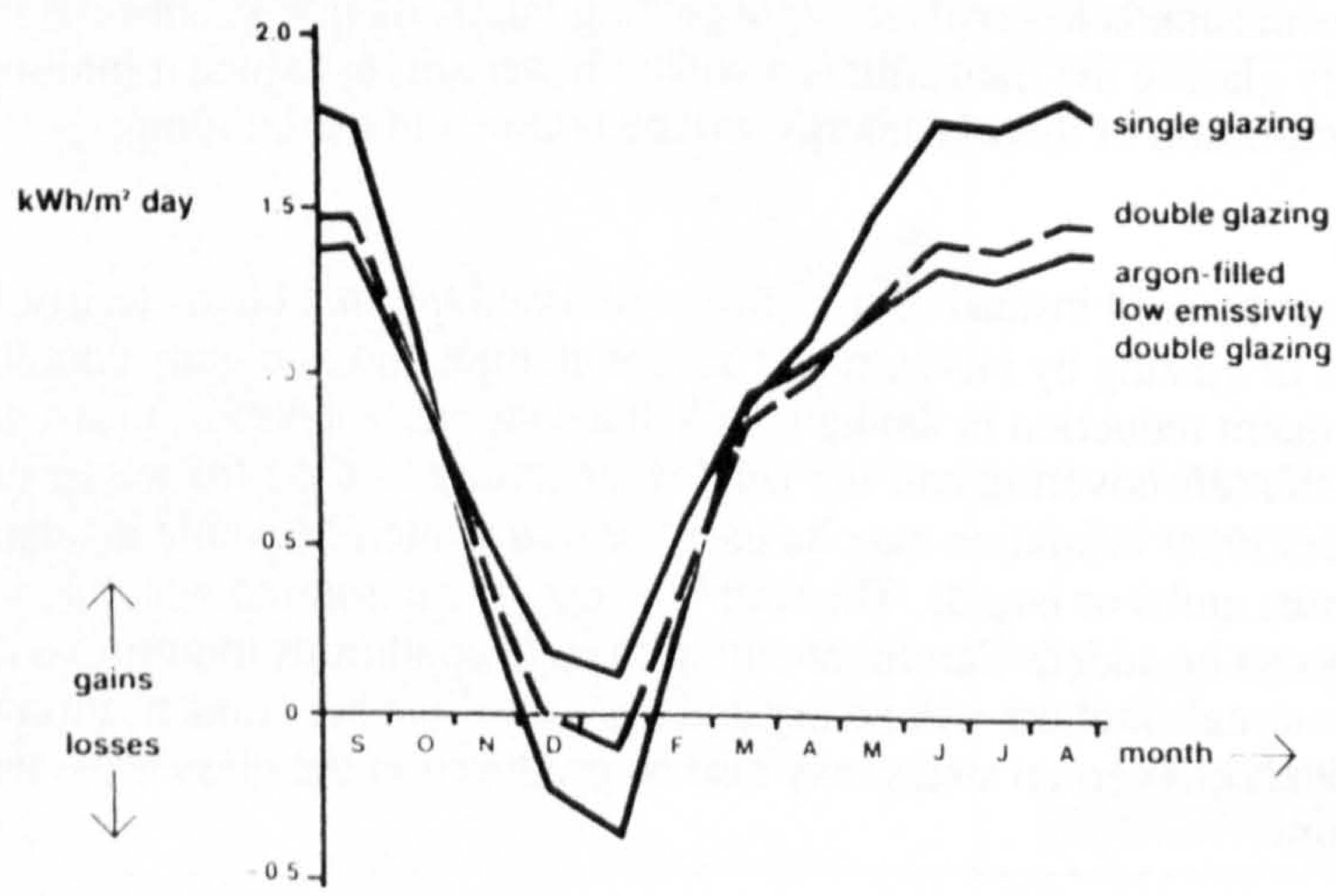


Fig. 4.9. Energy balance through unobstructed S-facing windows at Kew[35]

For single glazing there is an overall heat loss during December, January and February that is almost eliminated with double glazing and turned into a net heat gain at all times of year with low-emissivity double glazing. Bartholomew describes single glazing with night time shutters as equivalent to double

[34] Geoffrey Pitts, *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989. dig p 43 and John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C.E.C, 1992. p76
[35] Neil Milbank, 'Housing: The Passive Solar Approach to New and Existing Domestic Buildings', in Patrick O Sullivan (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985. p49

glazing.[36] Unobstructed South facing double glazing with insulating shutters can achieve a positive heat flow for all of the year *in southern England.* Window energy balance graphs can also be constructed by subtracting the daily conduction losses from daily solar gain *for the period of the heating season.* For double glazing over the heating season south glazing for many cool temperate climates will show net gain, East and West a smaller net gain and North a net loss. Figures can be worked out for all the glazing in a house and a window energy balance plotted.

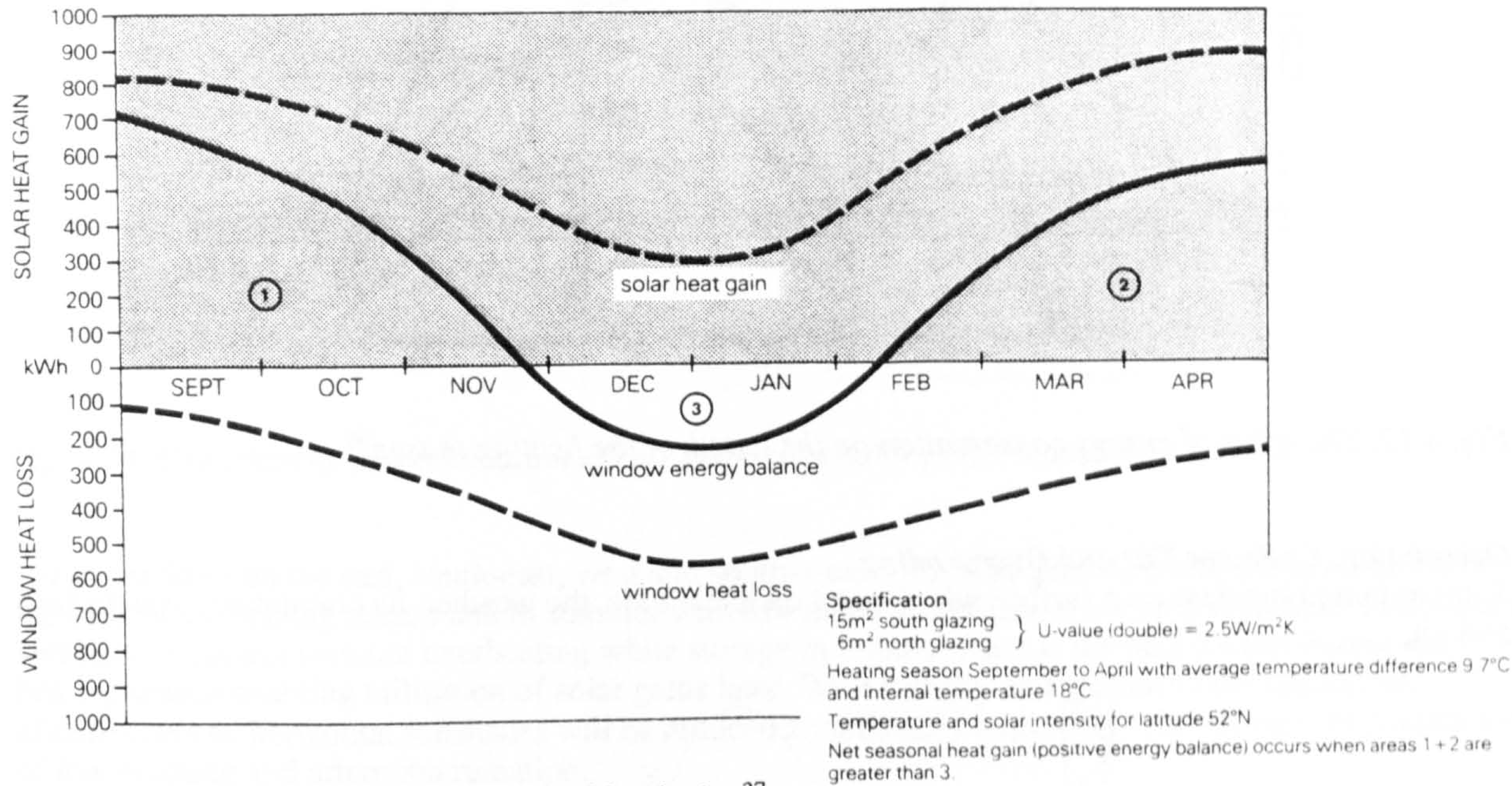


Fig. 4.10. Window energy balance: double glazing[37]

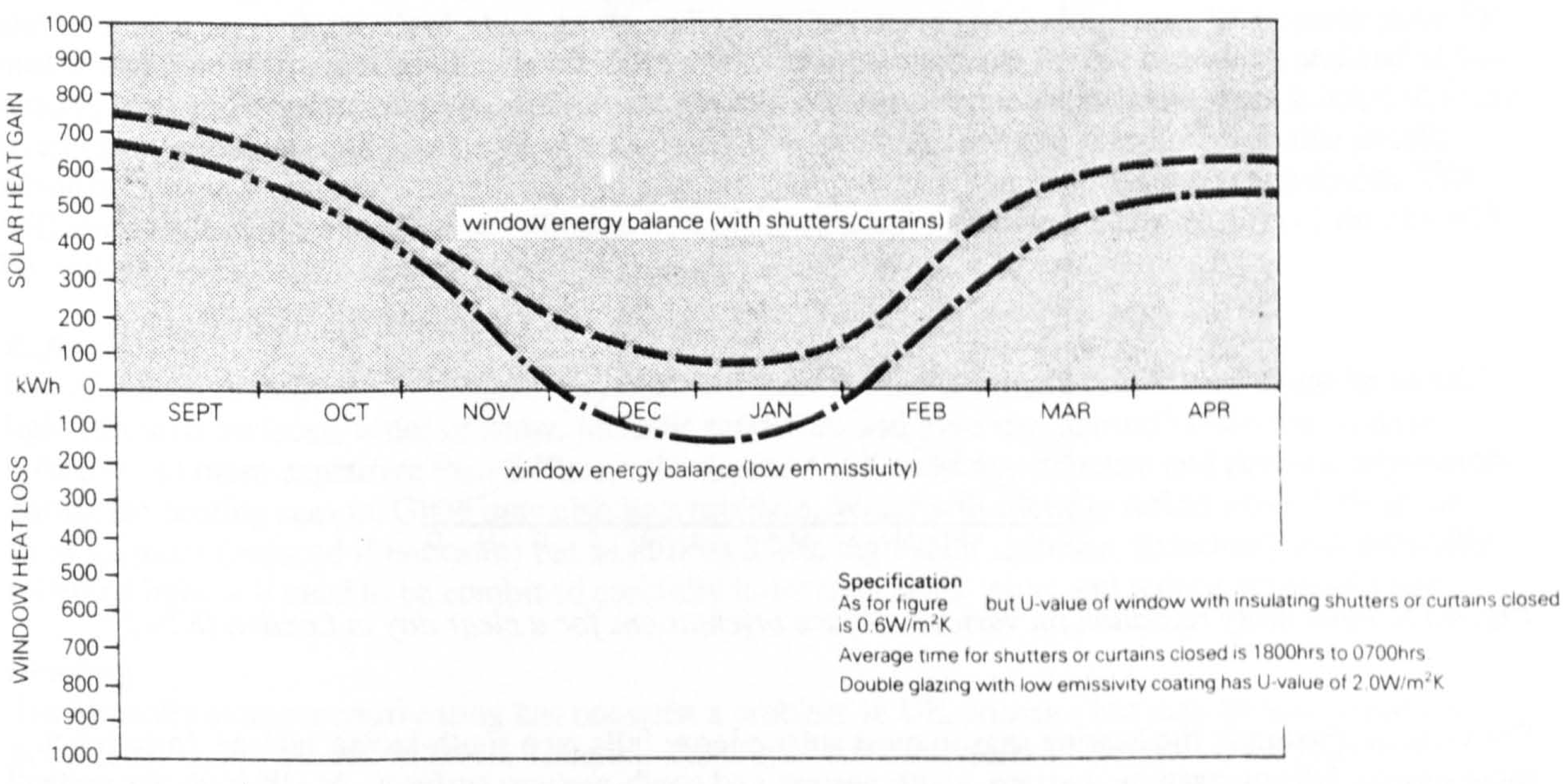


Fig. 4.11. Window energy balance for the same house with window improvements[38]

Even though the net energy balance may be positive for insulated glazing on an unobstructed south elevation this does not mean that 100% of the south elevation should be glazed. *The graphs indicate the potential for solar gain. There are technical and economic limits to the amount of storage that can be incorporated. Further with energy efficient design space heating loads are reduced. There is little point collecting more solar heat than can be absorbed for later use or than is required for space heating. Potential solar gain is greatest at the beginning and end of the heating season. Although insulation*

---

[36] D. M. L. Bartholomew, 'Possibilities for passive solar house design in Scotland', in Kerr Mac Gregor (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
[37] Geoffrey Pitts, *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989. p44
[38] ibid. p45

increases the ratio of solar gains to the heating demand of the building reductions in heat losses effectively shorten the heating season and thus reduce it to the least favourable times for solar gains. This underlines the importance of appropriate sizing of passive solar elements for heat gain and storage.

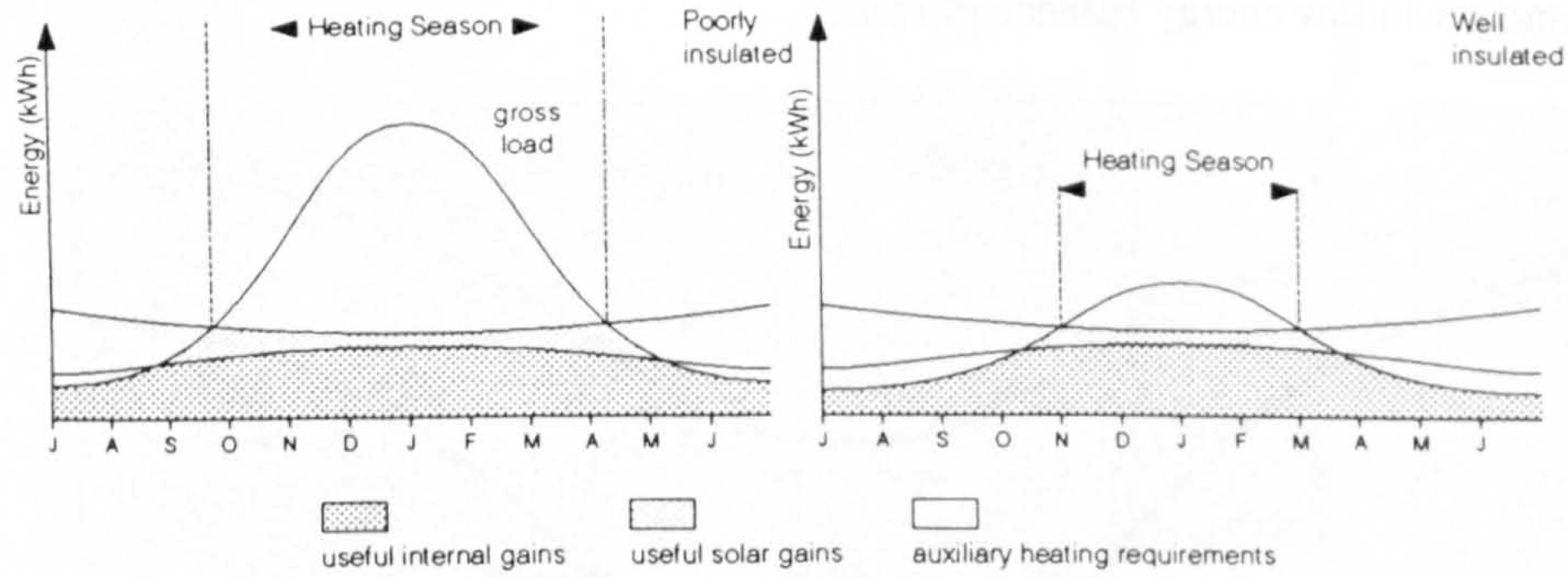


Fig. 4.12. The effect of energy conservation on the length of the heating season[39]

Orientation, Collector Tilt and Overshading
Solar radiation incident on a surface will depend on its latitude, the weather, its orientation, overshading and tilt.

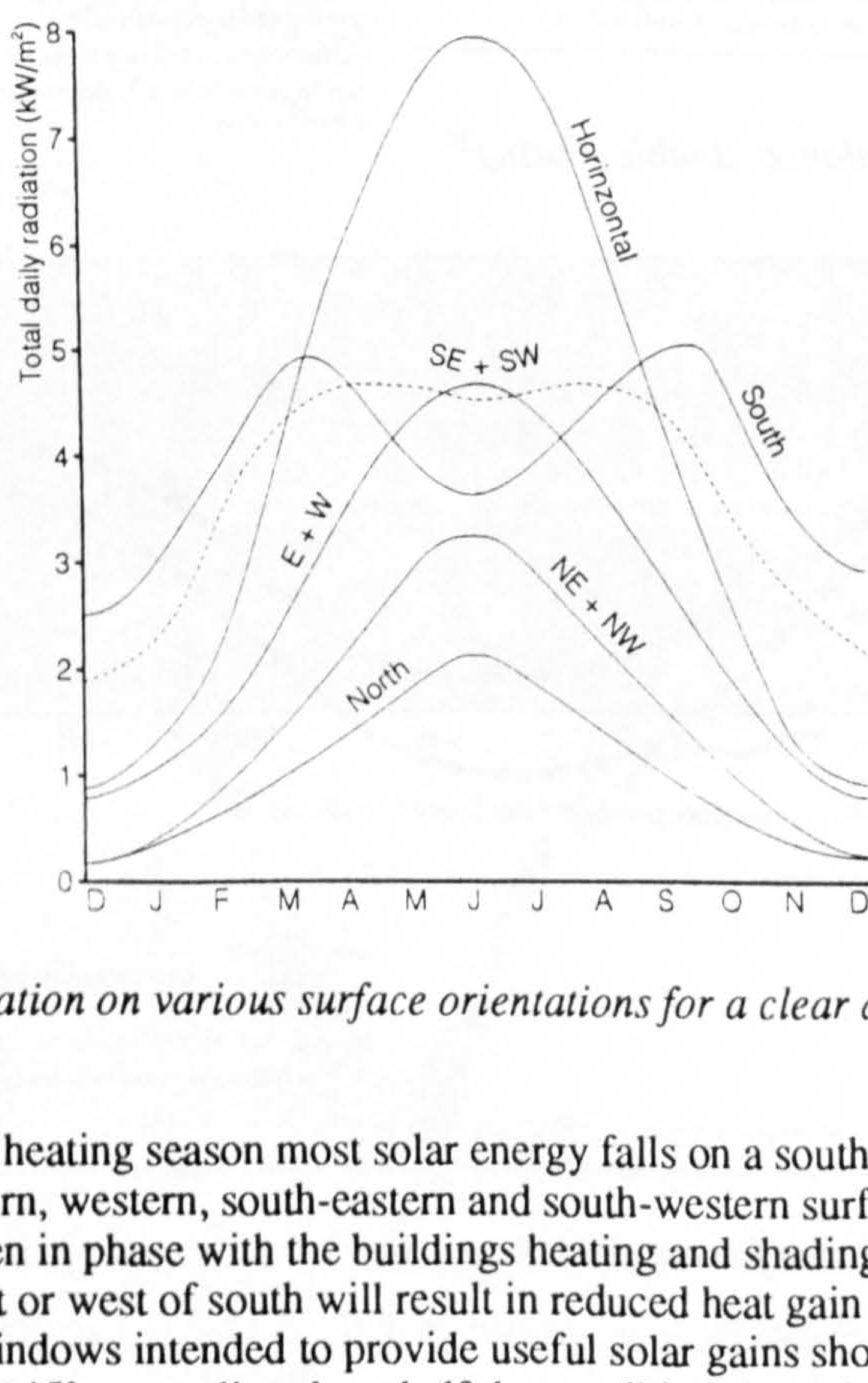


Fig. 4.13. Total daily radiation on various surface orientations for a clear day in London (Kew)[40]

For vertical glazing in the heating season most solar energy falls on a south-facing surface. In summer more energy falls on eastern, western, south-eastern and south-western surfaces. At UK latitudes vertical south-facing glazing is then in phase with the buildings heating and shading requirements. Balcomb has shown orientation 30° east or west of south will result in reduced heat gain of only 3% from south.[41] Milbank also notes that windows intended to provide useful solar gains should be orientated S±30° although orientations of S±45° can realise about half the possible solar gain. He argues that obstructions on the horizon of up to 10° are not too important but at 25° the potential solar benefits are reduced by one half. The pattern of demand may however affect orientation, for example, if the greatest demand is for the afternoon then an orientation west of south may be chosen.

[39] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C. E. C, 1992. p 65
[40] ibid. p72
[41] Ralph Lebens, 'Guidelines for Passive Solar Heating Design, Appendix B', *Passive Solar Architecture in Europe*, Architectural Press, 1980.

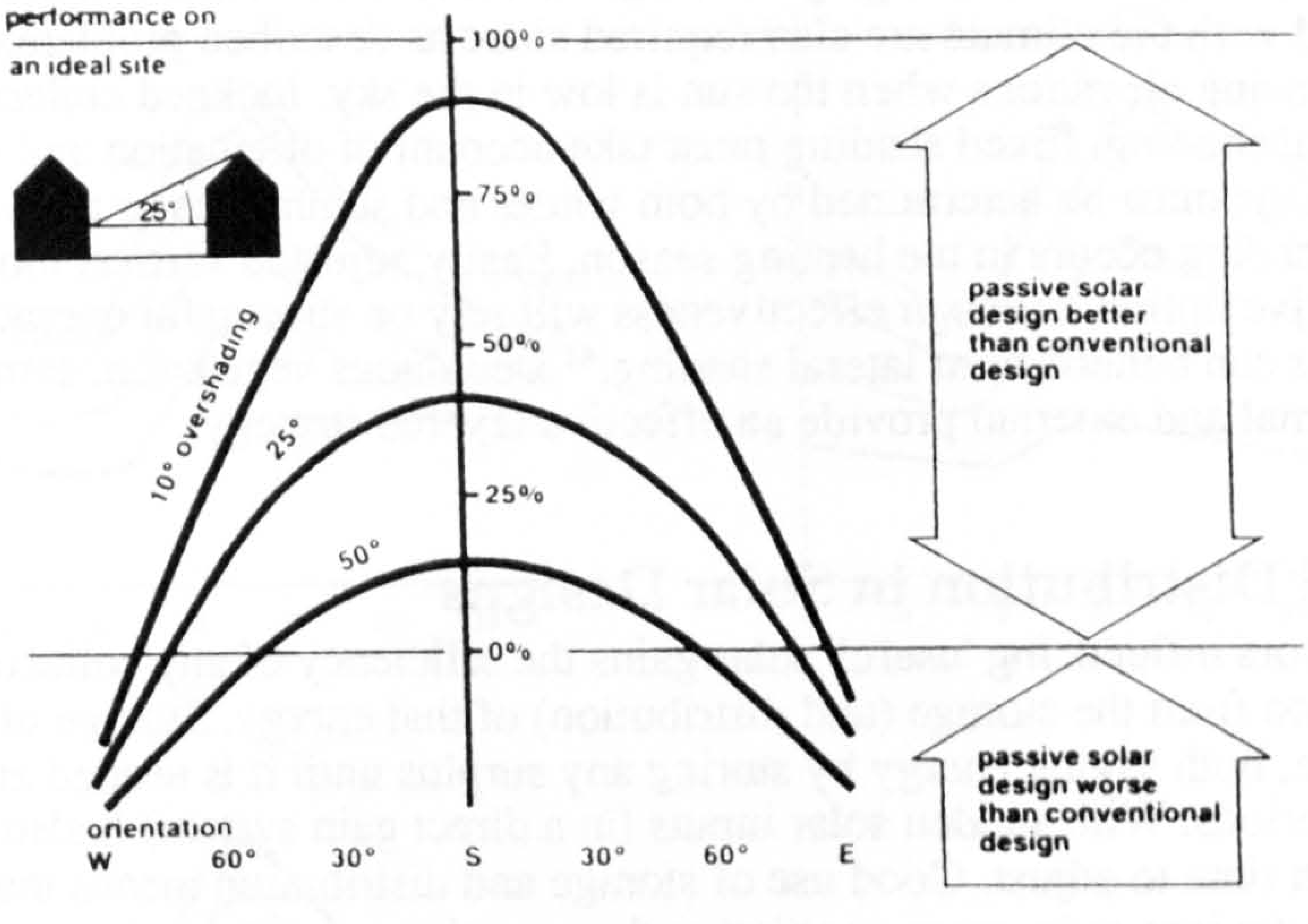


Fig. 4.14. Overshading and orientation effects on passive solar performance[42]

Large windows on the east, south-east, west and south-west walls may present overheating problems at the ends of the heating season and in summer with low angle morning and evening radiation. Shading and venting can control summer overheating while storage in thermal mass is the best control during the heating season enabling utilisation of solar gains later. With easterly and westerly orientations the effectiveness of horizontal sunshades will be reduced significantly since they will not prevent penetration of low morning and afternoon radiation.

Transmittance is greatest at 90° to the glazing and thus the ideal slope of glazing will vary with latitude and time of year. A slight tilt of glazing (depending on the latitude of the site) may be advantageous for mid winter gain if summer shading is effective and storage is available for the beginning and end of the heating season. For practical purposes vertical glazing is considered most efficient since it helps to avoid overheating problems and gives 90% of solar radiation during the heating season.[43] It is also usually advantageous in terms of construction, cleaning and fixing of movable insulation and sunshades. Tilts will also result in more long-wave radiation loss to the atmosphere since a larger section of the sky will be 'visible'.

Reflection

Use of reflectors in front of the glazing system will increase incident radiation. These could be metallic, light coloured surfaces, water or snow. Metallic reflectors will give specular reflection that is more effective but more expensive than diffuse reflection and will need maintenance and periodic adjustment during the heating season. Glare may also be a problem. Water will usefully reflect up to 35% at low solar altitudes (reduced if not calm) but as little as 2% at high solar altitudes. Externally and internally reflected light will need to be combined carefully to increase solar gains and reduce potential glare.

Shading

Traditionally summer overheating has not been a problem in UK climates but may be with increased south glazing and insulation levels. External shading of solar apertures is the most effective way of protecting a building from overheating outside the heating season although it must be accompanied by strategies for potential natural cooling ventilation. External shades will interrupt unwanted radiation before it is transmitted through the glazing. Internal shading will act as a heat collecting devise with the air between aperture and screen and the screen itself heating up and circulating to the interior. Shading can be located between two panes of glass and will have the advantages of external insulation but with reduced maintenance due to exposure to the elements. Maintenance (by the occupant) may be a problem. Reflection and absorption properties will also be important with this method. Shading may double up in winter to increase thermal insulation and protect glass surface from wind.

---

[42] Neil Milbank, 'Housing: The Passive Solar Approach to New and Existing Domestic Buildings', in Patrick O Sullivan (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985. p50

[43] Donald Prowler and Douglas Kelbaugh, 'Building Envelopes', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.

Fixed overhangs provide a basis for shading against high mid-day sun but systems that can be continuously controlled with the climate are also required since as described problems can arise with East and particularly West facing elevations when the sun is low in the sky. Inclined collection surfaces will need particularly careful shading. Fixed shading must take account of orientation and sun angle and aperture shape. Overhangs must be determined by both winter and summer solar angles to a particular window to ensure no shading occurs in the heating season. Easily adjusted vertical movable shading is perhaps the most effective option although effectiveness will rely on successful operation by *inhabitants*. East and West apertures can benefit from lateral shading.[44] Deciduous vegetation, simple overhangs, blind and louver's internal and external provide an effective layered strategy.

4.2.3. Storage and Distribution in Solar Designs

As indicated by the factors influencing 'useful' solar gains the efficiency of any collection system cannot be considered in isolation from the storage (and distribution) of that energy. Storage of solar energy performs a dual purpose, both saving energy by storing any surplus until it is needed and avoiding overheating in sunny periods. With sudden solar inputs (in a direct gain system) it also allows the auxiliary heating system time to adjust. Good use of storage and distribution means that occupants will not need to use shading devises or increase ventilation thus wasting potential gains.
There are three principle types of storage:

- direct storage that receives direct solar radiation through glazing,
- secondary storage is in thermal radiative with direct storage,
- remote storage relies on transfer of heat by convection (natural or fan-induced).

Direct Storage
The suitability of the storage depends on a number of factors that can be divided into two categories: the thickness and material of the storage; and how heat is charged and released. The mass available for heat storage is largely determined by the frequency with which the storage is charged and discharged. Temperature variation in the material is reduced as the distance to the heating surfaces increases: the material will gradually participate less in storage. The thickness playing a role is the *effective thickness*. Goulding notes that for the most important charge and discharge rhythm (once every 24h) and with heat supply from one side, the effective thickness of masonry building materials is usually between 60mm and 120mm. As a result it is little use for thermal storage purposes to construct walls and floors thicker than 80 to 160mm when heat is supplied on one side.[45]

When solar radiation strikes a non transparent or translucent material directly part of it is reflected and part is absorbed, transformed into heat and stored in the mass of the material. The material heats up progressively by conduction as the heat diffuses through it. Initially incoming radiation is absorbed or reflected by opaque materials depending on their surface colour and texture and the angle of incidence. The colour of the surface material influences the solar collection and thus the storage characteristics.[46] Typically black absorbs 90% of solar radiation for storage in form of heat, red or brown absorbs 70%, dark grey or green 50% and white 20%. White smooth surfaces cause high reflection. Black and rough surfaces cause low reflection.

The graphs indicate variation in heat quantity stored through solar radiation under clear sky conditions for a floor immediately under a south oriented window at 51°N for variation in season, surface colour and thickness. Inside temperature is a constant 20°C and the temperature under the floor is 13°C.

[44] Geoffrey Pitts, *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989. p47
[45] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C.E.C, 1992.
[46] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A primer for Architects*, Batsford for Commission of European Communities, 1992.

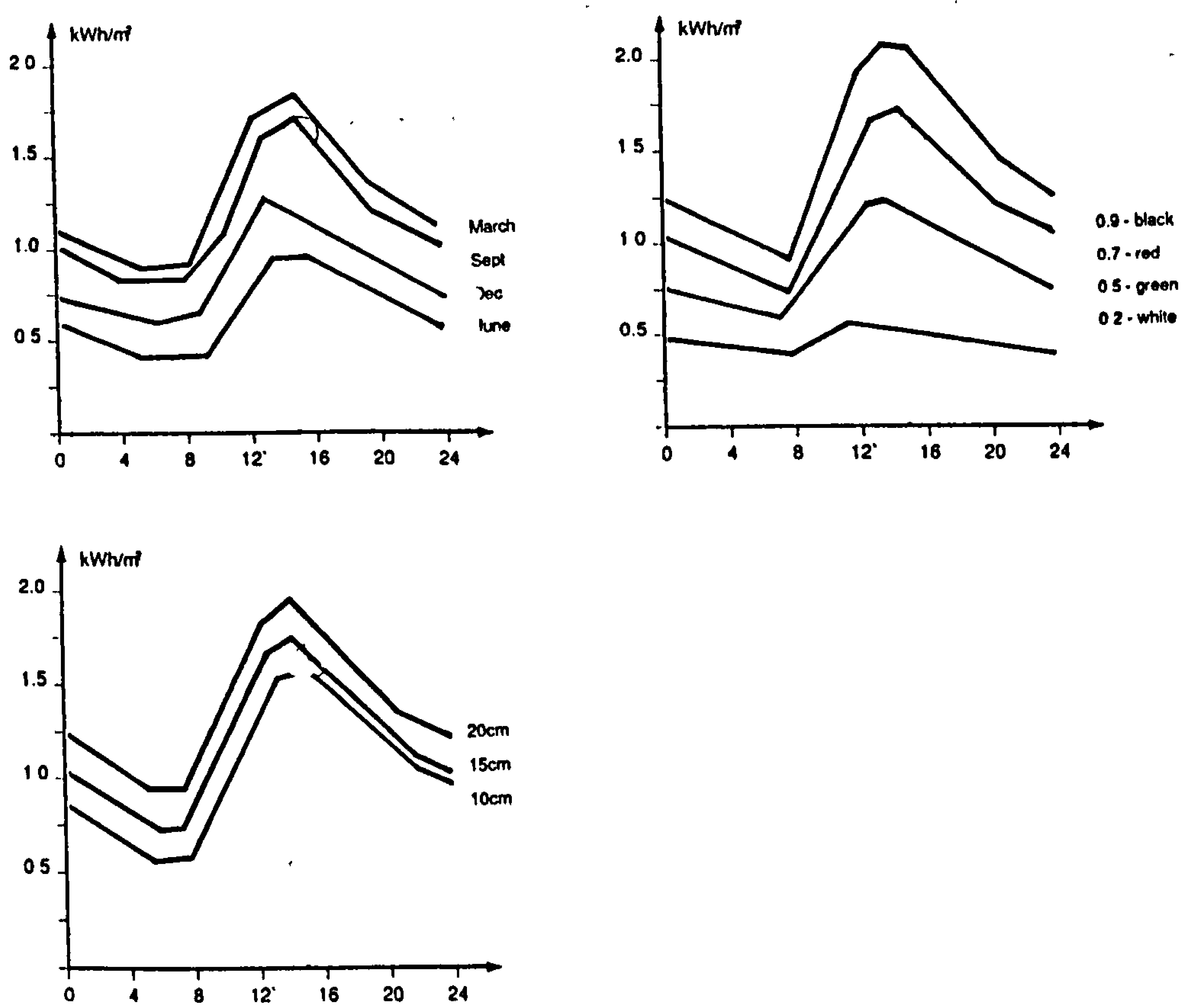


Fig. 4.15. Heat stored from solar radiation in a floor[47]

Once absorbed energy in the form of heat may be convected or radiated back to the room air and other surfaces or conducted into the material. The rate of transfer into or out of the material is dependent on the temperature differences and the materials thermal conductivity. A high conductivity thermal capacity material will reduce surface temperature and keep energy in the material during the demand side of the diurnal cycle. Primary storage materials thus typically need a dark surface, high conductance to encourage penetration of heat and high heat capacities to induce heat to remain within the storage material by reducing surface temperature rise. A low emissivity and small air movement will reduce losses when temperature rises.

Indirect Storage

Direct storage is the most efficient means of storing solar energy. Secondary or indirect storage involves radiative contact with a sunlit area. Heat exchange between masses at different temperatures is spontaneous because it obeys the second law of thermodynamics concerning thermal equilibrium between masses. Once the storage material has absorbed enough energy to be warmer than the surroundings or its surroundings cool it may release energy by infra-red (long-wave) radiation and natural convection. The former occurs when the surface temperature of the material "seen" is higher than the surface temperature of adjacent objects. The later occurs when the surface temperature of the storage material is above ambient. Heat exchange through infra-red radiation is influenced by the temperature difference between the components, their location and emissivity. Unlike visible radiation, the emission of long wave radiation is not influenced by the colour of the surface but is reduced by roughness.[48]

Infra-red radiation will not heat the room air directly but must fall on an absorbent surface to be converted into heat (non-reflective and non-transmitting to infra-red radiation). If it falls on low thermal capacity materials (e.g. furnishings) it will cause a high surface temperature rise and will heat the room air quickly by convection. Most building materials will absorb a large proportion but not, for example, polished metal.[49] A secondary thermal mass may thus be required to absorb and store infra-red radiation.

---

[47] ibid. p59
[48] ibid.
[49] Bion Howard and Harrison Fraker, 'Thermal Energy Storage in Building Interiors', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.

Secondary storage should be "seen" by the primary storage. The storage with the best 'view' will receive most radiation.

The rate of indirect storage through convection is controlled by the temperature difference between the surface and the air, the rate of air flow and surface roughness. Rough surfaces have a greater area and thus convective heat transfer is increased. Usually the rate of transfer by natural convection is comparatively low despite often high convective movement in passive solar buildings. In a direct gain system, storage generally occurs in the building construction itself. A dark floor may be used for primary storage but is not absolutely necessary due to multiple reflections within the room. Heat not stored in a 'primary' mass may still be transferred to secondary storage. The remainder being released to the room by convection.

Distribution and Remote Storage

Primary issues that affect the distribution thermal energy in buildings include, energy flows within rooms and buildings, room geometry and building form, room and building function, building materials (walls, floors, ceilings; room to room differences; massive versus light), single- or multi-zone buildings, room relationships to thermal storage, exterior openings, interior openings and adjacent rooms, ambient conditions affecting building interiors (orientation, siding, adjacent buildings, exterior openings), control strategies, energy efficiency.[50] The aim of distribution is to have solar heat reach locations where it may be of use. In a direct gain system this will usually involve reducing the need for distribution. Ideally design should ensure solar energy is collected and stored in or adjacent to the room where it will be used (thermal zoning). Building interiors are also impacted by vertical zoning. In general the higher the zone the potentially warmer. Winter and summer concepts may thus vary.[51]

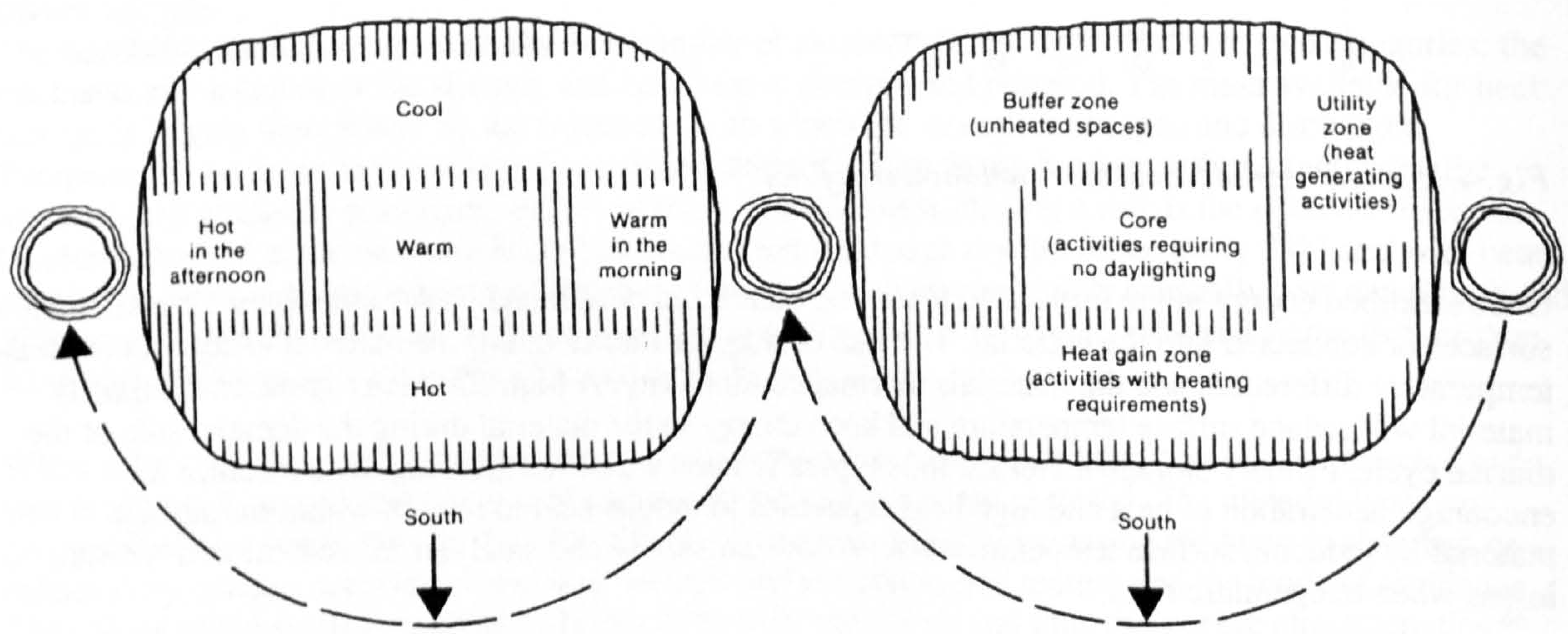


Fig. 4.16. Horizontal temperature zones of building interiors resulting from orientation and potential design response.[52]

The distribution of solar energy in a room should be designed to prevent large differences between surface temperatures and the air temperature near the ceiling and floor. If sufficient primary and secondary mass is provided in a direct system the distribution of exchange of heat between walls (radiation) and walls to air (convection) will be sufficient. Radiation can achieve relatively uniform distribution of energy as well as good thermal comfort. Temperature differences are then caused by the heating system or poor resistance of windows. Air circulation between rooms and remote storage is discussed with reference to sunspaces below.

---

[50] Gregory Franta, 'Thermal Energy Distribution in Building Interiors', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.
[51] ibid. p261
[52] ibid. p259 - 260

Storage Estimates
Storage is usually in the form of a solid floor with underfloor insulation, insulated masonry walls, timber framed walls with internal brick veneer or partially solid internal partition walls. It may be a free standing mass within the space. Concentration of mass into smaller surface areas may result in overheating of the space particularly at the start and end of the heating season when temperatures are mild and sun angles low. Mass is best if well distributed in the direct gain space (over floor, walls and ceilings). A 6 to 1 storage to glazing area is thought to be most effective.[53] This roughly equates to the walls and floor of the south facing spaces of a typical direct gain house with and area of south glazing equal to 20% of the floor area. David Turrent and Koen Steemers argue that 25 mm dense internal render on walls is normally sufficient.[54] They also argue that mass in the floor is preferable since it may generally receive more direct radiation. The floor however may be covered more easily by occupants with carpets or rugs. Generally then the thermal mass required is accommodated in traditional building construction with slight modification and attention to detail in particular cases balancing occupancy and insolation. Use of solar gain in the UK may not imply high thermal capacity buildings but usually some form of intermediate thermal capacity appropriately located in the fabric. Clearly mass becomes a problem in the UK climate where solar gain is infrequent. Lightweight construction (low thermal capacity) will be preferable in intermittently occupied rooms.

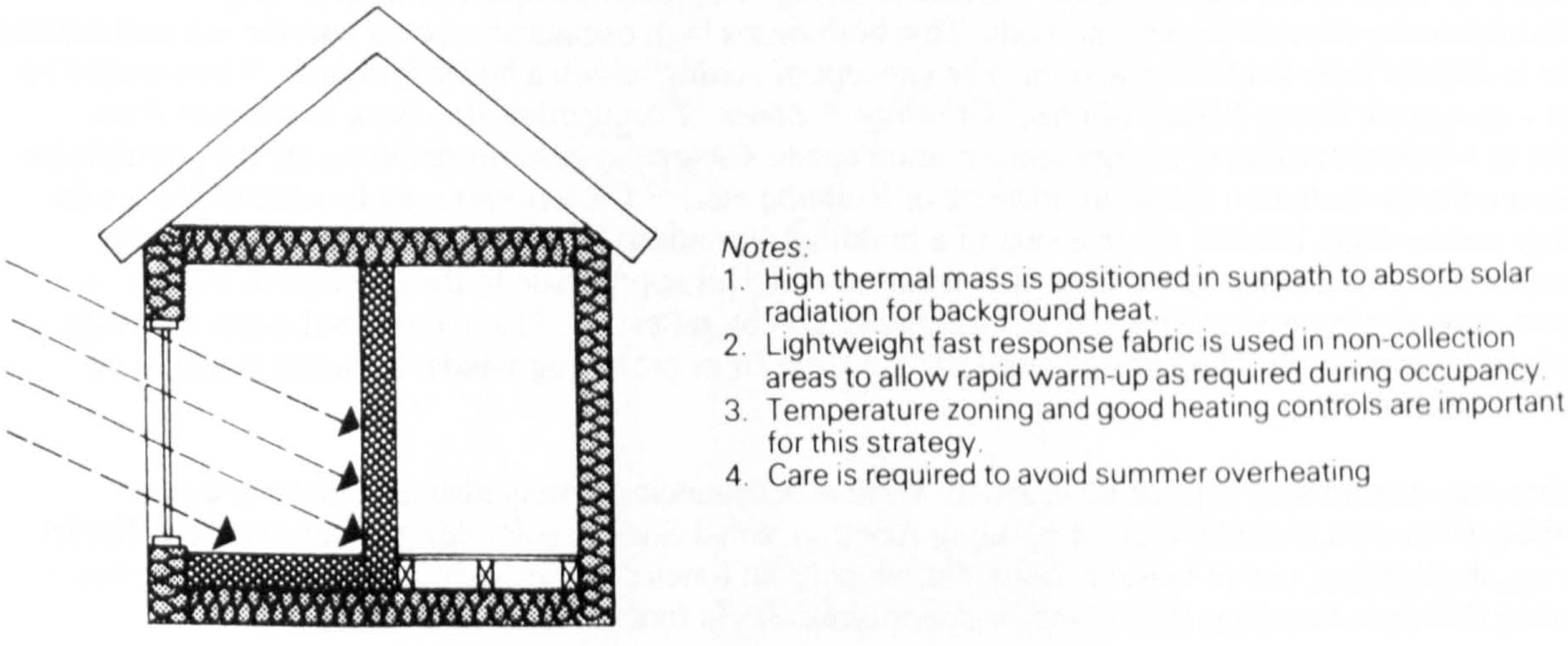


Fig. 4.17. A medium weight thermal capacity strategy[55]

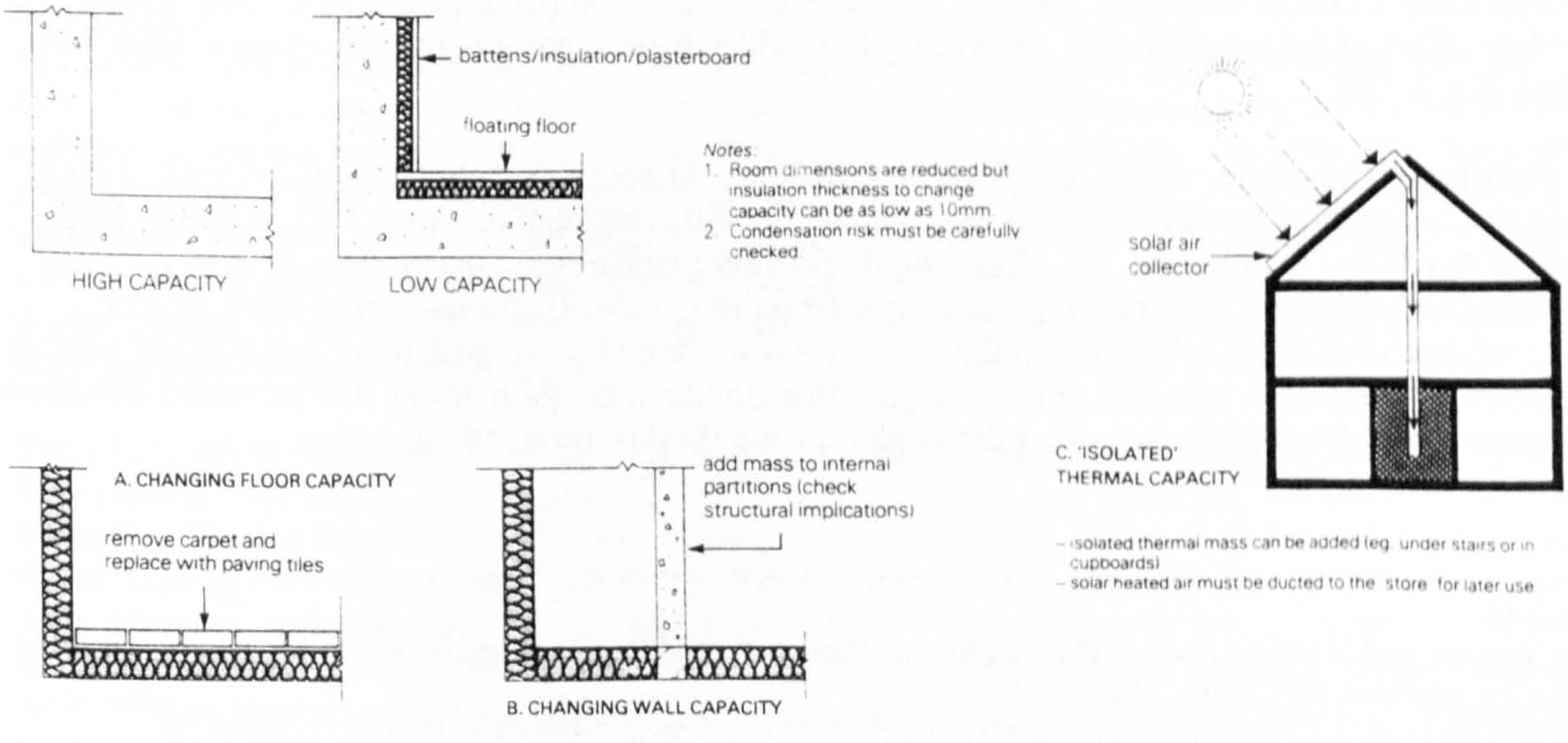


Fig. 4.18. Simple methods of changing thermal capacity of interiors[56]

[53] Balcomb reported in Bion Howard and Harrison Fraker, 'Thermal Energy Storage in Building Interiors', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.
[54] David Turrent and Koen Steemers, 'Domestic Low Energy - 4 Beyond the Regs', *Architects Journal*, 11 April 1990.
[55] Geoffrey Pitts, *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989. p42

Thermal Comfort
Comfort is a complex problem even in simplest interior environments.[57] It involves air temperature and stratification, mean radiant temperature, air movement, humidity and indoor air quality. Control of interior space comfort by architectural use of passive energy relies on effective thermal energy storage. Successful integration of shading, gain and storage creates successful control with minimum mechanical system intervention. Howard and Fraker argue that the narrow criteria of western society to comfort i.e. temp, humid and air flow is reflected in our use of non-renewable energy to obtain more tightly controlled comfort. The individual nature of comfort is another reason for design participation of the occupants.[58]

4.2.4. Zoning

Zoning is defined here as organising building space to rationalise distribution of heat and reduce thermal losses (heated space, buffer space and collection space optimisation). Placing rooms with high energy demand to the South and low energy demand/occupancy or unheated space to the North is a simple example.[59] Alternatively a hot core of the building may be surrounded by concentric zones with decreasing temperature requirements.[60] Upstairs living is another example of this 'free' and environmentally most benign of methods. This both raises high occupancy rooms into the sun and enables them to benefit from heat stratification. The concept of zoning within a house is simply demonstrated by Boje Lundgaard, Georg Rotne, Michael Grimmig.[61] Zones of occupation step back or contract from South to North according to energy conservation needs. Clearstory systems demonstrate the possibilities of directed solar radiation (East sun to West of Building etc.).[62] Clearstories may be used to bring solar energy and sunlight into the reverse side of a building. Variations in thermal mass can be used with orientation of clearstories hence time of irradiation of a wall appropriate to the function of a space. A system may also be used to 'concentrate' solar radiation by reflection. Placing external doors and large windows away from building corners will protect them from prevailing winds. I discuss this in more detail in *Chapter Five.*

Zoning may extend to groups of houses with various occupancies. It may also take place at a site planning level with consideration of building function, suitability for solar design, conservation, district heating, daylighting, use of waste energy, mutual benefit, times of occupancy and occupant demands. Relating different functions thus gives an opportunity single function estates do not.

4.2.5. Direct Gain: Performance

Existing Solar Contribution in Houses
Although today's houses are rarely designed to utilise solar radiation (solar gain at best being more a secondary effect of the need for light and views) it provides their largest energy contribution apart from gas (see *Fig. 4.19.*).

This contribution obviously varies considerably from house to house. Neil Milbank estimates that for a well heated but uninsulated Victorian house solar energy will contribute less than 10% of energy needs compared to a house insulated to 1983 Building Regulation Standards at approaching 20%.[63] As noted with higher levels of insulation the *usefulness* of solar gains can drop especially since these figures assume random orientation of glazing in the existing stock. Those houses with more south-facing glazing will clearly do better than average. Milbank argues that simple direct gain design and increased insulation can increase the solar contribution using direct gain to one-third of (low) energy needs.

---

[56] ibid. p42
[57] Bion Howard and Harrison Fraker, 'Thermal Energy Storage in Building Interiors', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990. p163
[58] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A primer for Architects*, Batsford for Commission of European Communities, 1992. p112
[59] Boje Lundgaard, First Prize, 'Category B - Clustered Housing', in Ralph Lebens, *Passive Solar Architecture in Europe*, Architectural Press, 1980.
[60] Jourda and Perraudin, 'First Prize, Category C - Single Dwelling', in Ralph Lebens, *Passive Solar Architecture in Europe*, Architectural Press, 1980.
[61] Ralph Lebens, *Passive Solar Architecture in Europe*, Architectural Press, 1980.
[62] Bion Howard and Harrison Fraker, 'Thermal Energy Storage in Building Interiors', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.
[63] Neil Milbank, Housing: 'The Passive Solar Approach to New and Existing Domestic Buildings', Patrick O Sullivan (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985.

Heat Source		***Contribution %***
Solar		14
Appliances		10
Cooking		5
People		9
Water heating		9
Auxiliary heat:	solid fuel	6
	gas	39
	electricity	4
	oil	4

Fig. 4.19. How homes are heated[64]

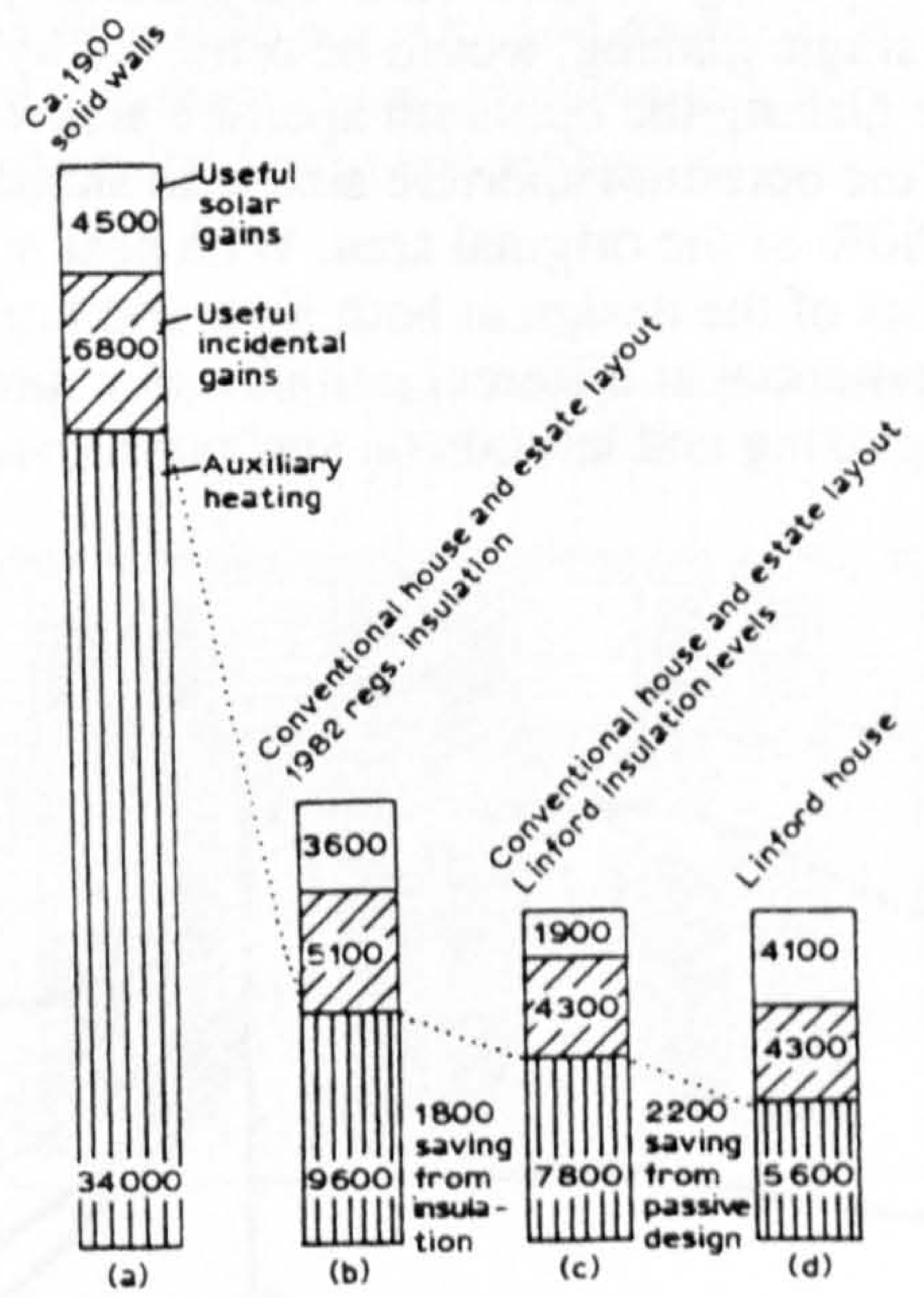


Fig. 4.20. The effect of improved insulation standards on annual space heating in houses at 19°C[65]

New Houses

The Giffard Park development in Milton Keynes was monitored from September 1983 to February 1986.[66] The energy required for space heating was reduced to 39% of that of an equivalent contemporary building regulations house. Solar gains contributed 25% of the space heating requirements. Incidental gains contributed 31%. A5 architects designed a direct gain house to compare with a semi-detached starter home reference of 56m^2 estimated to consume 2980 kWh annually.[67] They managed to create savings of 42% with typical occupancy by improving insulation, reducing north glazing and providing double glazing. A principal difficulty here is separating the effect of solar gain from the savings due to extra insulation and ventilation measures.

The ETSU report on Oak Farm Road gives figures for the monitoring of a direct gain semi-detached two storey house from March 87 to February 88.[68] Gross living floor area was 77m^2 (of which 51.6m^2 was habitable). Passive features included: southerly orientation; glazing of approximately 50 % of the south facing facade (14% of floor area, 21% of habitable); heat reflective blinds to prevent overheating and night time loss; and externally reflective ground finishes. The wall U-value was 0.3W/m^{2}K achieved using a 100mm cavity filled with granular polystyrene insulation. A 100mm dense concrete inner skin, solid 100mm internal walls and concrete ground floor provided mass that resulted in little monitored overheating. The house cost 2% *less* than an equivalent non-solar house of similar insulation standards. Monitored results (climate as Kew) showed a solar contribution of 14% of annual energy requirement

[64] John Doggart and Mike Flood, 'Energy form Renewables - 1 The Solar Contribution', *Architects Journal* 13 September 1989.

[65] ibid. p48

[66] Commission of European Communities, 'Gifford Park', *Project Monitor Issue 1*, Commission of European Communities, June 1987.

[67] 'Economic Square Plan for Semi-D's', *RIBA Journal*, October 1983.

[68] ETSU, *Solar Building Study: Oak Farm Road*, ETSU S 1160/SBS/10.

(26% displacement of space heating energy) for morning evening and weekend occupancy to 18°C (typical). Incidental gains provided about 30% (8677 kWh requirement). Correct operation could have increased solar gains by 17%. SERI-RES simulation of correct operation showed solar gain contributing 21% of annual energy requirement. This represented a saving of about 20% of bought energy compared to a similarly insulated house simulation. The ETSU report concludes that simple direct gain measures can make useful energy saving at *no extra cost.*

4.2.6. Latitude, Occupancy and Insulation/Gain in Direct Gain Solar Design

The Linford House

The Linford house (new build) in Milton Keynes (52°) has a monitored direct gain solar contribution of 30% of its space heating requirements achieved without problems of overheating.[69] The design has a preponderance of glass in the main living and bedrooms that face south. Studies have been made of its likely performance in other locations using window area and glazing type as variables.[70] At Kew (51°) the lowest energy consumption, with single glazing, would be achieved by reducing the solar aperture of the design to about 60%. With double glazing the optimum aperture area would be approximately equal to the design area. At Lerwick (60°) the optimum aperture size with single glazing would be zero but with double glazing it would be about 80% of the original area. With heat reflecting glass the optimum area is within the range 1 and 1.4 times that of the design at both Kew and Lerwick. The glazing system thus has a considerable influence on solar potential at different latitudes of a direct gain system. This can be compared to less crucial effect of glazing and latitude on sunspace systems discussed below.

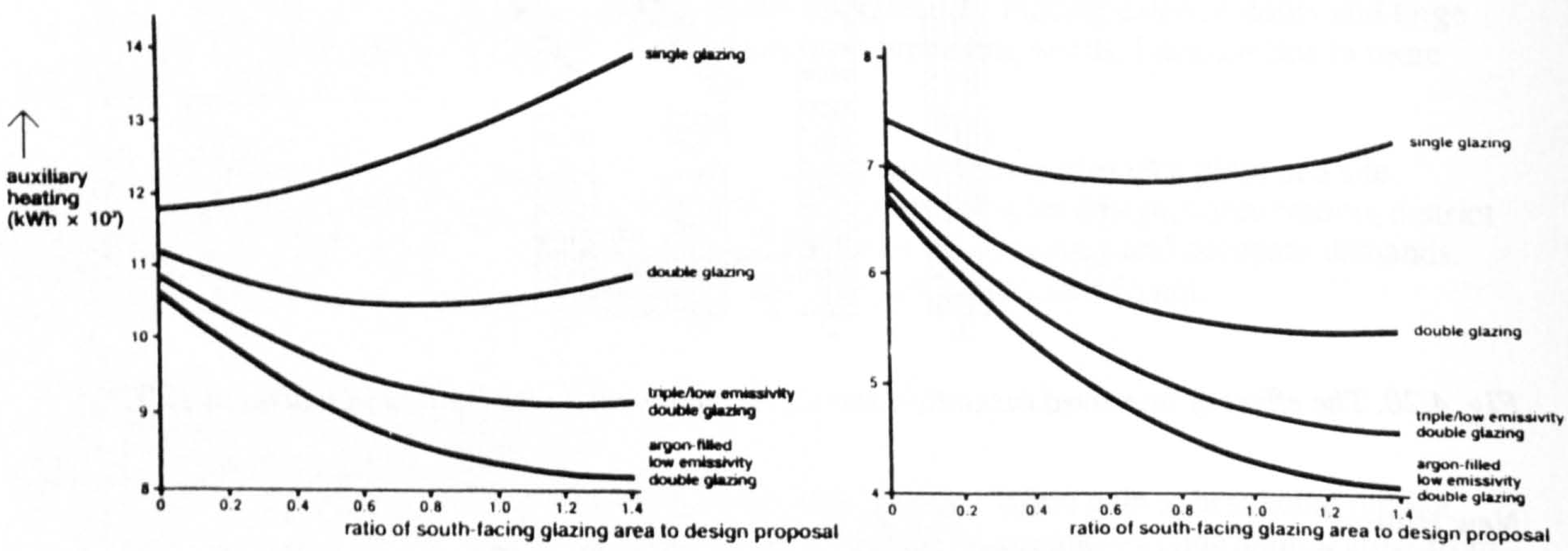


Fig. 4.21. Glazing performance and auxiliary heating in a Linford house at Lerwick and Kew[71]

Within the UK optimum glazing area will increase with improved energy balance characteristics and reduced latitude although eventually limited by incorporation of storage mass. Single glazing should be avoided in direct gain systems.

SEF Direct Gain House

The detailed effect of latitude on direct gain systems is also discussed by Bartholomew with reference to a house designed by Stillman and Eastwick-Field (SEF) for the DoE's passive solar research project.[72] This project assessed the designs of 17 architects using SERI-RES computer simulations that Bartholomew describes as free from major errors.[73] The work, based on the climate at Kew, aimed to develop an understanding of passive solar energy in *effective marketable designs.* It also demonstrates the importance of occupancy and occupant reaction in solar designs as well as the relative benefits of passive solar features and insulation at different latitudes.

[69] Neil Milbank, 'Housing: The Passive Solar Approach to New and Existing Domestic Buildings', in Patrick O Sullivan (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985.
[70] ibid.
[71] ibid.
[72] D. M. L. Bartholomew, 'Possibilities for passive solar house design in Scotland', in Kerr Mac Gregor (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
[73] ibid.

Clearly the assessed value of passive measures will depend on the *type of reference* used. The SEF design was compared with a commercial design providing the same accommodation: a detached 4 bedroom, 2 bathroom house built to 1982 Building Regulations with all windows double glazed. To determine the effect of insulation against solar gain a similar reference upgraded to the insulation values of the design was also used. The final design cost was £212 (0.5%) more than the basic reference and £220 less than the upgraded reference. These figures were within the variation limits of the comparison and thus defined as negligible (cost effective).

The SEF design was predominantly a spatial rearrangement involving location of principal living space's to the south (instead of the living dining running from front to back), buffered by the services, garage and circulation to the north and kitchen and study to the east and west. The solar design had a similar window area to the reference but rearranged to face predominantly south (28.5m^2 or 19% of floor area) leaving 2.8m^2 facing north and 0.6m^2 facing east. Windows were double glazed except the kitchen and study, night time insulation shutters were fitted, and insulation values increased to floor 0.6 W/m^{2}K, walls 0.3W/m^{2}K (1990 building regulations = 0.45W/m^{2}K) and roof 0.15W/m^{2}K (1990 building regulations = 0.25 W/m^{2}K). Plots were arranged to reduce overshadowing to a maximum of 10% and a 1.8m hedge provided some wind shelter. Provision for future conservatories was included and heating installation reduced.[74]

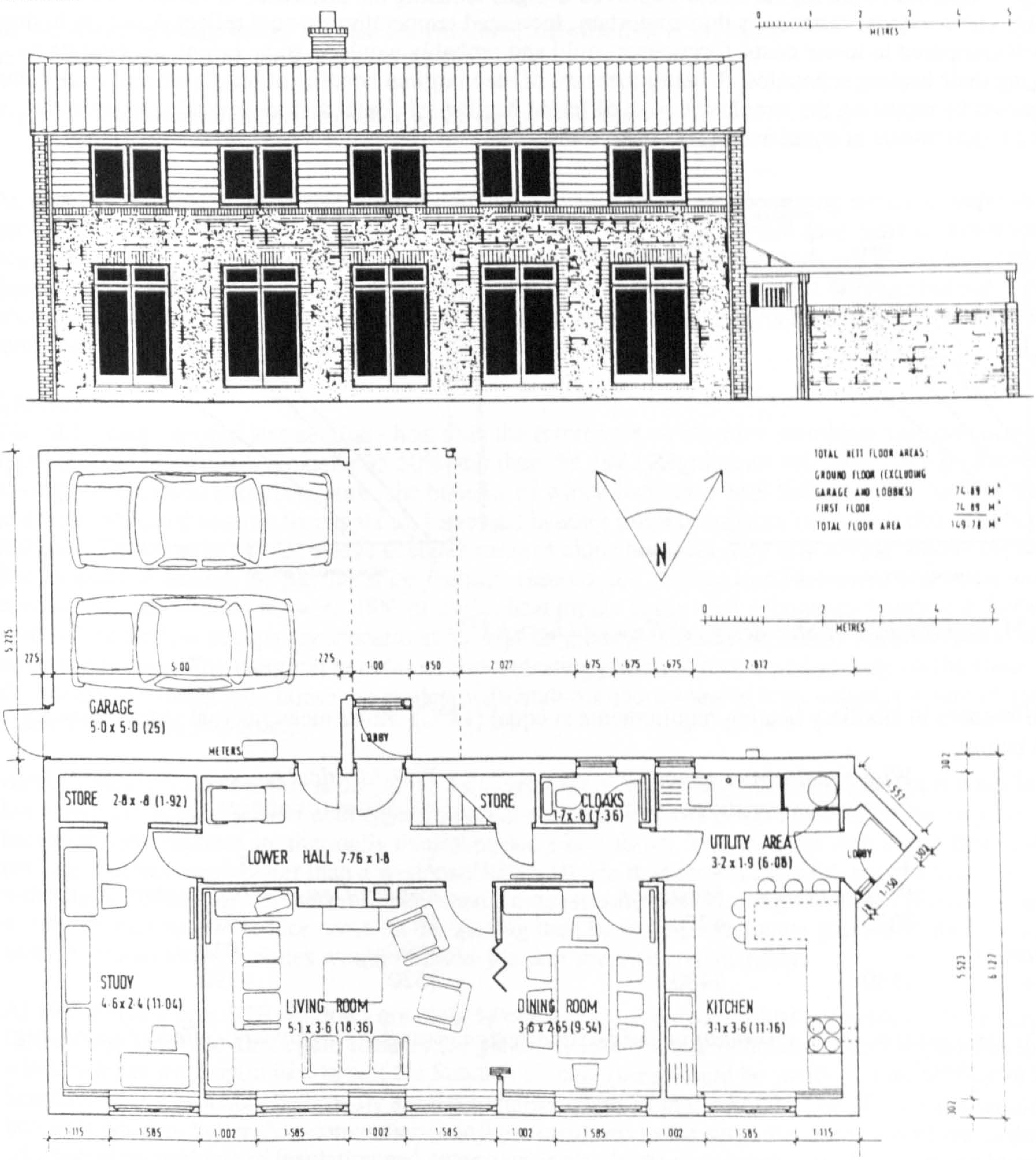


Fig. 4.22. Front elevation and plan of SEF design[75]

[74] 'Design on the Private Sector Home', *RIBA Journal*, October 1983.
[75] ibid.

Typical occupancy was defined as thermostat settings of 21°C in the living room, dining room and bathroom on weekday evenings and all day at weekends, 18°C in the early morning and late evening in the bedrooms, appropriate intermittent heating elsewhere and at other times with 6800kWh/year incidental heat gain. Typical weather data was used for three latitudes and simulations run.

	1982 Reference	*Updated Reference*	*SEF Design*
Kew 51°N	11790	7880	6210
Eskdalemuir 55°N	17730	12800	10910
Lerwick 60°N	18530	13540	11910

Fig. 4.23. Annual auxiliary heating requirement with typical occupancy for reference, updated reference and SEF design (kWh/year)[76]

Differences between the two references and the solar design measure the benefits of increased insulation and passive solar respectively but because heating schedules and incidental gains are constant inputs, average temperatures are higher in the improved designs reducing the difference in computed auxiliary heating. The *occupant reaction* is thus important. Increased temperatures would reflect desire for higher comfort compared to lower costs. Occupants could and probably would to some extent compensate by changing their heating schedules. A better measure of the marginal benefits of insulation and solar gains was gained by repeating the simulation with different heating schedules and interpolating to estimate heating requirements at equal average temperatures.

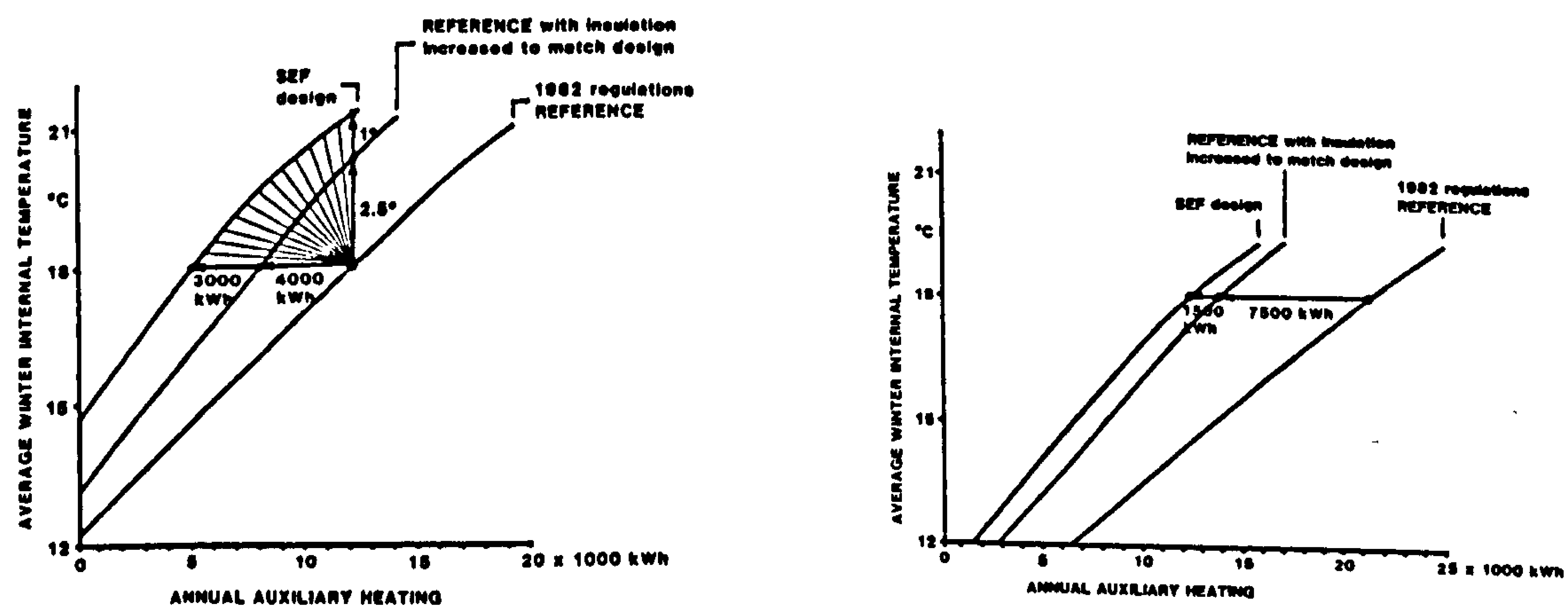


Fig. 4.24. Performance of SEF design at Kew and Lerwick[77]

The differences in auxiliary heating requirements at equal (18°C) winter mean internal temperature are shown below.

	With equal winter mean internal temperatures (18°C)		*With identical heating schedules (as above)*	
	1	2	3	4
	Passive design	*Insulation*	*Passive Design*	*Insulation*
Kew	2820	4270	1670	3910
Eskdalemuir	-	-	1890	4930
Lerwick	1530	7480	1620	4990

Fig. 4.25. Marginal benefits of insulation and passive design measures (kWh/year) - effect of correcting heating schedule[78]

[76] D. M. L. Bartholomew, 'Possibilities for passive solar house design in Scotland', in Kerr Mac Gregor (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
[77] ibid.
[78] ibid.

Bartholomew notes that column 1 above is probably best for comparing the relative value of passive design at different *latitudes.* The relative benefit of insulation should be noted.

Occupancy
Since the relative benefits from passive solar design and any energy conservation measures depends on *occupancy* two further occupancies were simulated: 'low' and 'high'. The table below shows an extension of column 3 above to compare the useful heat savings from passive design with the typical occupancy as described, a high occupancy scenario of continuous daytime heating of 21°C with 16°C night setback and 8600 kWh/year of incidental gains and a low occupancy scenario based on heating to 21°C in living and dining rooms, occasional heating elsewhere and 3700 kWh/year of incidental gains. The table shows sensitivity of passive solar measures to occupancy.

	High occupancy	*Typical occupancy*	*Low occupancy*
Kew	1100	1670	740
Eskdalemuir	990	1890	600
Lerwick	710	1620	560

nb: the resultant mean winter internal temperatures are different in all cases
nb: typical occupancy is column 3 of table above

Fig. 4.26. Passive design benefits (kWh/year) - effect of occupancy

As noted the benefit from passive solar design and indeed from all energy saving measures depends on occupancy. Clearly fuel savings depends on fuel use and most measures will save more fuel in a well heated house than in a poorly heated one. Critically however for the solar measures raised temperatures during periods when the heating is off are beneficial if the house is occupied at the time but not if the house is empty. Passive solar gains are useful when incidental gains are insufficient to maintain desired temperatures but not if incidental gains are sufficient on their own.

Conclusions
The SEF design needed less auxiliary heat than the references on all three simulated sites and occupancy types (*for the same cost*), typically 35-50% less than the 1982 Regulations reference. The predominant saving however was extra insulation, the benefits of which increased with both the need for heat (latitude) and with increased heating (occupancy). Increased heating (high occupancy) still included 'night setback'. The benefits of the passive design measures alone however vary less simply with occupancy and location. Although the *passive solar features showed fuel savings in all locations and occupancies considered,* contributing between 18% of useful heat inputs in the high occupancy scenario at Lerwick and 61% in the low occupancy scenario at Kew, solar gains also made important contributions to the reference houses. The marginal benefits of concentrating principal rooms and glazing on the south side of the design of a direct gain house are modest with high occupancy and at high latitudes where increasing insulation is more important.

Bartholomew argues that this is due to the fact that even in south England single glazing is a net heat loser over the heating season with typical internal temperatures and double glazing or single glazing with insulated night shutters are thermally neutral as described above. This is better than a wall that is always a net loser but not much better than a well insulated wall. He thus argues that with present glazing technology direct gain can make no more than a modest contribution at high latitudes (Scotland) and that it is more important to reduce north facing glazing than increase south facing glazing. Windows with better heat loss characteristics would improve the performance considerably.

At 19% of floor area SEF windows are close to optimum at Kew for typical occupancy. The estimated fuel savings from the direct gain features are generally rather lower in Scotland than at Kew but if window areas were optimised to suit the Scottish climate (they would be smaller), fuel savings in Scotland would probably be broadly similar to those achieved in the South. The SEF design would however perform better than conventional designs insulated to the same standards anywhere in the UK. The complete package of insulation and solar gain is also highly economic - at 18°C average internal temperature it needs 40-44% less heating than a conventional house to 1982 regulations. Passive solar measures contribute 40% in the south of England and 17% in Scotland. Insulating shutters are an important factor in performance.

General Guidelines
Turrent and Steemers give a rule of thumb for unobstructed, South facing double glazing as 20% of floor area.[79] This is backed up by the SEF design at Kew but would be reduced in more northerly latitudes. In practice this is not much above conventional glazing areas but redistributed to provide 60/70% on the south-facing facade and 10-15% on the others. Clearly as well as overheating at the ends of the heating season the more glass the more need to consider visual comfort and privacy in the city. An optimum balance between mass, glazing and insulation is site and occupant specific. The UK climate however limits effective solar design practically and economically. The form of traditional Scottish housing exemplifies recommendations for direct gain in the Scottish climate. It should not be forgotten that small houses need less heating anyway. Appropriate direct gain systems for specific sites can provide 30% of space heating load in insulated buildings with minimal extra first costs.

The importance of user interaction with the system should also be noted since the materials concerned are the surfaces of the interior building structural elements, interior furnishings and other contents.[80] As a 'live in collector', conflicts between space use and energy collection and storage will inevitably arise. Furnishings and floor coverings may cover up thermal mass and thus reduce the effectiveness of the system. Net curtains will significantly reduce solar gain. Careful design control of these elements and occupant participation in the design encouraging awareness of the system are thus essential if it is to work efficiently.

From both design and performance perspectives, experience suggests that modestly sized wall aperture system (i.e. those designed to provide from a quarter to a third of heating load) have been most successful. Thermal mass location (i.e. storage to usefully use solar gains) is a problem for higher solar fractions. Mass is required to prevent overheating but in the UK with its many overcast days it becomes a drain on the auxiliary heating system. Mass will also slow down response time for auxiliary heating and thus will not be appropriate for many occupancies.

4.2. 7. Isolated Gain/Sunspace: Principles

In an isolated gain system solar collection is thermally isolated from the living space. The most common form of isolated gain system is the sunspace: an unheated glazed enclosure to the south of a building separated from the heated space by glazed, insulated or mass walls of various forms. A sunspace however has two modes of action.

Direct Gain Buffer Sunspace
A sunspace may be used simply as an unheated direct gain space. It will then contain storage mass and movable insulation and be used as a cheap extension to the house habitable for much of the year.[81] In this case it will save energy predominantly by acting as a thermal buffer (an unheated intermediary space designed to moderate the influences of ambient climate on the internal environment) increasing thermal resistance of and reducing ventilation heat loss through the walls and windows that it protects. The sunspace air temperature is funded by solar gains and internal loses. The graphs below show temperatures under a clear sky of a single glazed sunspace with a floor area of 10m^2 and volume of 25m^2 attached to a building at constant 18°C at a latitude of 51°N. There is double glazing between the sunspace and building. The temperatures are over 24 hours for a south facing sunspace in different months and in March over 24 hours for the same sunspace facing different directions.

---

79 David Turrent and Koen Steemers, 'Domestic Low Energy - 4 Beyond the Regs', *Architects Journal*, 11 April 1990.
80 Bion Howard and Harrison Fraker, 'Thermal Energy Storage in Building Interiors', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.
81 John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A primer for Architects*, Batsford for Commission of European Communities, 1992.

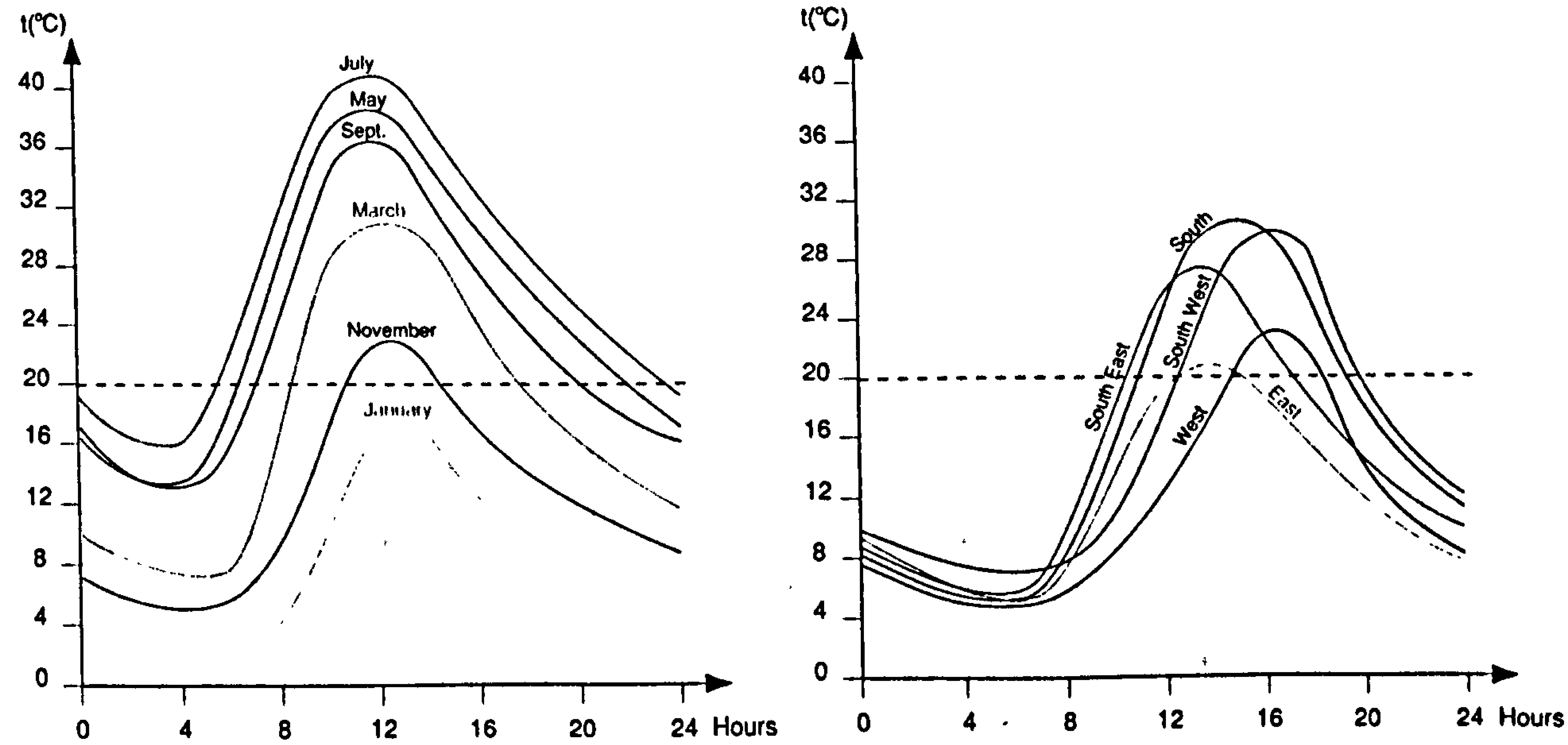


Fig. 4.27. Sunspace temperature[82]

If insolation has been sufficient to raise the sunspace temperature high enough to permit warm air flow to the interior then the sunspace can be used as an isolated solar collector. It will utilise the thermosiphonic loop.

The Thermosiphonic Loop
In a true passive system transfer of energy to the living space will be by a non-mechanical process usually involving a form of convection known as the thermosiphonic loop. Air, heated in the collector, will rise and its place will be taken by cooler air. When the heated air reaches a place unheated by direct solar radiation, it becomes cooler. An air circulation loop is set up between the directly heated zone and the non-irradiated zone. Return air stays close to the floor. The warmer air can thus transfer its energy to remote storage or occupied spaces and the cycle will continue as long as the collector is sufficiently warmed and as long as the organisation of space permits. Interior doors, windows, vents and movable insulation can be used for control and closed at night or during cloudy periods to prevent the possibility of a reverse cooling loop. Heat generated in direct gain systems may also be distributed from solar heated to occasionally occupied zones to prevent over heating or to heat remote rooms. Circulation will be enhanced by extending doors to the ceiling avoiding stagnant pocket of hot air. A doorway on its side, for example, would transfer only 60% of its potential.[83]

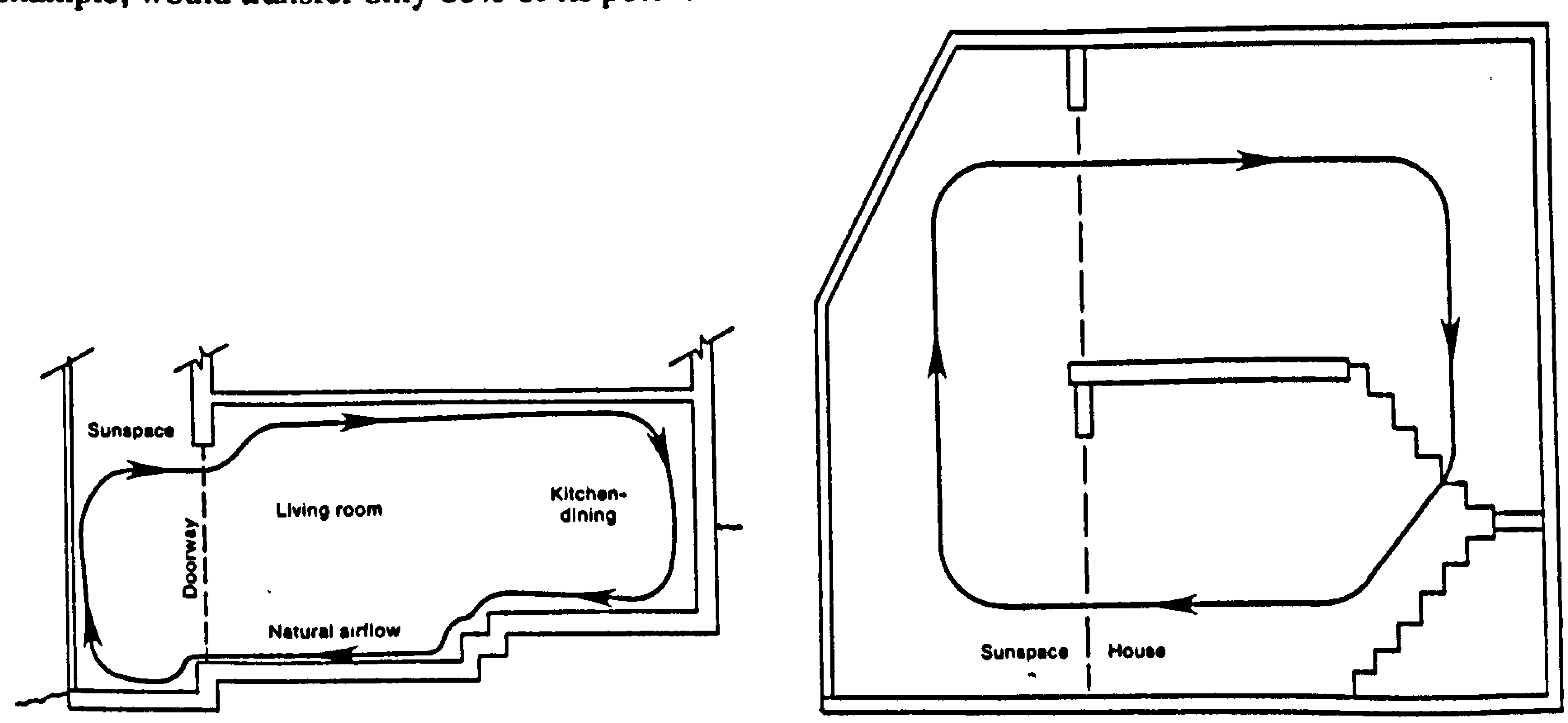


Fig. 4.28. A convective loop[84]

[82] ibid. p55
[83] ibid.
[84] Gregory Franta, 'Thermal Energy Distribution in Building Interiors', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990. p265

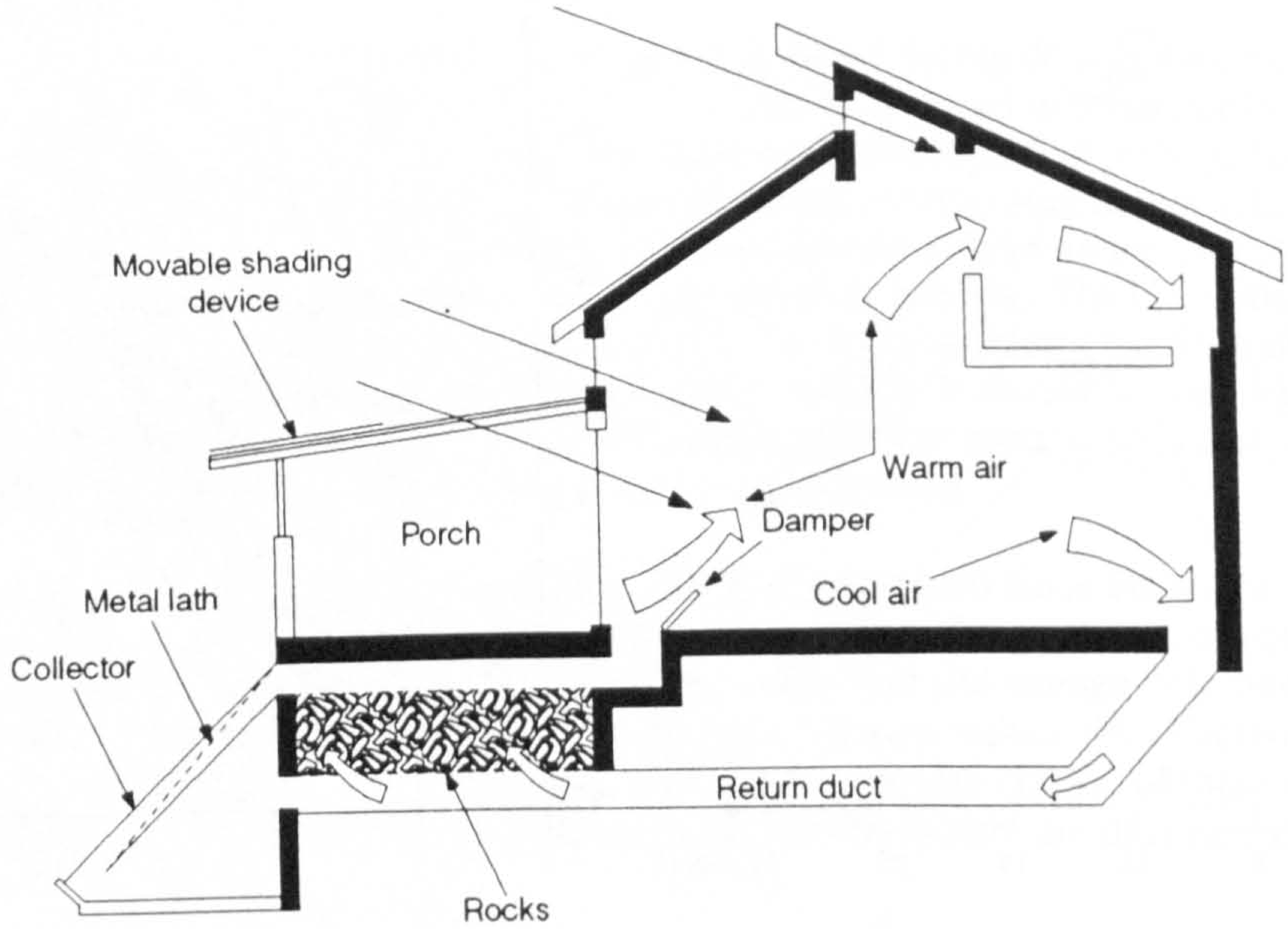
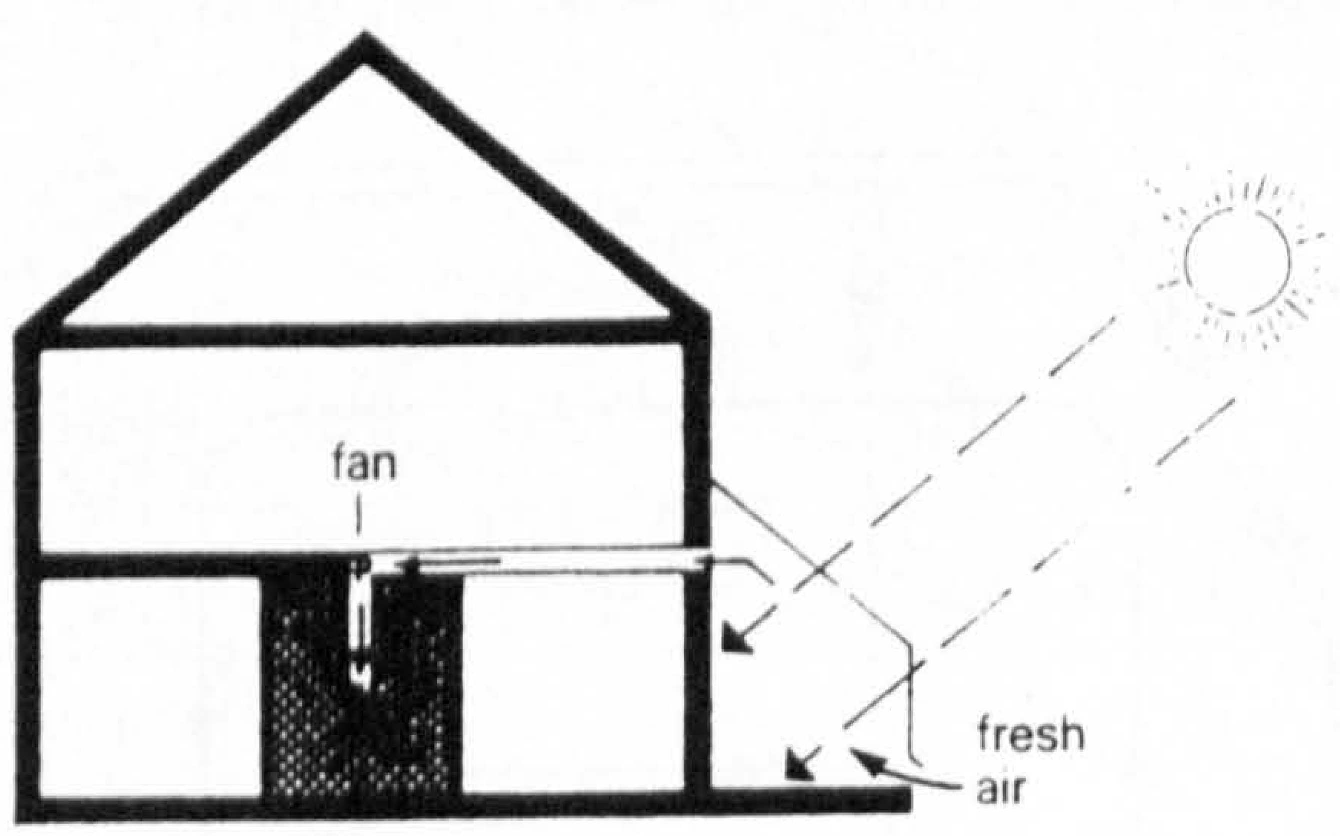


Fig. 4.29. Energy distribution in a building using a convection loop[85]

Isolated Gain Sunspace

Usually the sunspace will incorporate various degrees of irradiated thermal storage either the sunspace floor or the wall separating sunspace from living space. A mass wall is usually structural. Mass will serve to stabilise and moderate sunspace and living space temperature swings. A mass wall will also conduct heat from the sunspace (collector) to the conditioned space. The wall may be used as an extended Trombe wall (see below) distributing the stored heat by means of convection, conduction and radiation. Ventilation openings at the top and bottom of the sunspace will allow a convective loop to distribute heat more effectively than doorways.[86] More mass in the sunspace means lower temperature swings but also higher average sunspace temperature as well as less 'excess' heat for interior use. The opposite is true with sunspaces containing less mass, except in terms of higher average temperature where the highest performance glazings (and night insulation) are utilised.[87] Ventilation air to the house can be preheated by solar gains in the sunspace. In this case a simple fan may be used to extract the pre-heated air.



Notes:
Solar energy is absorbed in the high mass wall and floor of the conservatory and the resultant, re-radiated heat can provide a source of pre-heated air for a mechancial ventilation system. At a higher level of solar use the warm air can be drawn into a centrally located thermal stove (insulated 'cupboard' type in this case). Warm air is drawn from the store by natural convection or fan as required to supplement the house heating.

Fig. 4.30. Hybrid storage from a sunspace[88]

If the sunspace contains little thermal mass the air temperature will rise quickly and air can be circulated to remote storage. This can increase the useful solar input by providing longer term storage. Thermal envelope design uses floors and the double leafed envelope to circulate air around the house. In a double envelope design the south facing sunspace forms part of an envelope that wraps around the entire

[85] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C. E. C, 1992. p81
[86] ibid. p 70
[87] Bion Howard and Harrison Fraker, 'Thermal Energy Storage in Building Interiors', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.
[88] Geoffrey Pitts, *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989. p71

structure and may come into contact with the ground beneath the building before returning to the sunspace.

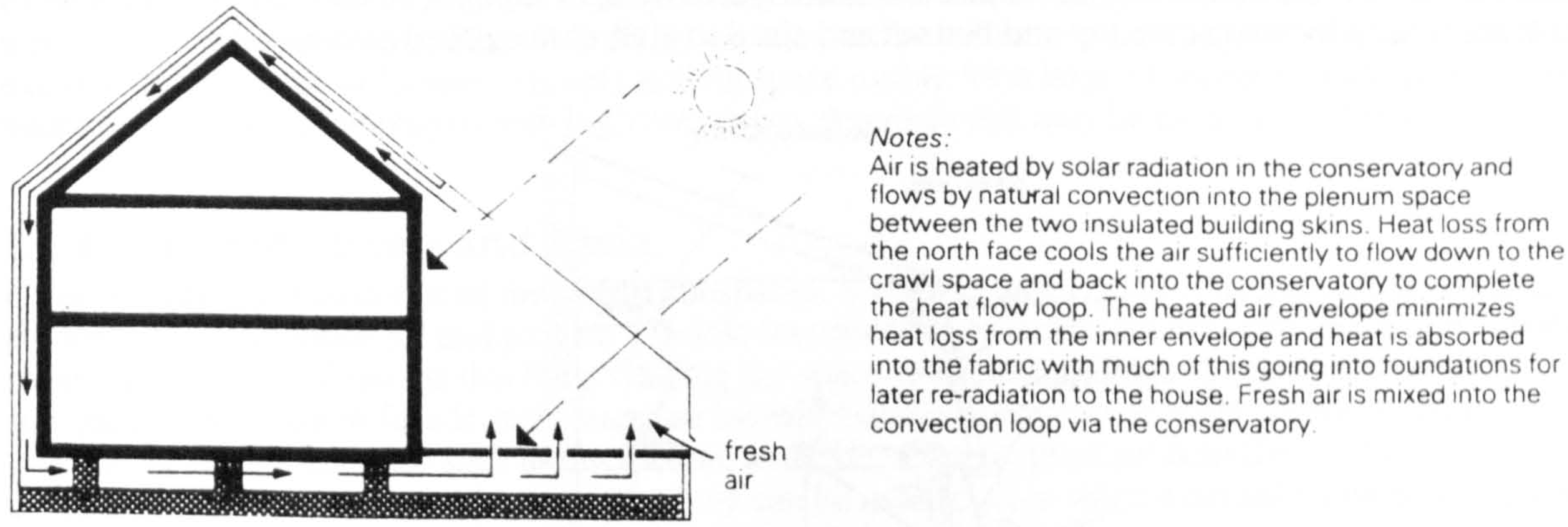


Fig. 4.31. Double envelope design[89]

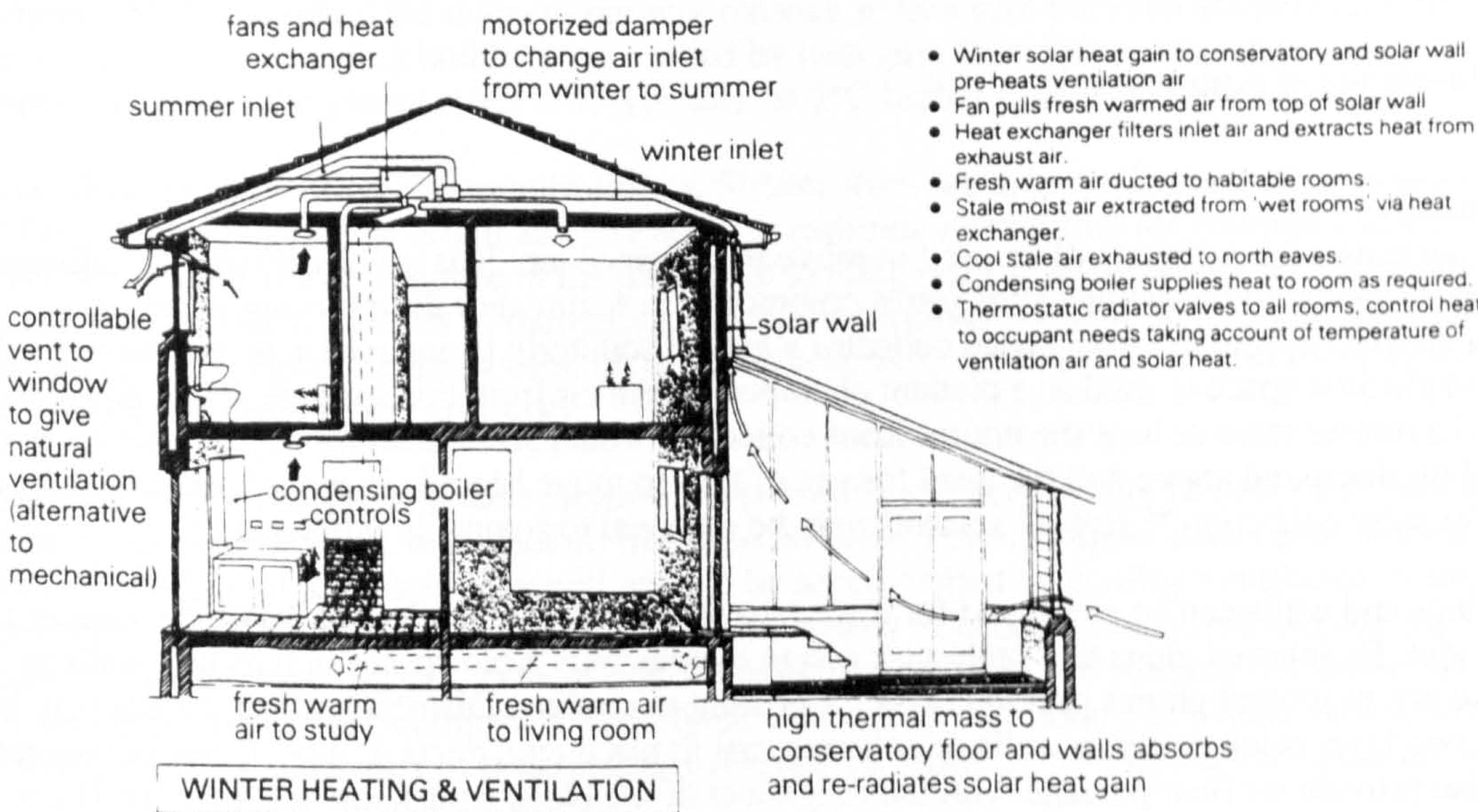


Fig. 4.32. The TRADA designed Lifestyle 2000 house[90]

Sunspaces can take a wide variety of geometrical configurations; as simple add-ons to the south wall, semi-projecting or completely recessed into the building (i.e. surrounded on three sides by the living space, covering part or the whole width of the house, and of various heights). The exact form and method of distribution will depend on, required performance, climate, shading, construction and lifestyle. Forms are discussed in relation to performance below. Turrent and Steemers define two generic types of sunspace.[91] An integrated sunspace protects an area of wall for a relatively small area of glazing. A lean-to conservatory is simply added to an external wall and is particularly suited to retrofits. An advantage of the former is that the sunspace is in direct contact with more rooms of the house to which it can provide solar preheated air, conversely they argue the occupants are more likely to use the space as an extra habitable room and provide it with heating. A sunspace must be unheated if a net solar gain is to be achieved.

Roof glazing of the sunspace tends to receive more summer than winter sun (depending on pitch). Added on sunspaces however allow, more easily than direct system glazing, an azimuth and tilt angle appropriate to the site thus maximising solar gains. This will increase the need for the sunspace to be partitioned off from occupied spaces, shaded and have its own venting systems in summer and night time insulation to avoid increased radiative losses at night. Single glazing for the sunspace and double for the

---

[89] Donald Prowler and Douglas Kelbaugh, 'Building Envelopes', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990. p133

[90] Geoffrey Pitts, *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989.

[91] David Turrent and Koen Steemers, 'Domestic Low Energy - 4 Beyond the Regs', *Architects Journal*, 11 April 1990.

divide between sunspace and living space is the most effective use of glazing in contrast to direct gain systems but if the sunspace is to be heavily planted double glazing will reduce condensation problems. Sunspaces should be separated from adjacent heated spaces by tight fitting windows, doors and vents. Vents are ideally located at the top and bottom and sized to 10% of the glazed area each.[92]

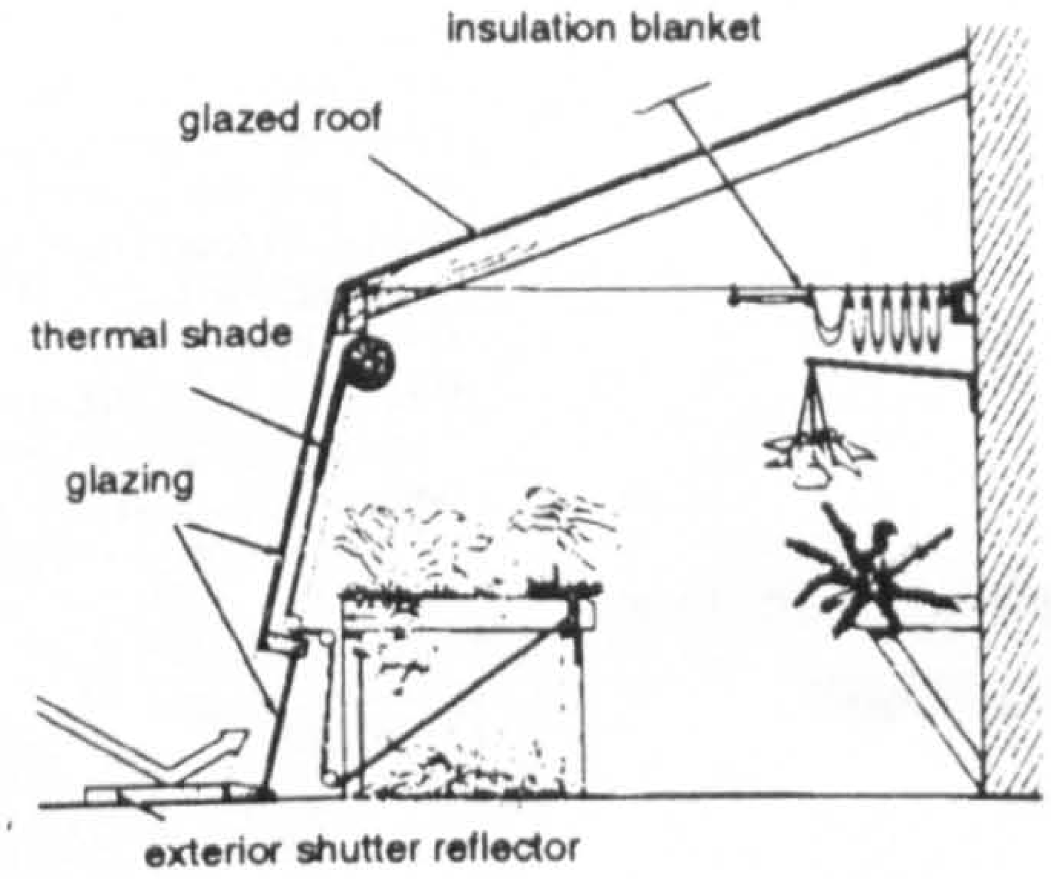


Fig. 4.33. Insulation of a sunspace[93]

Hybrid Systems

In 'hybrid' systems a fan or fans will be used to move the warmed air. This usually involves reinforcing the convective loop through remote stores (most commonly rockstores) or destratifying warm air collected in an 'attic' space. In a roof space collector a glazed southerly facing roof acts as a passive solar collector and the attic space is used as a plenum chamber. Warm air from this space is drawn down using a fan to feed a remote store or heat the house. Roof collectors would seem ideal for city use but given the problems of tilt discussed above and the need for use of fans to move heated air, walls have more often been used for solar collection.[94] Hybrid systems may be essential to some city problems.

Floors, ceilings and walls can be employed for forced convection to remove heat to isolated rooms or for providing a sink for internal gains that otherwise add to overheating. Void spaces in masonry walls or under floor cores in precast planks provide mass for heating or cooling. Distribution and storage may be provided in two layer brick partition walls or concrete cast in place with ducts or pipe. Cores of concrete block can also provide air flow passage with the roughness of the block enhancing heat transfer. If one side of the element is at ambient temperature it will need to well insulated. Hybrid charged stores may be most efficient if passively discharged.

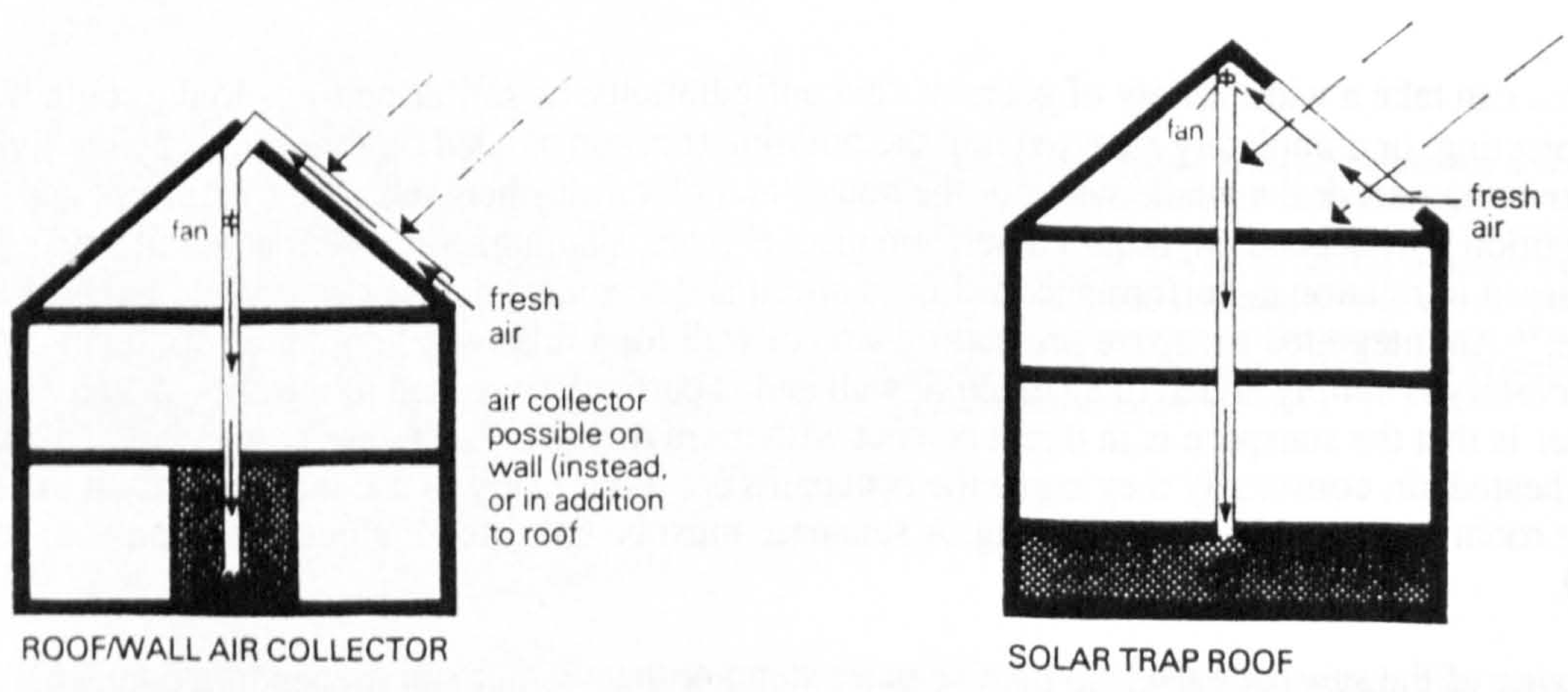


Fig. 4.34. Solar trap roof and roof/wall air collector[95]

---

[92] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C. E. C, 1992.
[93] ibid. p76
[94] Geoffrey Pitts, *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989. p71
[95] ibid. p71

Amenity of Sunspaces
Sunspaces are particularly applicable to northern latitudes.[96] They provide bright warm extensions of living space on days when radiation levels are reasonable but low air temperatures and high winds make it impractical to be outdoors. Thus they create an intermediate climate providing, for example, April external temperatures in January, cheaply adding space usable for a large proportion of the year. For the young, elderly and unemployed with high occupancy demands this may be particularly favourable.

5.2.8. Covered Streets and Atria

Covered streets and atria extend the role of sunspaces. Similarly they enable solar collection and solar preheating of ventilation air and provide a usable intermediate environment between inside and outside reducing heat losses from the dwelling. Glazing the space between buildings as opposed to linked sunspaces along a south facade still creates an intermediate environment or buffer space suited to climate tolerant secondary activities such as circulation, a market, storage, physical activities and for normal occupancy in spring and summer. In winter they can be used to sit in when external temperatures are mild or the sun is out. They offer a sort of pseudo outdoor living, with an extension into spring and autumn of the short summer season. Clearly atria should not be expected to provide comfort comparable with indoor environments.[97] Unheated the temperature will balance somewhere between ambient and the room temperatures in surrounding buildings, governed by heat gain from these, solar gains and heat losses. The temperature inside the glazed space will typically be 5°C higher than outside air in winter.[98]

Atria allow for association between dwellings. Shelter from wind, precipitation, urban pollution and noise are further advantages. The bright amenity space is especially beneficial for children and the elderly. The protection offered is also valuable in the temperate to cold, rainy climate of Northern Europe's long interseasonal periods. Benefits of increasing individual dwelling window sizes (better daylight and reduced artificial light) can apply even on north elevations. Solar penetration into living spaces can be increased using south facing corridors.

Lower zones of an atrium will have steadier temperatures and people may be excluded from upper zones where temperatures can be high. Hot air may also be taken from the upper zones and directed to adjacent rooms.[99] Shading of solar apertures will need to be accompanied by cooling ventilation in summer. Economic analysis has shown that atria may be less costly than open courtyards and streets. Savings are made in less elaborate facades, in reduction in circulation space in surrounding buildings and joint circulation for groups of buildings.[100] Clearly the concept of economic extra space builds on the benefits of single building sunspaces (it is particularly relevant to forms of co-housing discussed in *Chapter Nine*).

5.2.9. Sunspace Performance in the UK

In *The potential for sunspace buffer zones in Scottish housing* C. Porteous discusses the energy performance of three house models with different sunspace buffers in the climate of NW Scotland. Porteous qualifies evidence from BRE and ETSU passive solar programmes that used climatic data from Kew and predicted that sunspace buffers cannot be justified as energy saving devices on cost terms alone.[101] He argues that the NW of Scotland enjoys greater amounts of sunshine than the London area from February to May and with correspondingly higher degree-day totals the opportunity for appropriate solar space heating is increased since demand and supply are matched.[102] Additionally if designed as an essential element within minimum advisory/statutory space standards, construction cost differentials can be tailored to a pay-back period within 10 years. If extra to minimum standards it still provides extra floor area on cost.

---

[96] Kerr MacGregor, 'Potential for solar energy in northern climates', in Kerr Mac Gregor (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
[97] Oyvind Ascehoug, 'Glazed Spaces - Research and Development in Norway', *ISES Conference Proceedings*, C49, September 1987.
[98] David Turrent and Koen Steemers, 'Domestic Low Energy - 4 Beyond the Regs', *Architects Journal*, 11 April 1990.
[99] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C. E. C, 1992. p56
[100] Anne Grete Hestnes, 'Atrium Buildings for Cold Climates', *Clean and Safe Energy Forever*, Proceedings of the Solar World Conference, 1989.
[101] S. Nielson, 'Options on energy', *Architects Journal*, 23 May 1984. W. B. Pascall and B. U. Phelps, 'Passive Solar Housing for the UK mass Market', *Proceedings Solar World Congress*, Permagon Press, 1984.
[102] C. Porteous, 'The Potential for sunspace buffer zones in Scottish housing', in Kerr Mac Gregor (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.

Porteous' first model was a simulation of the first actual Scottish passive solar housing project of 22 single person flats at Stornoway (58°N). The sunspace while extra to the minimum floor area is an essential plan element - the entrance porch for each flat. It is located on the south side of the living room/Kitchen with 7.2m² of vertical double glazing to the exterior and a single glazed screen dividing the porch from the living space.

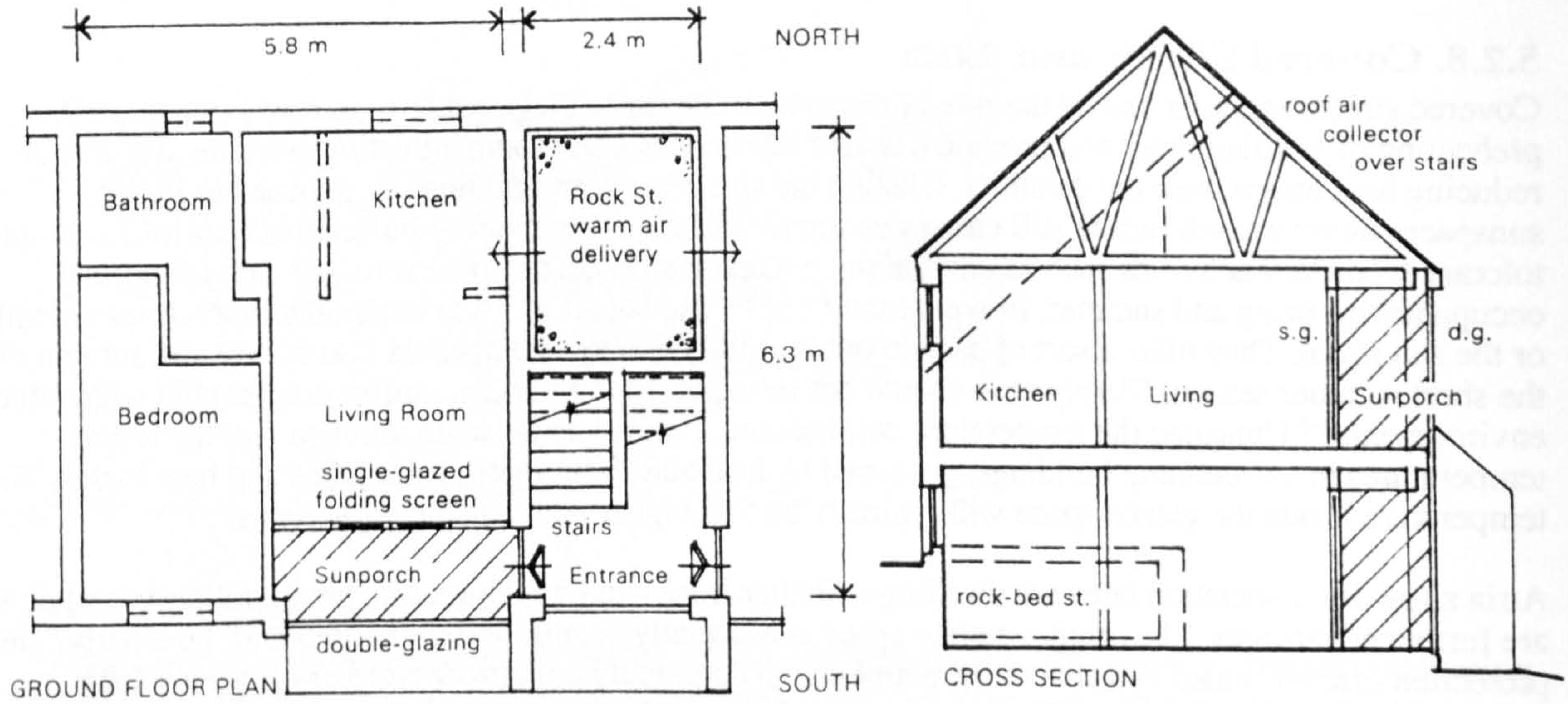


Fig. 4.35. Plan and section of single person flat, Stornoway[103]

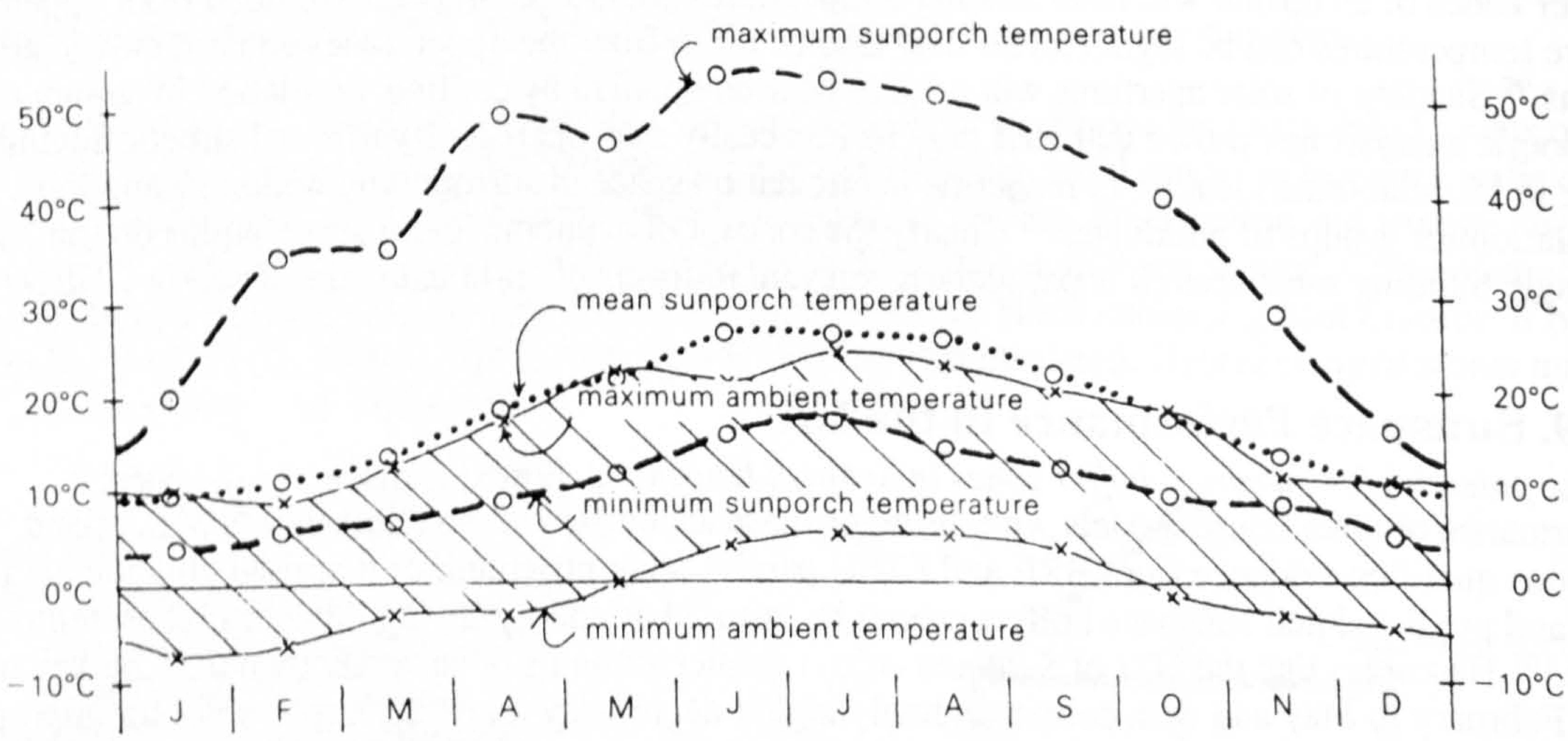


Fig. 4.36. Stornoway passive solar housing: annual sunporch and ambient temperature swing[104]

Comparing simulated temperature swings in the sunspace with ambient external temperatures illustrates the climatic advantage of the sunspace as outlined. The model allowed for a daytime ventilation rate to the sunspace of 2 ac/h. This increased the accuracy of the simulation. The high temperature swing illustrates the potential value of controlled venting to a store (in this case a rockstore was used) that can increase useful solar gains and allow for more variety in occupancy while still benefiting from gains. It was predicted that *May to September space heating load* can be fully met by casual and useful solar gain. The fuel saving, compared to an equivalent reference model (equivalent insulation) without this feature, was found to be 30%. The ratio of gross collection area to heated volume was 0.1 (20% of floor area). The annual saving was 150 kWh/m². *Pay-back was estimated at 8 years.*

---

[103] ibid.
[104] ibid.

Sunspace Design and Performance
Porteous analysed two further house models to explore the link between design and performance of a sunspace (relative proportion of useful solar gains to auxiliary heating). The variables used within a 4-person, south-facing terraced house shell were:

- ratio of gross sunspace collector glazing to heated volume;
- ratios of inner and external heated-space glazing, and also roof glazing, to gross sunspace collector glazing;
- double and single glazing mix, and thermal capacity/response of opaque surfaces.

A whole house ventilation rate of 2ac/h was used that, argues Porteous, is representative of normal occupancy (occupant behaviour) not unoccupied houses with windows and doors closed (0.75 ac/h). The control houses were not randomly orientated 'non-solar' houses but equivalent direct gain models, south-facing with no overshading and the same insulation levels (opaque wall $0.27W/m^2K$, roof $0.23W/m^2K$ and floor $0.37W/m^2K$). The heated zones have light internal linings for fast thermal response but heavy secondary capacitance to limit temperature swing provided by load bearing partitions and party walls together with a solid ground floor slab. These were a constant for the sunspace houses and control houses.

Modelled for March all house models showed that a high proportion of the space heating can be met in early spring (30-42%). *All sunspace options improved on the direct gain references.* Porteous points out however that the exact type of sunspace is crucial to its cost effectiveness in a particular region concluding that in NW Scotland a combination of sensible planning, direct solar gain and the use of buffer devices such as a small sun lobby and north storm lobby in a well insulated house are the optimum energy saving and amenity measures. Extra costs of larger sunspaces would have to be set off against amenity. *Locating the sitting room at first floor level was also found to save significant quantities of fuel - approximately the same as introducing a ground floor sunspace buffer to a direct gain house.* These savings would be particularly valuable where the ground floor is shaded by adjacent buildings. Single glazing in lieu of double between buffer and living space incurs marginal extra heating cost and there was no energy benefit in increasing the sunspace size to cover all the available collection area. Porteous points out that "A sunspace covering half the ground floor collection surface with single vertical inner and outer glazing, performs as well as a sunspace covering the whole collection surface, and with double inner glazing".[105] Roof glazing to a sunspace is of little value. Exposed northern surfaces of the living space in one model increased demand significantly.

Malcolm Newton Sunspace
The value of the dual operation of sunspaces as buffers and collectors was demonstrated in Malcolm Newton's (M/N) rejigged version of a traditional terraced form also designed for the DoE's passive solar R&D program.[106] The reference design was a common, public sector, three bedroom, four person terraced house. The M/N houses, importantly given the need for variations in orientations and diversity in solar architecture are designed for a N/S running terrace. Adjacent rows are placed back to back thus having no back gardens but with correspondingly larger front gardens. The obvious restrictions produced by this design are made possible by a $27m^2$ sunspace, part single and part double storey that runs from front to back of the house and onto which all the major rooms face. This form keeps the minimum envelope area exposed to the weather and replaces the back garden with the intermediate climate of the sunspace. The asymmetrical pitched roof with its gabled walls to the street has its steeper pitch as the south facing roof of the sunspace. $16.1m^2$ of window looks into the sunspace and $3.2m^2$ looks onto the street (security). The sunspace has $42m^2$ of glazing. Insulation levels of exposed elements are slightly over 1982 values and equal to the updated reference. The final design was costed at £2199 (12%) more than the reference but with an add on allowance for the sunspace of £1000 to the house value on amenity grounds and also £120 for the lobby the cost was thus £1079 extra. In addition $27m^2$ of space was added for over six months of the year.[107] Bartholomew analysed its performance as with the SEF design above. The much reduced consumption of this three bedroomed house compared to the SEF four bedroomed house discussed above should perhaps be noted in all forms. It has half the floor area.

---

[105] ibid.
[106] D. M. L. Bartholomew, 'Possibilities for passive solar house design in Scotland', in Kerr Mac Gregor (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
[107] 'Terraced Houses Show Big Savings', *RIBA Journal*, October 1983.

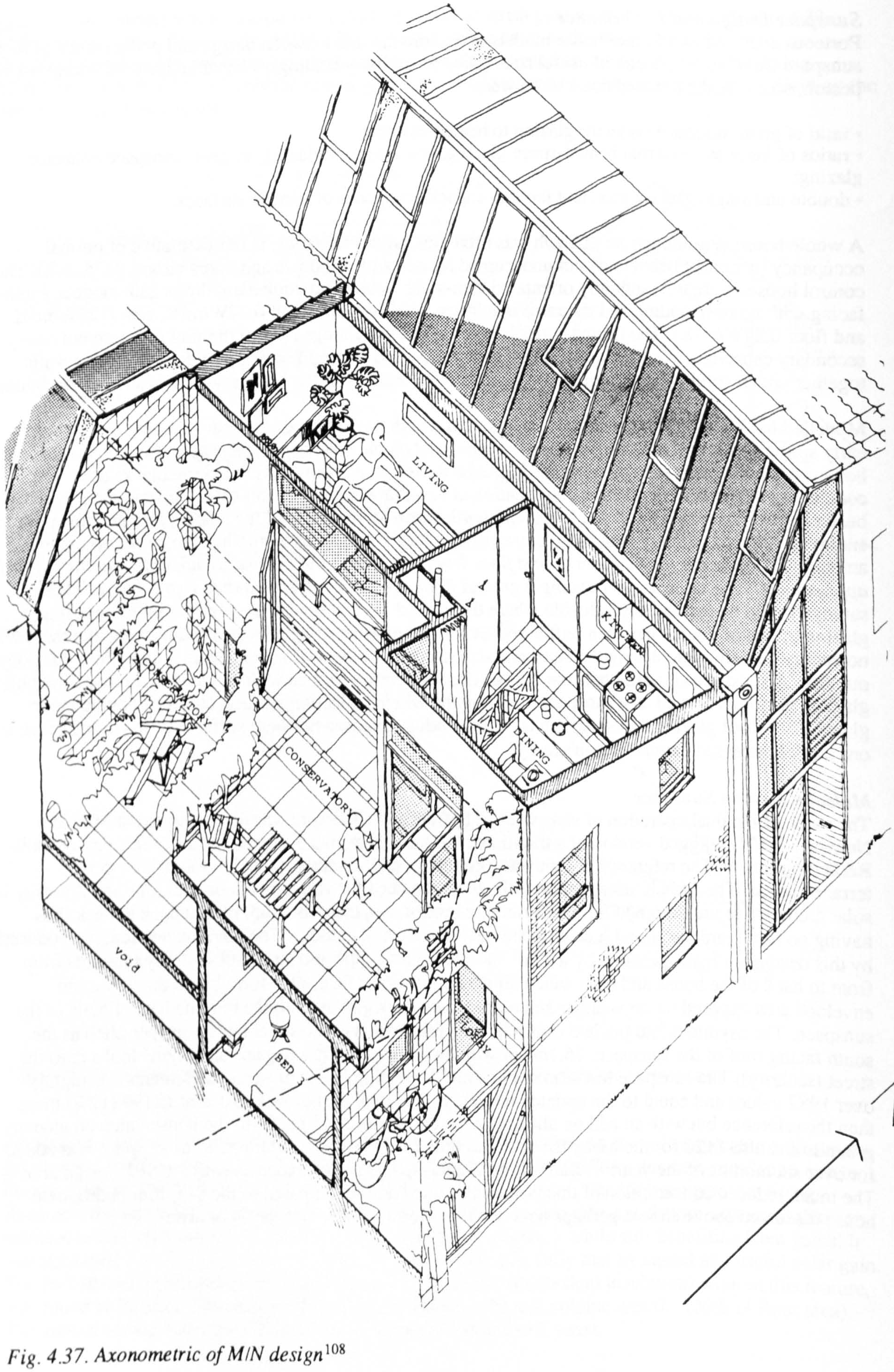


Fig. 4.37. Axonometric of M/N design[108]

[108] D. M. L. Bartholomew, 'Possibilities for passive solar house design in Scotland', in Kerr Mac Gregor (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.

	1982 Reference	*Updated Reference*	*M/N Design*
Kew	5800	4920	1990
Eskdalemuir	8960	7940	3320
Lerwick	9040	7950	3230

Fig. 4.38. Annual auxiliary heating requirement with typical occupancy for reference, updated reference and Malcolm Newton design (kWh/year)[109]

The table shows that at all *three latitudes* the design was much more efficient thermally than the 1982 Regulations reference and the upgraded reference with typically 65% less auxiliary heat than the standard reference. Its insulation only slightly exceeded the 1982 value and 66% of its performance advantage over the 1982 reference, unlike the direct system above, was due to the *passive solar measures.*

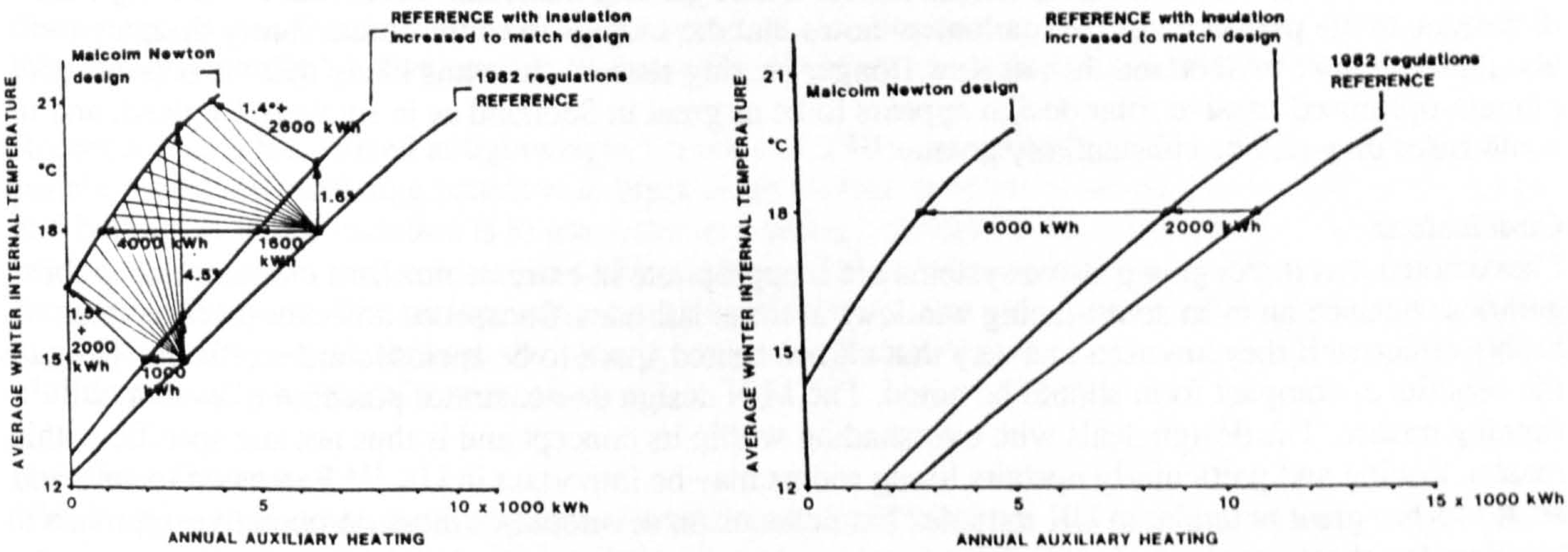


Fig. 4.39. Performance of M/N design at Kew and Lerwick[110]

	With equal winter mean internal temperatures (18°C)		*With identical heating schedules*	
	Passive design	*Insulation*	*Passive Design*	*Insulation*
Kew	4060	1550	3000	880
Eskdalemuir	-		4660	1020
Lerwick	5880	2160	4720	1090

Fig. 4.40. Marginal benefits of insulation and passive design measures (kWh/year) - effect of correcting heating schedule[111]

	High occupancy	*Typical occupancy*	*Low occupancy*
Kew	3900	3000	1900
Eskdalemuir	5870	4620	2670
Lerwick	6100	4720	2820

nb: the resultant mean winter internal temperatures are different in all cases
nb: typical occupancy is column 3 of table above

Fig. 4.41. Passive design benefits (kWh/year) - effect of occupancy[112]

Critically in comparison to direct gain the benefits of both the increased insulation and passive design measures increase with latitude and occupancy.[113]Bartholomew suggests that the main reason for this

---

[109] ibid.
[110] ibid.
[111] ibid.
[112] ibid.
[113] ibid.

performance is that the design encloses the heated space extremely efficiently with only one end wall and the roof exposed to the elements. *The direct effect of the sunspace he concludes is mainly to reduce heat loss from the heated space rather than provide extra heat input into it.* Temperature in the sunspace, as described, is raised by heat loss from the heated zone and solar gains. It is a minimum of 4K above ambient in December at Kew and 8K in transition seasons. Bartholomew describes conditions in the worst winter month as being similar to late March in the open air. Gain/loss trade-offs are much less critical than gain/loss balance through glazing in a direct gain system (these are critical at high latitudes). Whereas high internal or low external temperatures can make a window and thus a direct gain system a net energy loser, they can only increase the value of the sunspace.

Bartholomew concludes that the substantial performance improvements in this design at any latitude of the country would be practically (condensation and buildability) impossible to achieve by increasing insulation to a conventional design.[114] This feature alone makes this scheme stand out. Most of the performance advantage of the design is attributable to passive solar features and there is no obvious need to change the design for Scottish or English sites. Better glazing materials would make relatively little difference to the performance. Bartholomew notes that the savings from the conservatory design are about 50% higher in Scotland than at Kew (longer heating season). It seems likely that the benefits of climate-optimised passive solar design appears to be as great in Scotland as in southern England, and in some cases they will be substantially greater.[115]

Conclusions
I have noted that direct gain passive systems are inappropriate in extreme northern climates due to the gain/loss balance on even south-facing windows at these latitudes. Sunspaces however promise to be highly effective if they are used in a way that allows heated space to be enclosed more efficiently. Again the benefits of compact form should be noted. The M/N design demonstrates potential of even a N/S running terrace. The design deals with overshading within its concept and is thus not site specific within reason. Zoning and particularly upstairs living rooms may be important in UK.[116] Extension to atria and corridors has great potential in UK latitudes but depends on developing a more co-operative approach to housing. Pay-back costs remain a problem.

4.2.10. Indirect Gain: Principles and Performance

Indirect gain systems collect, store and distribute solar radiation within some part of the building envelope which encloses the living spaces.

Mass and Trombe Walls
Mass and Trombe Walls consist of a massive wall (usually concrete, stone, brick, block or composites) placed directly behind southerly oriented glazing. The outer surface of a mass wall is heated by radiation and may be painted black to maximise heat absorption. Diffusion of heat from the radiated side of a wall to the heated space side will involve a dampened delay or time lag. This lag is defined as the time between the moment the irradiated face reaches its maximum temperature and the moment when the opposite face reaches its maximum temperature. It will depend on thermal storage capacity and thermal conductivity of the material and its thickness (approximately 18 minutes per 10mm concrete). Heat transferred through the wall is released by radiation to other surfaces and convection. A Trombe wall has additional vents top and bottom to allow air to circulate from the cavity between the wall and glazing through the heated space. The convection space air can reach 60°C on clear days.[117] Windows may be placed in Trombes but again vents located at the top and bottom of the wall are more efficient.

In both mass and Trombe wall systems 'night time' insulation will be required to prevent re-radiation outward from the wall. Reverse flow of air in a Trombe system at night or during cloudy periods is prevented using a backdraft damper of thin plastic over the inner face of a vent (absence can reduce efficient by 10%). Prowler and Kelbaugh argue that mass walls sacrifice 5-10% of overall efficiency but construction is simplified and initial costs are lower. The cavity between mass wall and glass must be vented to the outside in summer and the glazing shaded.

---

[114] ibid.

[115] ibid.

[116] C. Porteous, 'The Potential for sunspace buffer zones in Scottish housing', in Kerr Mac Gregor (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.

[117] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C. E. C, 1992.

Trombe walls were developed by Prof. Felix Trombe and Jacques Michel in France in the mid to late 1960's with the Odeillo House. Perhaps critically prototypes were developed in the Pyrenees. Here the high solar radiation and cold nights provide optimum conditions. Research concerned improving the net energy balance of the wall i.e. reducing night losses, preventing backflow and automatically regulating air flows.

In UK climates in mid winter or when there is insufficient solar energy during the day to heat the wall the high U-value of Trombe walls can result in a heating burden. The recent development of transparent insulation may be applicable here.[118] It may also be possible to isolate the mass from the system and use only the air flow (isolated wall collector). Applying a selective coating to the mass wall is equivalent of adding another layer of glazing although such measures are expensive. At Christopher Taylor Court in Bournville a selective surface was added to the mass wall to enhance the solar absorption of solar energy. Trombe walls and possible variations have rarely been explored in the UK. In temperate climates it is certainly necessary to install double glazing and fully utilise movable insulation. Practical problems of locating such insulation in a Trombe wall system between the glazing and the mass wall or externally discourage its use. Condensation on the glass and its cleaning present further problems. Trombe walls then, can potentially be developed in southern England but are unlikely to be effective in Scotland.

Recent research has looked at lightweight versions of a Trombe called TAP's or thermosiphoning air panels. These are insulating panels with black outer surface covered by single glazing and vents at top and bottom. Another variation is to use water as a storage element since it has a greater heat capacity than brick or concrete per unit volume. In addition convection currents spread the absorbed energy rapidly throughout the store. The surface temperature is therefore lower and as it is practically an isothermal heat store and heat loss back through the solar aperture is reduced. Water can be used in thick layers while still eliminating the time lag of a mass element.

A Hybrid Trombe

The Trombe wall at Machynlleth Centre for Alternative Technology is a simple 'add-on' design modified specifically for the UK climate.[119] Insulation has been placed on the inside of all the existing house walls. The south-facing wall also has a $6m^2$ steel heat exchanger bonded to its outside so making the wall a heat store. Next comes an insulated barrier followed by a $13.4m^2$ Skysorb, backpass, stainless steel solar collector which is double glazed. A further $4.6m^2$ of collector is in the roof. A 20 W 300 m^3/h fan circulates the air and roof vents are provided for periods of overheating. The wall operates in 1 of 4 ways:

• heat is passed from the collector to the house on a sunny winter days (sufficient radiation and the house is cold);
• heat is diverted from the collector to the heat store when the house is sufficiently warm;
• heat can then be passed from the store to the house when radiation is insufficient;
• if there is need for heat but insufficient heat store or radiation, dampers shut down the system to prevent reverse thermosiphonage (e.g. night).

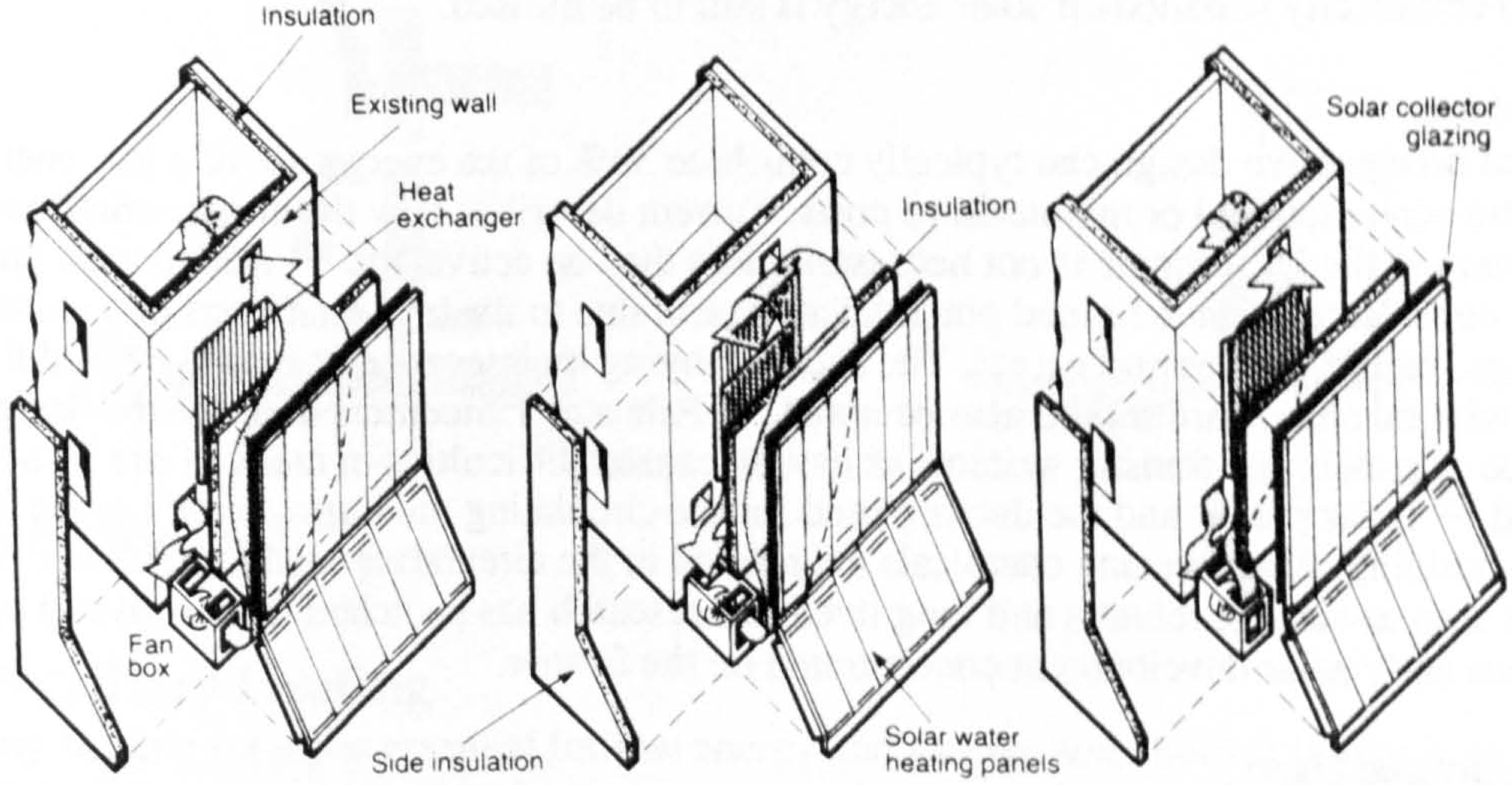


Fig. 4.42. Principle of Operation of a Hybrid Trombe[120]

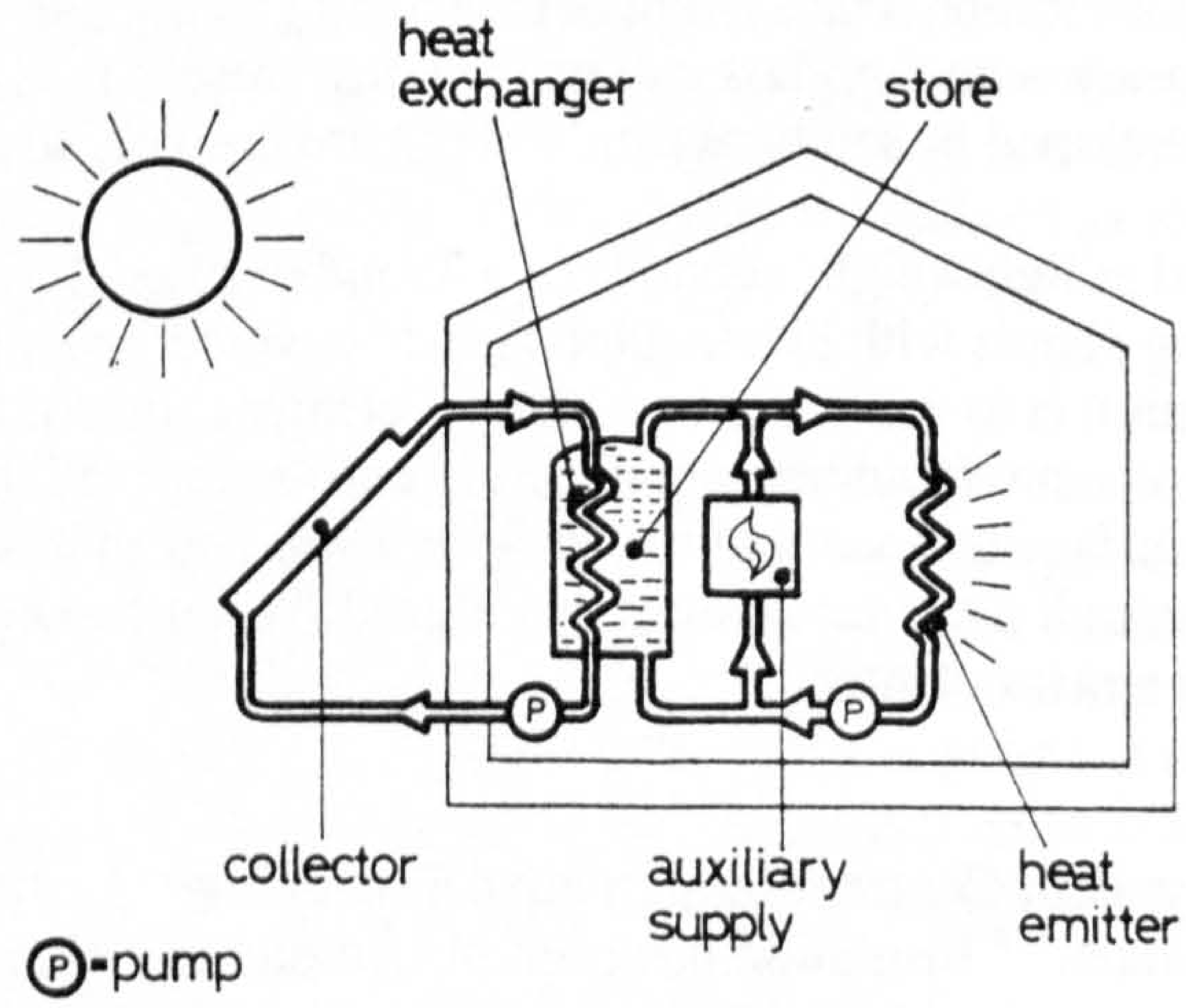
[118] ibid.
[119] Stephen Ashley, 'Sophisticated Trombe', *RIBA Journal*, October 1983.
[120] ibid.

While not strictly a passive system the technology was appropriate to the maintenance ability and performance requirement of the user. The 52m^2 house has a seasonal heating requirement of 6000kWh (Oak Farm Road discussed above 8677) of which 42% is provided from the solar wall. The occupier is not in residence all day and is content with 16°C maximum internal temperature.

4.2.11. Active Solar Design

Space Heating

An active solar system relies on energy other than that derived 'locally' from the sun to collect and distribute heat. An active system comprises of collector, store and heat emitters with a circulating medium (water or air) to transfer and distribute the heat through the system propelled by electric pumps or fans. It is essentially applied to a conventional if insulated house design. Water heating for domestic use is often incorporated into active systems or an active water heating system may be used in passively space heated houses.



4.43. Typical Active Systems[121]

Active Benefits

In an actively powered building both form and fabric are more independent of solar collection, storage and distribution. The system is designed only with reference to the macroclimate (although the panels may be sheltered from the wind). This freedom can give scope for house design around a range of microclimatic features and allow the sun to be used in a more selective way inside and outside of the building i.e. a building designed passively but with the obligation to capture as much sun as possible taken away. The collectors are usually roof mounted but can be remote from the structure. This may be essential in certain city situations if solar energy is still to be utilised.

Active Problems

I have noted how passive design can typically contribute 30% of the energy use of a low energy house with no extra constructional or maintenance costs. Turrent describes how the energy contribution from a passive system in the UK climate is not necessarily less than an active one.[122] Active solar space heating is however considered to have limited potential at present due to the high first costs of a collector array, water storage, piping, pumps and valves. The accompanying maintenance costs and limited life associated with this hardware should also be noted. W Palz and T Steemers describe the design and maintenance of panels and transfer systems as having caused difficulties in many of the 29 active projects they studied.[123] Solar panels and the ducting used for the circulating medium also add to the 'ecological load' of the building. Anti-freezing chemicals are needed in the circulating medium. Passive solar heating systems are seen as simple, reliable and long lived and research has switched from active to passive systems since early solar development concentrated on the former.

Active Systems and Users

The resulting form of an active system less directly conveys the impression of a building working with the climate. Control is part of the traditional auxiliary supply not distinctly solar. Equipment is more complex than the window and blind operations of a passive system that are direct and informative in their

[121] W. Palz and T. C. Steemers, *Solar Houses in Europe: How they have Worked*, Pergamon Press, Oxford, 1981.
[122] David Turrent, John Doggart and Richard Ferraro, *Passive Solar Housing in the UK*, ETSU, 1980.
[123] W. Palz and T. Steemers, *Solar Houses in Europe How They Have Worked*, Pergamon Press, 1981.

operation. The system however may be more versatile and less time consuming for many occupancies. Communicative and interactive elements would take other forms such as participation in design and energy feedback monitoring.

Water Heating
Heating water accounts for between 10% to 17% of energy consumption in European housing. Today most active units are used for water heating where year round application means a more rapid pay back period. Solar panels for domestic hot water should be tilted at an angle equal to the latitude of the site less 10°. Active hot water systems are most cost effective in UK when built as central systems (use for multi-family housing).

4.2.12. Passive Cooling

In situations where the air inside a building is warmer than ambient air and cooling is required the reduced density of warmed air described can be used to expel that air from the building. One way is to evoke the stack effect providing an opening at the top of the building and inlets lower down (nb problem of pollution of air low down in cities from roads). The stack effect can also be used in an atrium or sunspace. The air movement generated can be used to draw air from the rest of the building or outside at low level. This can be used to induce cross ventilation with air taken from the building's shaded side (microclimate) and expelled via the sunspace on the sunny side. Increasing the height will reinforce the stack effect. Heating systems described using thermosiphonic circulation to charge mass can also be used to cool buildings in summer if collectors are covered by day and dampers left open at night.

It is also possible to dissipate heat from a building using cross ventilation driven by the wind pressure induced by microclimate design to accelerate light breezes. Opening on the lee side should be greater than those on the windward side. Air flow across massive elements will help to dissipate heat from them. External wind deflectors can be positioned for local winds. The Venturi effect may also be used to encourage stack ventilation.

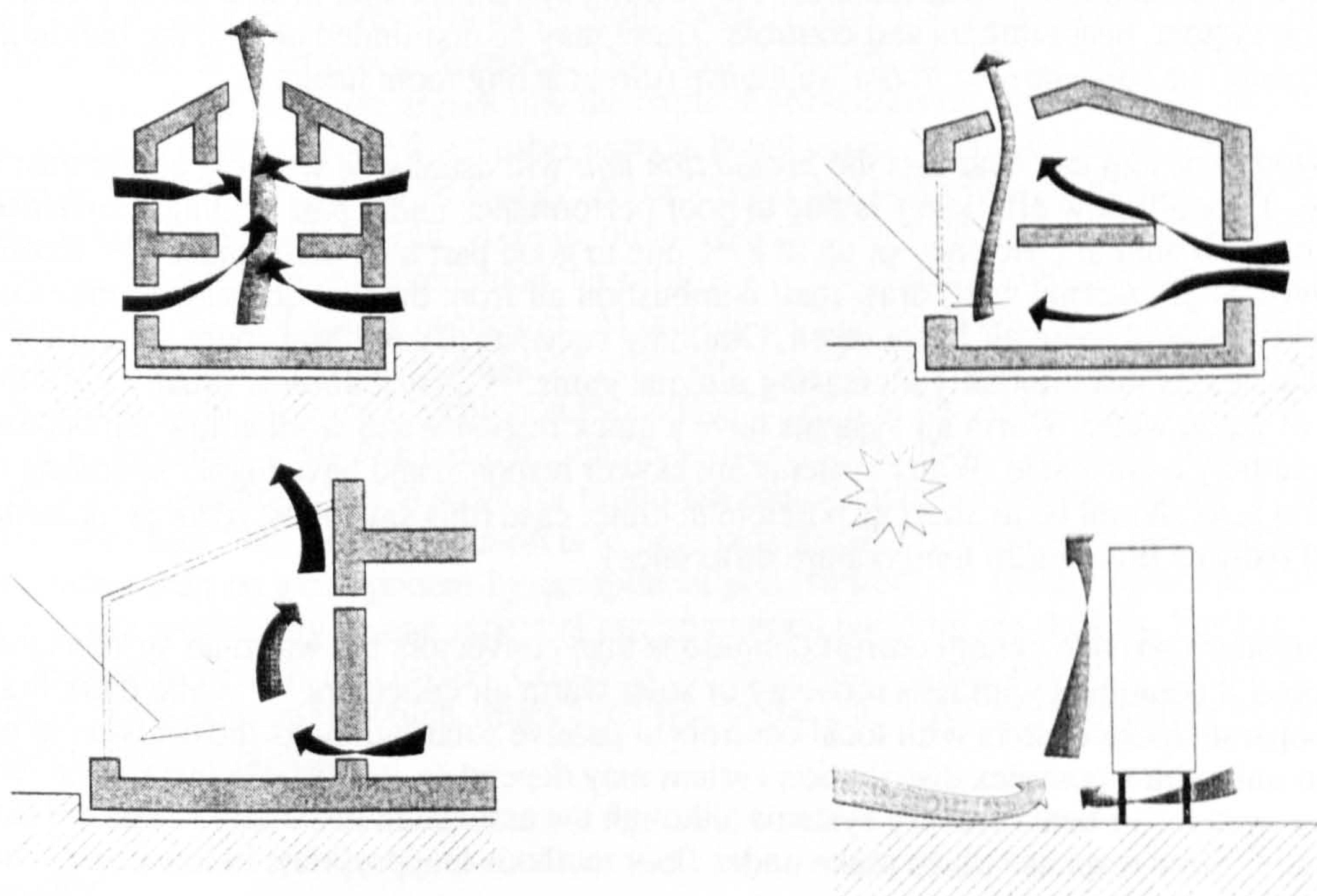


Fig. 4.44. The stack effect[124]

4.2.13. Auxiliary Heating

An auxiliary heating supply is essential for low energy and passive solar houses in Northern and Central Europe (even with *group* interseasonal active storage and superinsulation). The auxiliary heating system will have to provide supplementary heat in certain parts of the building at certain times, for longer and shorter periods and with variable intensities in order to achieve the required comfort.

[124] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy Conscious Design: A primer for Architects*, Batsford for Commission of European Communities, 1992. p90

Responsive systems
In a house designed for solar gains there is a need for a responsive and locally controlled back up heating system to prevent overheating when for example incident solar radiation requires the heating to be switched off. Quick response is significantly less than one hour.[125] A gas fired boiler controlled by a thermostat in a space that does not receive solar gain is, for example, unresponsive. It is unlikely that any single room thermostat will be able to respond accurately to the variable inputs into all the different rooms in the house. More responsive would be individual heaters each with their own thermostat or centrally supplied radiators controlled by thermostatic radiator valves. If the later is used it is essential to provide a controller that can turn the whole system off otherwise the cycling of the boiler will significantly reduce its overall performance. This can be achieved with some boiler managers or by having a controlling room thermostat in one room without thermostatic valves on the radiators in that room.[126] In superinsulated designs a fast response fabric demands a similar fast response heating system.

System Design
The system will be selected in response to the planning, building envelope and ventilation decisions that define the criteria of the design. Factors to be considered include:

- design day heat loss,
- lifestyle, building occupancy and intermittency of heating,
- the choice of passive solar components (if any) and the method of heat distribution (water or air),
- the storage provided (capacity and location),
- temperature zoning,
- casual gain,
- comfort levels required and seasonal heating requirements.

It should be noted that the auxiliary system should be sized appropriate to heat loss (winter design outdoor minimum temperature with no internal or solar gains and with internal design temperatures). It may take account of arrangement of movable insulation, zoning for winter and cloudy/night use, and the insulation value of sunspace buffers but not solar gain. Savings can be used to partly offset the cost of additional insulation but not solar features. The heating system consists of four parts: production unit, distribution system, heat emitters and controls. These may be distributed around the building (full central heating system) or concentrated in one appliance (direct acting room heaters).

As it is sized to design day heat loss the *production unit* will usually be working at less than its maximum. Typically low efficiency is due to poor performance under part loading. Condensing boilers however have an annual efficiency of up to 87% due to good part load performance [127] Room sealed boilers (vertical or external wall) draw their combustion air from the exterior and are thus safer and more efficient since heated room air is not taken. Goulding suggests placing heat sources centrally with vertical flues so that heat is lost internally increasing internal gains.[128] *Distribution* is usually via either ducted warm air or piped water. Warm air systems have a quick response and work at low temperature but space requirement may be problem. Water systems are slower response and have higher operating temperatures. Distribution runs should be as short as possible in either case (this save runs, reduces incidental heat losses and reduces flow/return temperature difference).

Radiant *emmiters* provide better comfort conditions than convectors but warm air systems may be advantageous if combined with heat recovery or solar warm air collectors.[129] While there is a tendency to return to separate room heaters with local controls in passive solar buildings the decision to use a central production unit with a complex distribution system may depend on its possible integration with hybrid, active solar systems or heat recovery systems although the associated installation costs are frequently prohibitive.[130] Slow response times make under-floor methods inappropriate in low energy and passive solar designs.

Temperature zoned *control* offer potential for additional savings with living areas heated to, for example, 20°C and others rooms to, for example, 17°C. The average internal temperature is thus lower reducing the

125 Jake Chapman, 'Energy Efficient Houses The Principles', *Architects Journal*, 9 November 1988.
126 ibid.
127 ibid.
128 John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C. E. C, 1992.
129 David Turrent and Koen Steemers, 'Domestic Low Energy - 4 Beyond the Regs', *Architects Journal*, 11 April 1990.
130 John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C. E. C, 1992. dig p 88

seasonal heat requirement. Control will need to be local (2 zone control). A good control system will react quickly to variations of internal loads and solar radiation and thus preserve thermal comfort in both solar and other low energy designs. In general the control system must be able to detect and react to room temperature. *Time controls* are required for intermittent heating and *temperature controls* should be for individual room temperature or zone control. As noted a single thermostat controlling whole house temperature is inappropriate. Thermostatic radiator valves to control individual rooms or zones are particularly important in passive solar houses due to intermittent and unevenly distributed gains.

Mechanical Ventilation and Heat Recovery
As described in very well ventilated houses, well sealed with low infiltration mechanical ventilation with heat recovery becomes essential to ensure good quality internal air and minimise condensation. Most systems are based on a cross flow heat exchanger that recovers heat from the exhaust air at an efficiency of around 70%. Stale air will be exhausted from the bathroom and kitchen and fresh pre-heated air delivered to living spaces. Solar air collectors may be integrated as part of the system using the same heat-distribution network as in the TRADA Lifestyle 2000 House (*Fig. 4.32.*).

User Education
The entire benefit of a low energy house can be lost through improper use of the solar elements combined with the auxiliary heating. Enormous variations in energy consumed is also a feature of differing user requirements (use of bedrooms for additional living space). Surveys of identical houses with identical heating systems have shown variations by as much as four to one in fuel consumption.[131] User information and follow up monitoring and feedback are important. Work by the Martin Centre confirmed that houses with central heating consumed on average 30% more energy than non centrally heated equivalents due to higher mean internal temperatures throughout the house. This demonstrates the critical nature of the heating control in the building and the potential of seasonal and daily zoning to dramatically reduce consumption.[132]

4.2.14. Building Regulations

The Building Regulations for energy efficiency, until recently have not taken passive design into consideration let alone broader green measures. The 1990 Revisions to Part L1 allows for a degree of flexibility in design. Peter Burberry argues that the explicit provisions of Approved Document L1 are confined to standards of insulation.[133] All other aspects being equal, improved standards of insulation in new buildings will result in economy of energy. As described any other factors are involved in design for energy conservation such as site layout, volume, building form and planning, thermal capacity and thermal response, fenestration and orientation, air infiltration, ventilation, time and area control of the auxiliary heating system, and use by occupants. At present an 'elemental approach' to double glazing allows increased U-values in other areas instead of double glazing. It is also possible to take several of these factors into account by using Calculation Procedure 2 given in the Approved Document, but the main thrust of its guidance leads to a basic minimum standard rather than a rigorous objective for good design.[134] It enables housebuilders to settle for minimum requirements of double glazing. J Douglas Balcomb describes how "The simple solution is to base regulations on whole-building annual performance rather than on a component-by-component prescription".[135] Ideally however building energy performance in use would only be one aspect of environmental building regulations. Further passive design is individual to country and region. Critically the optimum balance between passive solar and conservation depends on climate which varies even within the UK. VAT applied to fuel would need to be graded between climatic regions.

Conclusions

Little hard data is available on occupied passive solar houses. It takes time to design and monitor such houses and to analyse the results in a meaningful and unambiguous way. As described there is considerable variation of performance depending on occupant use. In the Linford design average savings vary from 1400 to 2200 kWh per year with user behaviour, internal arrangements and overshading.[136]

---

131 ibid.
132 'Old Houses Have Energy Potential', *RIBA Journal*, October 1983.
133 Peter Burberry, 'Building Regulations 1990 Revisions: Part L1', *Architects Journal*, February 1990.
134 ibid.
135 J. Douglas Balcomb, 'World Outlook for Passive Solar', *Clean and Safe Energy Forever*, Solar World Conference, 1989.
136 Neil Milbank, 'Housing: The Passive Solar Approach to New and Existing Domestic Buildings', in Patrick O Sullivan (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985.

Milbank notes that new build solar designs can contribute 30% of the lower heat requirements of well insulated housing with thought given to site layout and orientation.[137] He notes that this will have a considerable impact on reduction in energy demand if applied to all new houses and estimates the annual primary energy saving after 20 years as 0.2 mtce (at present buildings use 21 mtce per year). This assumes 1000kWh savings for each house and 500kWh for flats. In both cases the savings are assumed only for dwellings in suitable locations. Such a figure relies on projected estimates of house building numbers and take up of measures. Such figures focus on the limitations of 'energy in use' design and the city context (see Chapter Five). The real value of passive solar design may be its communication.

Solar design involves balancing all conservation and passive energy flows given the climate specific criteria and other restrictions of the site. Due to the progressively longer heating season that largely compensates for the reduction in available solar energy and lower ambient temperatures passive solar design (including increased insulation) would appear to maintain or increase its potential in the northern latitudes of Britain.[138] At these latitudes however inappropriate passive solar features and poor control can waste rather than save energy. In direct gain systems therefore care must be taken not to increase south facing glazing beyond its optimum which in northern latitudes is not far above current normal levels. Reduction of northerly glazing is probably more important given conventional glazing systems. Direct gain systems become marginalised in northern latitudes due to the gain and loss balance of even south facing windows. Sunspace and atria systems would by contrast appear to be highly effective in northern latitudes provided that design is careful to effectively enclose the heated space. The role of the sunspace as a 'buffer zone' is critical.

Milbank notes a greater potential for saving energy in private houses on estates outside cities where good solar access can be ensured. Turrent and Doggart argue that orientation S±30° is compatible with densities of 125-175 persons per hectare (12-18 dwellings per acre) typical of most private sector housing developments.[139] I have noted the transport problems of such an approach. It should also be noted that smaller terraced houses and flats have lower consumption for the same insulation levels. Saving energy in suburban house forms without questioning those forms does not take these factors into account. Neither does it take into account the sustainability and social issues discussed in chapters one and seven.

From this analysis of solar design it seems that 30% of space heat load (in low energy designs) can be provided; *on cost* by *direct gain systems*, and *cost linked to amenity* for *sunspaces*. Such amenity may be best utilised by combining sunspaces into atria and corridors linking terraced buildings (social structures that encourage grouped housing are discussed later). Similar benefits can however be achieved through reducing window areas and increasing insulation. A south-facing glazing area of 20% of floor area is an optimum for passive solar design in the south. Ensuring 100% solar access to extensive glass facades should not be advocated as a strategy. A balance of solar access with requirements of shelter and storage capacity is preferable. For both solar spaces (that add to insulation values) and direct gain efficient enclosure of heated space is important and zoning of rooms to benefit from passive air collection. Small retreated spaces for winter occupation are efficient. A balanced strategy of insulation and solar design would be consistent with higher densities (medium density housing = 50 per acre). Superinsulation and solar design both have a role to play.

City type housing (flats and terraces) consumes less energy *per se* and may be more appropriately developed for energy efficiency than suburban forms given a balanced approach to passive design and insulation. I go on to describe how mixing building uses may also be beneficial and how making the most of mixed use and combining strategies of conservation and solar gain require early consideration at site level for groups of buildings. It also requires using the full variety of approaches in group schemes so that for example overshaded areas utilise high insulation. Our approach could be one of advocating more communal housing arrangements based around courts with the further potential for sharing renewable energy sources as auxiliary and benefiting from mutual warmth. A three floor version of the M/N design with heat supplying activities or insulated buildings located at ground level seem appropriate making mutual use of active water systems. This design dealt with overshading in its site strategy at high density. I do not reject individual solar design but go on to suggest that emphasis should be placed on social structures that can develop grouped design.

---

[137] ibid.
[138] D. M. L. Bartholomew, 'Possibilities for passive solar house design in Scotland', in Kerr Mac Gregor (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
[139] David Turrent, John Doggart, Richard Ferraro, *Passive Solar Housing in the UK*, ETSU, 1981.

Chapter Five:

Adapting the Built Environment

5.1. A Context for Low Energy Design

- Impact of the Built Environment
- Materials and Construction
- The Existing Fabric
- Passive Solar, Active Solar and Superinsulation Continuum
- Low Energy Design, Control, Participation and Adaptability

5.2. Levels of Design

- Urban Neighbourhood Design
- Participation at the Neighbourhood Level
- Urban Planning Levels and Conclusions

5.1. A Context for Low Energy Design

In this chapter I attempt to put my discussions on low energy design into the context of; the relative impact of building in the UK, the qualitative potential of different methods, the potential of the existing fabric, the 'energy capital' in building construction, the potential of adaptable and participative design.

5.1.1. Impact of the Built Environment

Goulding notes how in Europe buildings account for 28 - 45% of total annual energy consumption, two-thirds of which is used in housing.[1] Brenda and Robert Vale note that in the UK and probably in the whole of the developed world, *servicing* of buildings accounts for 50% of total fossil fuel consumption. Approximately 22% is used in transport and 28% in industry. Of the building component over 50% is used in domestic building (25% of the total).[2] If the energy used for extraction and manufacture of building materials and for travelling from home to employment and shopping are added the design and planning of the built environment probably account for three-quarters of fossil fuel use.[3] Planners, architects and their clients thus have an enormous role to play in reducing energy use and enabling use of renewable energy sources. In terms of CO_2 space heating and transport, account for about half of the UK's annual emissions (1.5% of the world total).[4] It should also be noted that in 1990 40% of contractor output was in the commercial and public building sector, 25% in the housing sector, 14% in the industrial sector and 7% in infrastructure, energy supply and transportation. About three-quarters of all construction industry activity (by cost) is concerned with buildings of which housing forms a considerable part.

Use of fuel	*UK Carbon Dioxide emission (%)*
Space heating	26.6
Water heating	6.4
Appliances	7.0
Lighting	6.5
Motive power	9.0
Process heat	15.0
Cooking	3.4
Agriculture	2.6
Transport	23.5

Fig. 5.1. Annual CO_2 emissions by end use[5]

Sector	*Consumption (Million therms)*	
	1986	*1988*
Industry	16 092	16842
Transport	16 257	18 002
Domestic	17 456	16 737
Public administration	3 545	3 287
Agriculture	564	536
Miscellaneous	3 946	4 067
Total	57 860	59471

Fig. 5.2. Energy consumption by sector (heat supplied basis)[6]

[1] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C.E.C, 1992. p155
[2] Brenda and Robert Vale, 'Building the Sustainable Environment', Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.
[3] ibid.
[4] John Doggart and Mike Flood, 'Energy from Renewables - 1: The Solar Contribution', *Architects Journal*, September 1989.
[5] ibid.
[6] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991. p85

At present North Sea oil and gas provide about 75% of the energy delivered to the UK economy. Energy measures involve both *conservation* and *replacement of fossil fuels by renewable sources*. This involves local group and individual house design and centrally generated energy (wind, wave and hydro-electric). Best policy means considering energy efficient building first and back up energy provision second.

Brenda and Robert Vale isolate three areas of building design critical to sustainability:

• energy capital (energy that goes into making of buildings and infrastructure and the energy in materials),
• energy revenue (energy consumed in the operation of the built environment that is the main impact on built form as discussed in *Chapter Four*),
• environmental impact of construction (pollution).[7]

Approximately 50% of domestic energy use is in space heating that can be addressed through low energy and solar design as discussed. *Critically however such strategies must be placed in the context of energy capital, environmental impact of construction, transport, qualitative benefits of different techniques and the social and economic context of our cities*. Some of these are discussed below.

5.1.2. Energy in Materials

Processing and Specifying

Energy used during extraction, manufacture, transport, construction, use, demolition and disposal must all be balanced with regard to the *specifics of a project*. Most building involves assembly of previously manufactured and transported materials *specified by a designer*. The process of assembly is labor intensive and as a consequence energy used on site is small percentage of capital energy costs of building.

Material	*Energy content (kWh/kg)*
low energy materials	
sand, gravel	0.01
wood	0.1
concrete	0.2
sand lime brickwork	0.4
medium energy materials	
plasterboard	1.0
brickwork	1.2
lime	1.5
cement	2.2
mineral fibre insulation	3.9
glass	6.0
porcelain (sanitary ware)	6.1
high energy materials	
plastics	10
steel	10
lead	14
zinc	15
copper	16
aluminium	56

Fig. 5.3. Energy intensiveness of materials[8]

[7] Brenda and Robert Vale, 'Building the Sustainable Environment', Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.
[8] Brenda and Robert Vale, *Green Architecture*, Thames and Hudson, London, 1991.

Material	*Primary energy requirement (kWh/m³)*
steel	$1.02 * 10^{10}$
plasterboard	1425
bricks	973
concrete blocks	834
lightweight concrete	834
concrete	736
timber	695

• The energy requirement is the total primary fuel at all stages leading to the finished item.
• Timber value is for finished components and includes a substantial transport energy factor as much UK timber is imported.

Fig. 5.4. Comparative material energy requirements[9]

Energy embodied in materials and components is an important component of the environmental impact of a building. Brenda and Robert Vale argue that 70% of energy used in construction is in the manufacture of materials and components. This is around 5 - 10% of the UK's total annual energy consumption.[10] Reducing these figures involves both *manufacturers* conserving energy in processing or using renewable energy supplies and *designers* specifying low embodied energy materials. Both could be encouraged by tax measures. An alternative approach (to CO_2 problem only) would be to plant trees for every building. A typical 3 bedroomed house has materials with capital energy content equivalent to 20 tonnes of CO_2. This would need about 20 trees to offset it over a 60 year period.

For a new building the capital energy embodied in its construction may represent between 5 and 30 times the annual revenue energy.[11] Embodied energy needs to be considered with the building type and proposed life. Housing tends to have low embodied energy (bricks, timber) and a life-span of 60 years. Commercial buildings however tend to have high embodied energy (steel, aluminium and glass) that may be as high as the revenue energy over a relatively short life (10 to 15 years). Buildings with such a short life-span should have low embodied energy (timber from managed production in UK if it existed) or be designed to enable materials to be recycled (i.e. demountable/kit of parts). If such buildings are designed to be adaptable their life can be extended as a complete building (see *9.2. Supports: an alternative to mass housing*). Another relationship between embodied and revenue energy is, for example, that insulation reduces revenue energy but increases embodied energy in a building. Brenda and Robert Vale note that mineral fibre insulation in roofs of up to 900mm will save more energy than it embodies over a nominal 60 year lifespan. For mineral fibre insulation in walls the limiting thickness is 700mm. It is important for designers to achieve a balance between these two requirements. These thicknesses are however higher than typical values of even superinsulated houses.

Materials and Transport
As described energy used in transportation is growing faster than any other sector. Energy used in the transport of materials is also increasing with global exchange of goods driven partly because fuel costs do not reflect pollution costs. Materials produced locally are thus not necessarily cheaper and consequently the material palette of the designer does not reflect transport globally. As noted the energy used in transport can be a significant proportion of energy embodied in those materials. Bricks, for example, delivered site from a brickwork's 20 miles away will have a transport energy cost of 100kWh per 1000, if they travelled 250 miles it would be 1250kWh per 1000.[12] The manufacture of 1000 bricks (extracting the clay and moulding the bricks) would require about 1400kWh.[13] Clearly in addition sources of clay must be considered in relation to the location of the brickwork's. Transport energy costs are particularly important in timber frame construction that has low embodied energy. If forestry in the UK produced significant quantities of structural timber the use of timber frame would involve low capital energy. In the UK 95% of timber for construction is imported with the consequent transport energy penalty.[14] This is in addition to the problems of exploitative markets discussed in *Chapter One* and unrenewable sources. One

---

[9] Geoffrey Pitts, *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989. p10
[10] Brenda and Robert Vale, 'Building the Sustainable Environment', Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London 1993.
[11] ibid.
[12] ibid.
[13] ibid.
[14] ibid.

city scale initiative that would be of considerable benefit would be to develop city forests for managed timber production (*see Chapter Six*).

Materials and Low Energy Construction
From the previous chapter and issues discussed here it seems the most appropriate construction for housing from the point of view of *embodied energy* and *low energy design* will be timber frame (and cladding) with some thermal capacity added by one of several techniques. Development of local UK supplies of timber would increase this potential. Timber frame has low capital energy (particularly if locally grown), and is ideal for highly insulated buildings that are not attempting to use solar gains (it allows for considerable levels of insulation). Timber frame without internal mass is however not an appropriate solar construction although light-weight construction may be used in rooms which are occupied intermittently. It should also be noted that cities are today our potential deposits of materials including buildings. Local recycled and recyclable materials could be the most efficient form of achieving mass (or complete brick carcasses) with timber additions or timber framed constructions. Other materials specified should be locally produced where possible particularly avoiding international transportation. Again the exploitation of global markets discussed in *Chapter One* is relevant here not simply transport costs. Hiring local contractors (if not utilising self-build) will also reduce transport costs in construction and aid the development of locally sustainable economies (see Chapter Seven). Later, I discuss, other beneficial elements of timber particularly its applicability for self build (or support core of brick with timber additions) with reference to encouraging greater self-reliance.

Other Factors in Construction
As noted the balance of light and heavy construction in terms of 'energy in use' is dependent on the specifics of climate and type of response (superinsulation or passive solar design). The traditional form of construction also affects this choice. In America where traditional building is light timber frame any adjoining mass would need reinforcement of footings. Howard and Fraker argue that this is a reason for designers to aim at conservation (insulation in a timber frame) to achieve net performance levels similar to passive solar.[15] In the UK traditional mass building appears to lend itself to modest but effective solar utilisation. This is opposed to its lesser potential for high insulation as it becomes increasingly complex to add insulation to a cavity wall. Structural materials that can provide heat storage are financially preferable to extra non-structural material. The combination of heavy and light construction may also vary in houses of one development depending on location within that project (exploiting different microclimatic zones). Durability of materials and the construction is also important and may be improved by good microclimate design. Problems of vandalism dictate use of cladding materials in the city particularly at ground level. A combination of brick 'core' and timber additions may be ideal and also give flexibility (extending life) if the 'core' involves basic living space that allows for extensions (see 9.2. *Supports: an alternative to mass housing*).

5.1.3. The Existing Fabric

The rate at which existing the building stock is being replaced is 1% a year and about 40% of the annual construction output is on maintenance and improvement.[16] A policy of green upgrading should recognise this enormous quantity of embodied energy and refurbish to reduce revenue energy. This points to the potential benefit of a national thermal upgrading programme.

Existing Houses
While the potential for new build to save energy in use is clearly greater than many existing buildings the *energy capital* tied up in existing infrastructure and building is means they need attention. New build is only a small part of the problem. The future life of old buildings involves how capital energy can be used and how revenue energy can be saved. Brenda and Robert Vale point out that approximately half of existing houses are solid wall construction.[17] Even cavity walled constructions are normally only 50mm wide. Improving the insulation value of existing houses involves either major disruption to inhabitants or a change of exterior appearance. Elkin notes that simple reductions in space heating such as draught proofing and loft insulation remain the exception.[18] Further such measures can have only limited impact and are likely to allow houses to be heated to a level of comfort which hitherto people could not afford. In preventing this Elkin quotes G. Gaskell "decentralised programmes [achieve] considerably greater

[15] Bion Howard and Harrison Fraker, 'Thermal Energy Storage in Building Interiors' in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.
[16] Brenda and Robert Vale, 'Building the Sustainable Environment', Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London 1993.
[17] ibid.
[18] Tim Elkin, Duncan McLaren, Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.

success in terms of mobilisation of consumers' energy savings and cost effectiveness than traditional centrally administered information campaigns and loans and grant schemes directed at consumers at large".[19]

A survey in Glasgow's Easterhouse estate noted that with an investment of £4600 per dwelling the homes of households suffering from fuel poverty could be upgraded to 1990 building regulation standards and efficient heating systems installed bringing financial savings in a seven year period comparable with increasing social security payments or pensions to provide the same benefits [20] The expected average cost of such measures elsewhere in the UK is £2500 per dwelling.[21]

To achieve levels close to those for new buildings insulation needs to be placed on the external skin and covered by waterproofing (render or timber cladding). Internal insulation cuts down on internal space and means it is difficult to achieve an unbroken skin through intermediate floors and under the ground floor (cold bridging and condensation). External insulation also maintains thermal mass to store solar gain unlike internal insulation. The predominant brick appearance of houses may thus need to change and this is a problem in terms of peoples preferences and for buildings in 'conservation' areas.

	Energy Use (giga joules)		
	1989 Regulations	*1990 Regulations*	*MK Index*
Detached House ($114m^2$)	90	78	56
Semi-Detached House ($80m^2$)	56	49	36
2 bedroom flat on intermediate floor ($60m^2$)	32	29	26

Fig. 5.5. Energy use in existing housing at previous and current building regulations and at Milton Keynes conservation index U-values[22]

Easterhouse

As noted above a project to refurbish some high U-value constructions causing severe fuel poverty has already taken place in the Heatwise project at Easterhouse. In an area of poverty and high unemployment households were spending £1000 pounds per year on keeping warm. One study showed residents spending more than the national average on fuel although they lived in small flats of $60m^2$. The technical brief is described by Brenda and Robert Vale.[23] The original brief stipulated 5 objectives:

- to modify the building fabric to achieve thermal comfort for all flat locations within affordable limits;
- provide a well distributed heating capability;
- devise a natural/mechanical ventilation system, simple to control, that will economically promote adequate ventilation rates to negate adverse effects of normal pollutants and condensation risks, without draught nuisance and within an energy conscious framework;
- suggest modest planning improvements where these relate to energy efficiency and moisture production;
- suggest improvements externally with emphasis on energy saving.

The scheme as applied to 9 Edderton Place made use of solar energy techniques to provide additional heat in two ways. One involved glazing the balconies outside the principal bedroom of each flat and replacing the bedroom window by a sliding double-glazed door to allow the extension of the bedroom into the sunspace in suitable weather. The sunspace acts as a solar warmed buffer to the bedroom and adjoining living room and a source of solar pre-heated ventilation air to these rooms. The glazing of the balconies also eliminated the cold bridge of the concrete balcony/floor slab that pierced the added

[19] ibid.
[20] ibid.
[21] ibid.
[22] ibid. p95
[23] Brenda and Robert Vale, *Towards a Green Architecture*, RIBA Publications 1991.

weather skin insulation. A second double glazed sunspace formed an extension to the kitchen as a utility room/conservatory. This buffers the kitchen and bathroom by covering the existing walls and windows and provides extra space in the kitchen. Brenda and Robert Vale describe how this space can be used for a washing machine and a drier (both major sources of moisture generation) to be removed form the inside of the flat. Even a north-facing flat will benefit from the effect of raised temperature due to house heat loss and will therefore be able to supply pre-warmed ventilation air.

Ventilation air is taken whenever possible from the buffer spaces to overcome heat loss due to introduction of outside air. Bathroom and kitchen are fitted with simple 'mechanical passive ventilators' to create additional ventilation when humidity levels require it. The ventilators incorporate small rubber bladders that expand when dry and contract when wet so opening and closing 'rising ductwork'. The bathroom window is sealed to ensure ventilation air enters from the rest of the flat. A major source of water vapour is the drying of clothes. A drying area was provided at ground level in the back-court but because of theft most tenants chose to use tumble-dryers (usually vented directly into the kitchen) or to dry clothes in front of the fire. The provision of the extra utility/conservatory provides somewhere to dry clothes outside the flat. Communal facilities and balconies could perhaps also be utilised with attention to planning and community development to overcome any problems of security.

The sunspaces, together with the external insulation and rainscreen are a clear visible sign that the blocks have been renovated. The measures were implemented for £30 000 per flat (as Brenda and Robert Vale point out considerably less than demolition and rebuilding) with the heating loads reduced by about 80%). Space heating costs were reduced from a theoretical £20 per week to £3 per week for a two-bedroom flat. The initial figure is theoretical because before renovation the construction was such that most people could not afford to heat their flats. Brenda and Robert Vale note that there are also benefits for the local authority who own the flats; they are easy to rent after they have been upgraded, and they do not deteriorate due to condensation, so reducing maintenance costs and prolonging the life of the housing stock. The local economy benefits from money being spent on goods and services rather than on high fuel bills. Local health is improved by elimination of damp, condensation and mould.

Potential (orientation and overshading) for Solar Retrofits in the UK

As part of the Department of Energy's passive solar R&D program the Martin Centre for Architectural and Urban Studies at Cambridge was asked by ETSU, who co-ordinated all the projects in the program, to look at the potential for retrofitting passive solar features such as roof space collector, sun spaces and Trombe walls onto the existing housing stock. Detailed information was compiled on orientation and overshading of a representative sample of the Cambridge housing stock and findings were extrapolated to give global predictions of the retrofitting potential for the UK's housing stock as a whole. Data collected related to solar access of each dwelling and in particular it's orientation and degree of shading of the south facade (S±45°). It was found that the Cambridge figures would correspond quite well to national figures.

Results showed that 57% of dwellings possess a clear facade within 45° orientation of South and 38% within 30°. Further 39% of dwellings orientated within 45° of south suffer less than 10% loss of possible radiation in the heating season (October to May), 59% suffer no more than 20% loss and only 5% lose more than 50%.[24] It was thus concluded that 62% of the housing stock had the potential for passive solar measures.[25]

The survey indicated that semi-detached houses were particularly suited with two out of three offering good retrofit prospects. Nearly three-quarters of the total inter-war housing stock was also suitable mainly because they were often built aligned to face broadly south. The most favoured group of dwellings seemed to be constructed between 1919 and 1969 when "larger plot sizes, coupled with the prevalence of a semi-detached, hip-roof house types, tends to produce higher levels of solar accessibility".[26] Overshadowing was found to be more of a problem on large detached houses due to mature trees than in higher density areas due to neighbouring buildings with suitably orientated dwellings suffering on average only 10% reduction in solar collection.

It was estimated that 40% of the housing stock would be able to utilise a sunspace (can act as buffer). Cost effectiveness was isolated as a principal concern.[27] Paybacks for sunspaces were estimated at 30 years (based on 1983 gas prices). It was concluded that sunspaces could not be justified on purely energy saving terms but that increased resale value, floor area and amenity benefits would compensate for this. It

---

[24] 'Existing Housing', *Energy Saving through Landscape Planning Vol. 4*, PSA.
[25] 'Old Houses Have Energy Potential', *RIBA Journal*, October 1983.
[26] ibid.
[27] ibid.

was also noted that sunspaces can become considerable energy users if not similarly considered as seasonal, climatically determined occupancy zones.[28] A quarter of existing sunspaces were found to be heated and therefore actually increased the total heating load.

The study demonstrated a potential that may be increased with measures such as consideration of roofs or upper floor for collection, combined with reduced window area and high insulation to ground floors. Trombe walls of specific types may also be appropriate. It should be noted that the study dealt with solar gain only. Higher density areas begin with less exposed wall areas and lower consumption.

5.1.4. A Continuum of Active, Passive and Superinsulated Design

I have noted potential quantitative benefits of solar design and superinsulation and other problems of energy capital in materials and re-use of existing buildings. Here I look at some qualitative issues.

Health and Sunlight

Energy is not the only benefit from use of sunlight in building. In the creation of healthy internal (and external) environments sunlight is perhaps second only to fresh clean air. Hobday describes how the World Health Organisation has recently promoted sunlight as an aid to hygiene in buildings "Direct sunlight aids external sanitation...laundry dries more effectively and hygienically. Direct sunlight indoors exerts a bactericidal effect, promotes cleanliness through improved perception of dirt and dust".[29] Hobday describes how recent studies have shown that respiratory infections are the most common infectious illnesses amongst adults and children in the US and that even north light filtered through glass is capable of killing bacteria that cause respiratory infection.

It was evidence that sunlight (and natural light generally) helped cure diseases such as tuberculosis and rickets common in polluted industrial cities that resulted in its consideration in city planning at the turn of the century. School and hospital buildings after the 1920's were oriented to accept sunlight, especially winter sun, and fresh air. Solar gain was considered an additional benefit. In 1933 the RIBA issued guidance to designers on sunlight penetration that called on the architect to secure the maximum penetration of sunshine as a primary consideration.[30] In the later half of the 20th Century increased public health provision and standards of living led to a marked decrease in the incidence of diseases directly linked to sunlight deprivation and the drive to provide sunlit buildings diminished. Hospitals stopped being built with open air balconies and solaria. The development of efficient artificial illumination and the adoption of more compact building designs with deep plan rooms also reduced design for natural light.

Specific sections of society however remain at risk from inadequate exposure to sunlight. A feature of modern cities that many people spend a considerable proportion of time indoors or travelling to and from buildings and are thus not able to benefit from the biologically active component of daylight. While this may not directly threaten the well-being of the majority of the population, it may, if for example, diet is deficient of Vitamin D to compensate for lack of sunlight. Hobday considers this to be a major factor in increased incidence of tuberculosis in Birmingham. Women immigrants from the Indian sub-continent he describes as particularly susceptible due to their diet, strict dress code and a tendency to stay indoors.[31] The division of Georgian and Victorian houses in to single aspect flats and bedsits today in the inner city mean that those in north-facing flats in cities will perhaps never receive direct sunlight. Hodges describes the psychological benefits of living in a direct gain solar home, being able to 'sunbathe' behind a window on a cold but sunny day.[32]

Building Biology

Work in the relatively new field of 'building biology' suggests that modern buildings do not produce "the quality of life and comfort (in the deeper sense)" that is particularly relevant to housing as a place of recreation.[33] Schimmelschmidt argues that the internal climate should benefit human health and comfort at all levels.[34] This includes dealing with problems of indoor air pollution that most commonly comes in the form of humidity, chemical and biological pollution from materials and finishes and also involves the need for fresh oxygenated air. Hal Levin and Kevin Teichman point out that people spend up to 90% of

---

28 ibid.
29 R. Hobday, 'Sunlight, health and energy efficient building', *International Journal of Ambient Energy*, July, 1992.
30 ibid.
31 ibid.
32 L. Hodges, 'The Hodges Residence: the first ten years', *International Journal of Ambient Energy*, January 1991.
33 Michael Schimmelschmidt, 'Our Third Skin: Hazard or Shelter', *RIBA Journal*, October 1989.
34 ibid.

their time indoors where pollution levels frequently exceed those outdoors.[35] Building biology suggests Schimmelschmidt regards the building as an organism with its surrounding surface being man's third skin (clothes being the second skin). He continues "for an organism to be healthy the skin should be allowed to function naturally: breathing, absorbing, protecting, insulating, regulating, communicating and allowing evaporation".

As noted with increased insulation levels heat losses from ventilation can approach fabric losses and therefore the design must reduce ventilation to a minimum.[36] As ventilation rates are reduced and buildings become more air-tight the problems associated with internal pollution (materials and internal activities) increase. The 'closed' architectural system created by vapour barriers and sealing of superinsulated houses may be inconsistent with healthy housing. In passive solar design utilisation of solar energy reduces the need for such strict control when it is available while storage also allows for some degree of extra heat loss simply because of the extra input of heat beyond casual gains. As also noted in sunny conditions passive solar design also allows for pre-heating of fresh ventilation air that is by definition non-ducted and thus less prone to dust.

Humidity is a particular problem in superinsulated structures both due to its detrimental health effects and problems in the structure due to condensation if cold bridging is caused by either design or construction faults.[37] Many believe that ventilation is the essential solution to the whole gamut of indoor air quality problems since sources are many and change over time. While the designer can specify 'friendly' materials initially the control over time and occupant activities are out of their control. Unfortunately un-polluted inlet air is today unusual in our cities. Measures geared to address and control car use are essential to increasing passive solar design and natural ventilation.

The source of the warmth inside a building is also important. Schimmelschmidt argues that ideally this should be by radiation from stored heat in the surrounding surfaces of the room. The actual temperature can then be lower. Comfort temperature is also reduced in direct sunlight. The use of thermal mass helps to temper interior comfort in any climate specific design, gives greater interior comfort flexibility, and is forgiving of design errors.[38] More problems of superinsulation are given in *High insulation - scenario for the future* and *Buildability of highly insulated air tight structures.*[39] *While it may easier to save energy by imposing strict controls on interior conditions and excluding the exterior this is perhaps not the best general solution.*

Passive Design and Biotics

While external conditions change constantly our architecture has made no attempt to interact dynamically with it. Plants and trees constantly change with the season, time of day and weather. Plants typically flower in spring and the flowers open and close in relation to the sun. In many ways architecture (and horticulture) have followed similar courses in attempting to bring uniformity and universality to our environment reducing what are seen as the inconveniences of natures dynamism.[40] Passive design however must move and adapt to the weather and time of day. Active design (unless incorporating passive design as discussed above) and superinsulated houses, as with traditional house forms, tend to remain static. Passive solar design thus falls into Bookchin's notion of '*biotic*' technologies discussed in *Chapter One*.[41] There is great potential in passive design to move with the climate and for people to interact with it. This includes movement of internal and external blinding systems and glazing, use of natural changes in vegetation along with movement within the building (e.g. from winter to summer spaces) and between the interior and exterior of the building.

J. Douglas Balcomb argues that "Passive Solar Design is the most benign of all building strategies. The required building materials have a minimum environmental impact both in their manufacture and during construction. Shipments of massive amounts of materials over large distances are avoided. The consumption of polluting coal, wood, and oil is displaced throughout the life of the building. Electric generating requirements are minimised, and thus, both acid rain and the number of new transmission lines

---

35 Hal Levin and Kevin Teichman, 'Indoor Air Quality - for Architects', *Progressive Architecture*, March 1984.

36 R. G. Courtney (1987) 'High insulation - scenario for the future', *International Journal of Ambient Energy*, July 1987.

37 Brenda and Robert Vale, *Towards a Green Architecture - six practical examples*, RIBA Publications, 1991.

38 Bruce Anderson, *Solar Building Architecture*, MIT Press, 1990.

39 R. G. Courtney, 'High insulation - scenario for the future', *International Journal of Ambient Energy*, July 1987 and A. Hildon and A. J. Howrie, 'Buildability of highly insulated airtight structures', *International Journal of Ambient Energy*, July 1987.

40 Allan Ruff, *Holland and the ecological landscapes 1973-1987*, Delftse Universitaire, 1987.

41 Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991.

constructed are reduced".[42] Although energy might be the issue discussed most often, ultimately the advantages in thermal comfort, visual aesthetics, and building reliability might prove to be the primary motivations for incorporating passive solar strategies. Patrick O'Sullivan also notes that one of the main characteristics of passive solar buildings is their high amenity value "People like them and find them light, airy and joyful".[43] The expectation was that this amenity value would reflect itself in low occupant stress and improved health.

Problems of Passive Solar Design
As Palz and Steemers note the weakness of the passive approach is dependence on the thermal characteristics of the building and the vagaries of the weather along with potential problems of overheating in summer.[44] While good design can provide appropriate shading, ventilation and mass to prevent overheating passive design is undoubtedly vulnerable to prolonged cloud. A hybrid system where heat is gained passively but ducted to a remote store usually using a small fan may improve storage capacity slightly. The vulnerability to noise and vandalism of passive solar designs are clearly a limiting factor in the city that may dictate different energy solutions in certain situations. Solar power and natural ventilation in the city clearly require reduced noise and cleaner air (privacy may also be an important consideration).

Passive and Social Arrangements of Housing and the Need for a Continuum
Mats Egelius writing on the architecture of Ralph Erskine explains "That the planners of most modern housing ignore social experiences in favour of physical gains is shown by the orientation towards the sun, instead of towards the square and street".[45] He argues for an architecture of social interaction. In meeting this criticism of much modern architecture low energy design is faced with a considerable challenge, the answer to which, seems to emerge from an analysis of the whole gamut of microclimatic factors (including energy capital) not arrangement for the sun. A considerable danger in green design is the production of energy efficient buildings in hostile streets both climatically and in their relation to each other socially.

While we cannot simply apply superinsulated solutions designed for the Scandinavian climate to the UK or continue to build non-climatically responsive buildings with solar panels (both of which give flexibility to a low energy strategy) neither is it appropriate to develop passive design at the expense of urban design. Jeremy Dodd describes how in a continuum of passive design "different forms and facades may belong to different microclimatic regimes, giving rise to a different architectural expression while remaining equally climatically responsive".[46] In this respect the city form will encourage diversity in design since each of its microclimates is unique. Similarly the climatic differences through the UK determine appropriate forms and optimum window areas.[47]

The Watt Committee Working Group on Passive Solar Design define *climatically interactive design* "a design that demonstrates the ability to integrate the scope to use the location, form and fabric of the building to admit, store or, at times, *reject* and distribute solar energy within that building so as to improve its thermal and visual environment".[48] It is thus an appropriate combination of the passive and superinsulated design. A continuum of passive, active and superinsulated deign will is needed to respond to the variety of city conditions and existing and new build scenarios. Superinsulation has proved popular amongst mass house builders since it allows them to claim to be building green buildings while mass producing mock Tudor suburban houses which have no relation to climate or improving city form. Superinsulation will be appropriate in certain situations and not in others. A north facing site may need higher insulation or may need to utilise active systems to heat the building. Here I am attempting to develop a co-ordinated approach with which to control and direct speculative design.

---

42 J. Douglas Balcomb, 'World Outlook for Passive Solar', *Clean and Safe Energy Forever*, Solar World Conference, 1989.
43 Patrick O'Sullivan, 'Passive Solar Techniques and their Application in Existing and New Technology', in Patrick O'Sullivan (ed.), *Passive Solar Energy in Building,* Elsevier Science Ltd, 1995.
44 W. Palz and T. Steemers, *Solar Houses in Europe How They Have Worked*, Pergamon Press, 1981.
45 Mats Egelius, 'Housing and Human Needs: the Work of Ralph Erskine' in Byron Mikellides (ed.) *Architecture for People*, Cassell Ltd, 1980.
46 Jeremy Dodd, 'The Place for Building' *Architects Journal* , 12 April 1989.
47 D. M. L. Bartholomew, 'Possibilities for passive solar house design in Scotland', in Kerr Mac Gregor (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
48 Patrick O'Sullivan, 'Conclusions and Recommendations', Patrick O Sullivan (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985.

5.1.5. Low Energy Design, Control, Participation and Adaptability

In *Chapter Four* I noted how users may affect the performance of low energy designs. Two examples are given here and some conclusions drawn.

Occupants and Performance

At Baggesensgrade, Copenhagen, a glass skin was added to the existing south facade of a block of flats creating 10m^2 conservatories covering the full width of each of the flats on the first to fourth floors (balcony on top floor). The glazing was 1.5m in front of the existing building. It resulted in energy saving due to supplying solar energy directly and via storage to the heated spaces and by acting as a buffer zone partially insulating the flats against the wind. The modifications meant operating at 66% of the previous space heating load with solar gains contributing 27%. The pay-back period was under 10 years. Critically the fuel savings increased from almost nothing in the first heating season to 34 per cent in the second year of monitoring once the occupants had been properly instructed on the use of their conservatories.

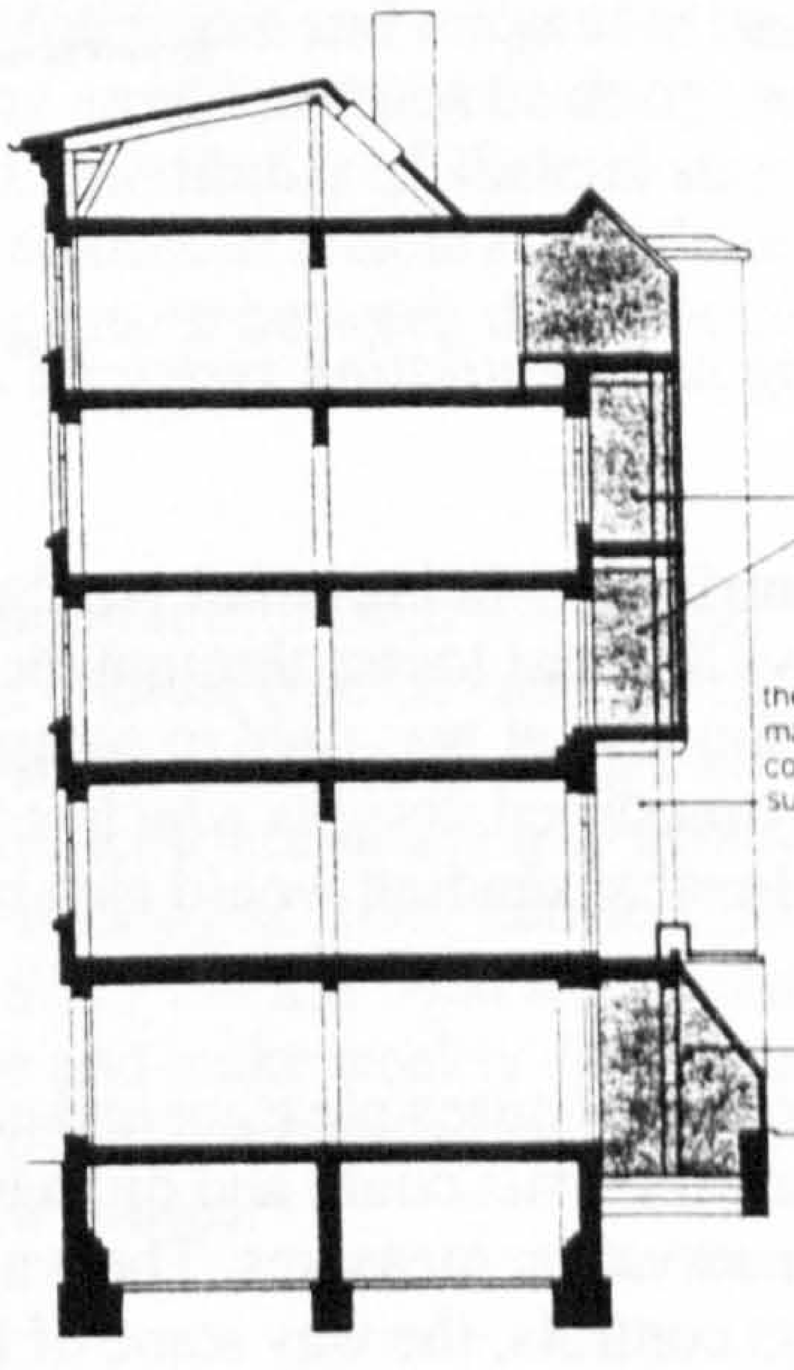


Fig. 5.6. Sunspaces - Baggesensgrade, Copenhagen[49]

Alderson describes the performance of 14 single bedroomed senior citizen's bungalows completed in 1978 at Acorn Close, Bebington, Wirral.[50] Nine of the 14 dwellings were built with high insulation and a glazed solar wall as a passive solar feature. The other five had the same internal layout but without the passive solar features and with minimum 1976 Building Regulation insulation levels. Monitoring of the occupied buildings was carried out over three years. The project was developed as an experiment to discover how well the energy saving features worked in public sector housing. The report states that it "gave an insight into the complex interactions between dwellings and their occupants and how different living styles could affect energy consumption and the performance of heating systems".[51]

The space heating energy consumption over 12 months after the initial monitoring year was 6500 kWh for the average traditional bungalow and 3250 kWh for the average comparative low energy bungalow. Energy consumption however varied by up to 100% due to the number of occupants in the dwelling and their lifestyle. Normalised for mean house temperature of 18.3°C and 1.5 occupants/house space heating consumption was 3280 kWh. The solar wall and insulation measures halved the space heating - 20% of this was due to the Trombe and 80% was due to the added insulation and double glazing.

[49] John Doggart and Mike Flood, 'Energy from Renewables - 1: The Solar Contribution', *Architects Journal*, September 1989.
[50] J. V. Alderson and A. G. Guy, *The Monitored Behaviour of Occupied Low Energy Bungalows - Final Report*, ETSU S1003.
[51] ibid.

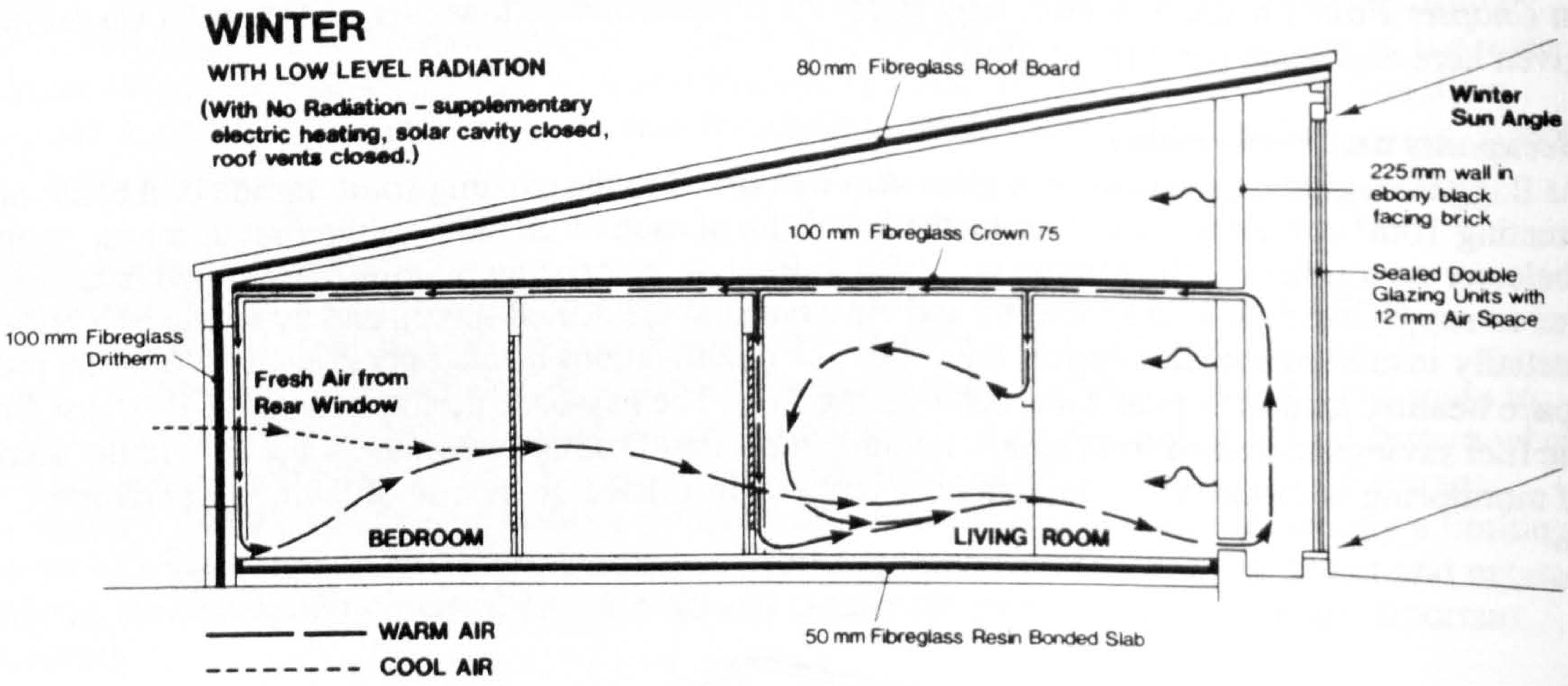


Fig. 5.7. Acorn Close: Solar Heating and Ventilation systems[52]

The main reason for the Trombe contribution being small was because in the absence of solar radiation during the night and on overcast days the heat losses through the Trombe were 50% more than the traditional dwellings. Much of the gained heat was used to compensate for this. It was estimated that the net contribution could be doubled by modified designs which reduced the amount of shading and increased useful absorber areas.[53] Movable shading would also have increased the solar contribution if used by occupants.

While the occupants found the low energy houses pleasant and comfortable and no particular trouble to manage the report concludes that the occupants could and did have almost as big an impact on the energy performance of the houses as the conservation measures. The way in which the residents used and understood the heating system and its controls, the way some of them used the solar cavity to grow plants, and the solar wall shades to keep the sun out of their eyes all had significant effects on the energy performance. Although the lifestyles of the occupants were theoretically similar they still resulted in widespread variation in energy consumption.

Low Energy Design and Users

Clearly both an understanding of the purpose of a solar design (or other environmental system) and its control by the occupants are essential to effective performance. Occupants are capable of offsetting much of the energy saving capability designed into solar buildings by miss use if they are not both well informed and motivated and if the measures are not designed appropriately to their occupancy. Effective use of highly solar driven building requires a different approach to the use of buildings by occupants and design by architects as well as effective communication between architects and occupants. The environmental designer needs a good working knowledge of occupants requirements and of the variety of basic design concepts that can meet these. Success will depend on fit of the energy measures to occupant demands. An initial list of performance goals specific to the project may include thermal conditions acceptable to various occupants and typical activities at different times of day and during each season.

Self-regulating passive measures may reduce inefficiencies due to errors by, or absence of occupants. Such systems are notoriously problematic to maintain. A knowledge of the control system would also be critical if implementation of solar power is not extend the disempowerment of occupants. Systems will ideally be robust and easy to operate. Automatic control systems may however be appropriate in certain circumstances. Overtly specialised solutions may however mean the occupant is increasingly helpless (see *Chapter One* and *Chapter Eight*). Prowler and Kelbaugh argue that "The industrial countries are so habituated to the technical fix that they are used to solving problems mechanically and have developed a mistrust of solutions that do not require machinery....There is a general failure to realise that passive

---

[52] W. Palz and T. C. Steemers, *Solar Houses in Europe: How They Have Worked*, Pergamon Press, Oxford, 1981, p262

[53] J. V. Alderson and A. G. Guy, *The Monitored Behaviour of Occupied Low Energy Bungalows - Final Report*, ETSU S1003.

design approaches are a more sophisticated, elegant and reliable solution than any mechanical approach could ever be".[54]

Participation
Participative process may be an important ingredient in successful passive solar design since to a great extent it must be used and modified by its inhabitants with changing social and climatic conditions from day to day and year to year. Participation in design and/or construction of a passive solar house should improve understanding of the mechanics and thus generate correct use of the systems. Further the effect of occupancy and lifestyle on solar design demands a knowledge of occupants by the professionals that may be achieved through a high degree of participation. An effective dialogue between architect and future occupant will enable systems to be geared to the individual need of each inhabitant. This is in addition to the social ecological benefits also developed in this thesis.

Adaptability
While the original occupants may be well briefed changes in occupants must also be considered. An 'operators manual' may be appropriate. *Modifiable* and *adaptable* buildings for new users may also be appropriate. The most appropriate housing would perhaps be designed with considerable participation but with the potential for user modification. Extendibility of skeletal structures around a solid core (or solar system) could allow both continuity and continued adaption. Producing fixed uniform ranked buildings not adjustable to changing needs of occupants or between different occupants is a problem of both solar and traditional architecture (see *Chapter Nine*).

Feedback
Monitoring and feedback schemes are important for both low energy and solar design both to check the performance of the system in the specific climate (use of solar energy is still experimental) and to check the interaction of users and building. Information needs to be presented so that occupants can then act on this information and modify the designs or their use of them to achieve greater fit. Design manuals should be provided and include an occupant monitoring section. Eco-feedback schemes have been developed in the Netherlands and one, *The Global Action Plan* has been implemented in Leicester.[55] Households are given a target energy consumption figure and make weekly comparisons. Awareness is thus increased of all energy saving aspects. The potential of such schemes may be improved in group housing projects where comparisons can be made between houses.

5.2. Levels of Design

5.2.1. Urban Neighbourhood Design

I have noted the transport need to consider mixed distribution of functions and the microclimate potential of exploiting the relationship between buildings. There are numerous other advantages to, where possible, beginning design at a level that involves groups of adjacent buildings and spaces between. They include:

• utilising complementary heating schedules with location of houses appropriately;
• consideration of local and neighbourhood scale district heating and CHP (energy supply issues generally);
• consideration of combined housing 'atria' and active solar systems;
• consideration of building complementary and mutual warmth.

Features discussed in the next chapter include:

• water systems and treatment systems (water supply systems for potable water only at the regional city level with other water used either from collected rainwater [from roofs] or grey water, these depend on design of houses or preferably groups of buildings),
• maintenance of effective open space provision and development of city food production strategies;
• domestic and other waste separation with collection of materials that cannot be processed on site.

---

[54] Donald Prowler and Douglas Kelbaugh, 'Building Envelopes', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.
[55] 'How to turn off waste, *The Independent on Sunday*, 7 March 1993.

Housing Mix and Neighbourhood Design

Where heating is the dominant need (in house design as opposed to office design) the shape and form should maximise solar collection and minimise heat loss. This is clearly best achieved by looking at groups of buildings not individual buildings. It can be accomplished by maximising the area of collection and minimising the remaining external surfaces. As noted solar access of practical use in Northern Europe involves avoiding obstructions between 30°- 40° East or West of South (10am to 2pm in heating season). Goulding describes the South facade 1.5 to 2 times the length of the East as ideal for detached and semi-detached house design but that this proportion is not the same for terraced or apartment dwellings.[56] A solar envelope: the greatest volume of development that can be achieved on a site without shading neighbours can be calculated to a convention (e.g. noon on winter solstice). Another technique (illustrated by the M/N sunspace design described in *Chapter Four*) is to reduce the ratio between external surface area and volume. As noted detached houses have twice the energy consumption per unit floor area compared to apartments and multi-family housing although often the reduction in potential for solar gains for apartments is approximately proportional.[57] Further low volume also means low heating demand and less ventilation. There is, it seems, considerable potential in both changing our housing form and developing these designs at a multi-family scale. Clearly in apartment blocks and terraces areas and orientations of external walls in each unit will differ giving different heat loss. Losses from apartments at the north-west corner of the top floor may be twice those in middle of the South facade.[58] These can be equalised using extra solar gain provision or insulation (or appropriate functions and occupations) located in certain areas.

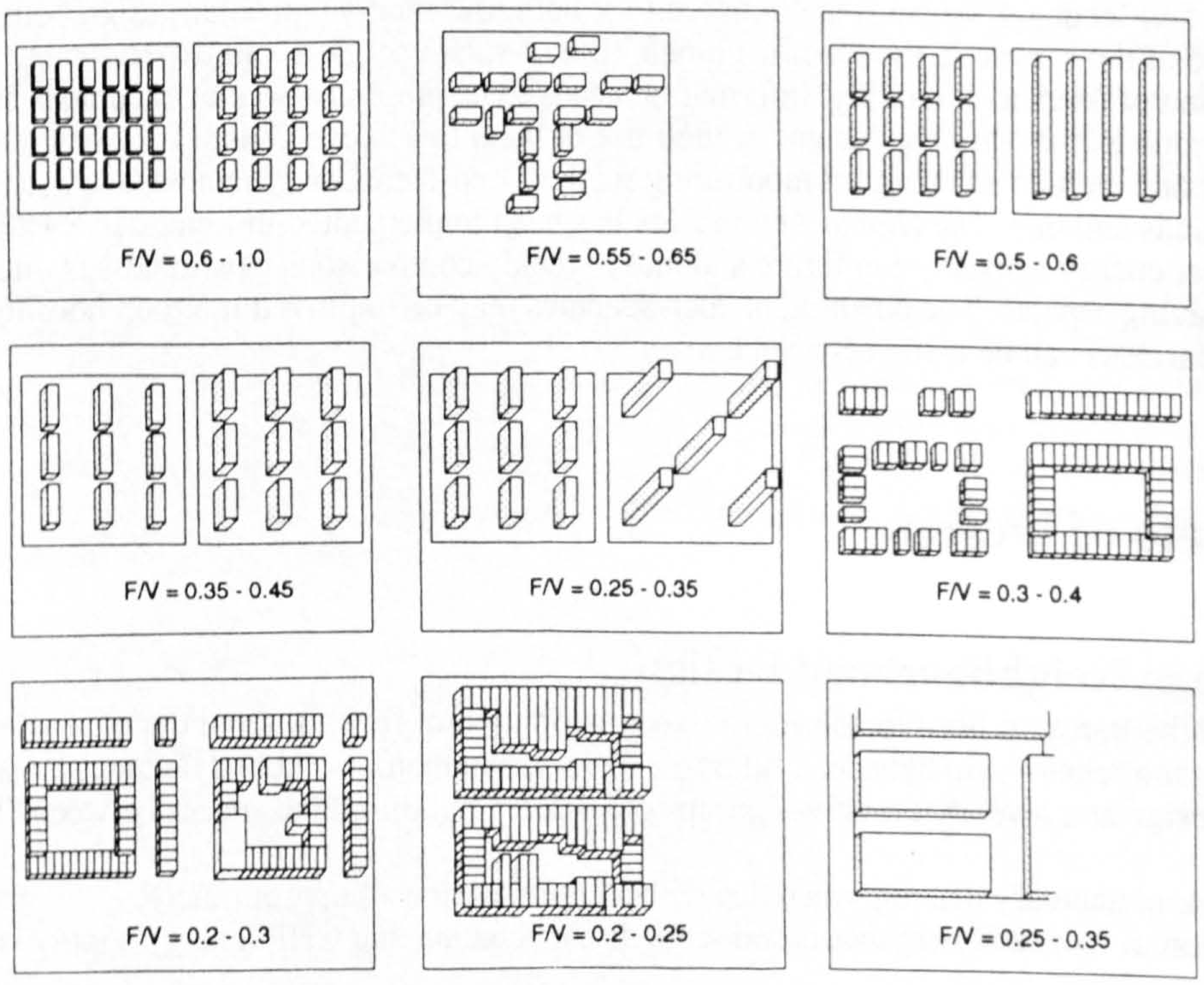


Fig. 5.8. Site layouts showing different surface area (F) to volume (v) ratios[59]

---

[56] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C.E.C, 1992.

[57] ibid.

[58] ibid.

[59] ibid. dig 10.7

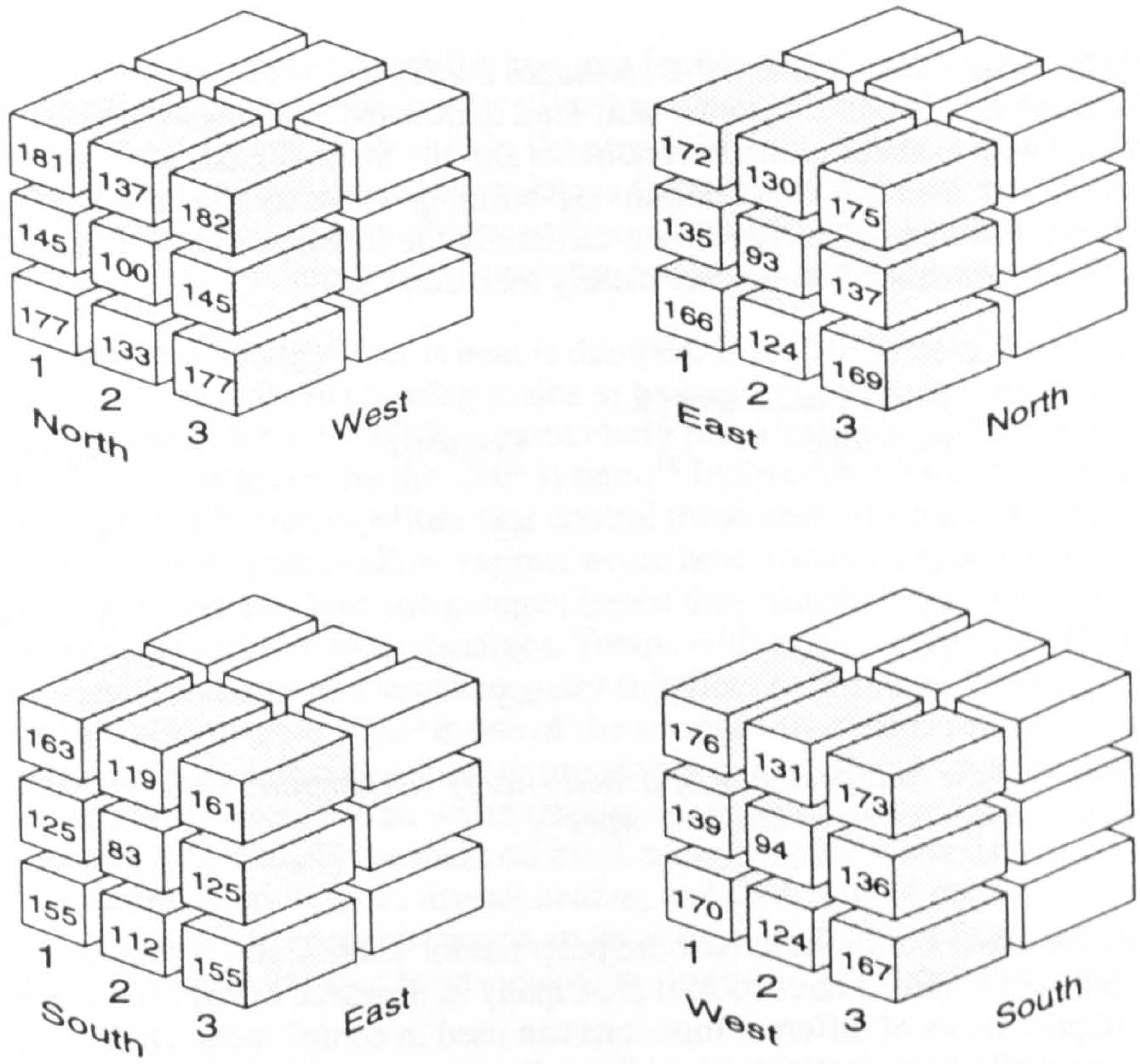


Fig. 5.9. Heat losses from rooms with different positions and orientations: base room central with north elevation (100%)[60]

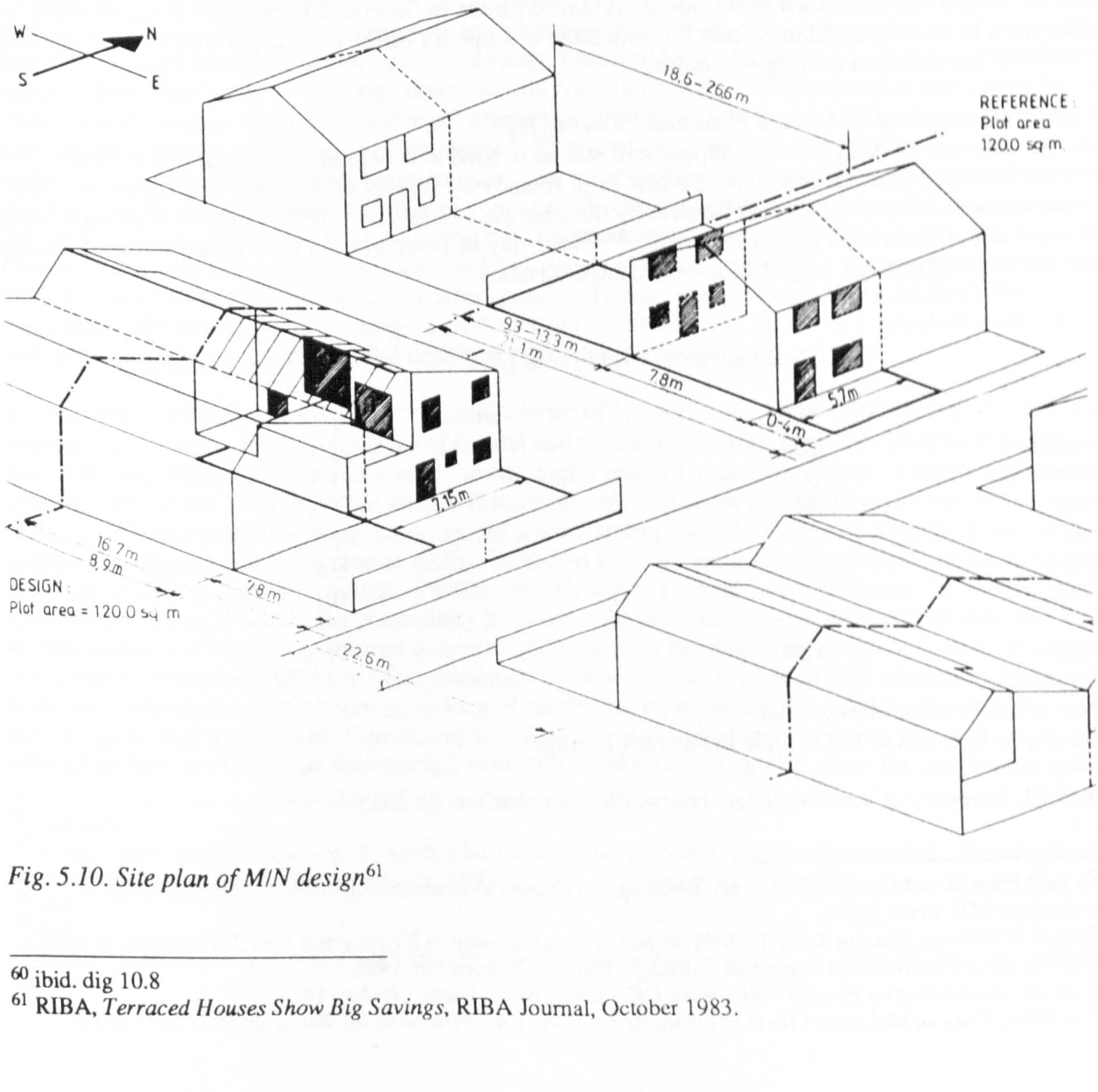


Fig. 5.10. Site plan of M/N design[61]

---

[60] ibid. dig 10.8
[61] RIBA, *Terraced Houses Show Big Savings*, RIBA Journal, October 1983.

Complementary Benefits - Skin and Load Dominated Buildings
Prowler and Kelbaugh divide buildings into 'skin-load dominated' buildings where energy consumption is primarily concerned with exterior climatic conditions and the thermal loads imposed on the building through its envelope and 'internally load-dominated' building where energy consumption is primarily determined by internal sources of energy flows. Generally the former are residential and later commercial buildings although superinsulated houses are clearly load dominated.

Building type	*Energy allotment (%)* *Envelope*	*Contents*	*Lighting*
School	15	45	40
Housing	50	30	20
Office	11	39	50
Hospital	10	40	50
Commercial	15	45	40

Fig. 5.11. An example of the interpretation of actual energy consumption data showing the percentage of energy need by cause in five different building types[62]

O'Sullivan argues that some buildings have more potential for climatically accepting designs (as opposed to climatically rejecting).[63] Here I have looked principally at domestic buildings but note the fact that the different energy requirements of different functions can used in complement. Different passive strategies are applicable to internally load dominated buildings. Exposure to sunlight is less critical. As more energy using (heat generating) equipment and persons are added to a building solar heat demand is reduced and cooling is needed. Daylight design can particularly save energy in offices and schools since they are day occupancy. Some industrial and office designs will not need heat input. Mixing uses on any one site means that more interactive buildings can be placed in beneficial locations. Functions could be prioritised as such. In addition within housing there is scope for different arrangements that are mutually beneficial e.g. different heating schedules.

District Heating and Combined Heat and Power (CHP)
Despite low energy design energy supply will still be needed to heat (and power) our cities. Clearly renewable energy sources should be the first step. A study by Friends of the Earth has suggested a 20% contribution from renewables was feasible by the year 2025 assuming a 30% reduction in primary energy demand achieved through energy efficiency.[64] These may be central (wind generation, biomass) directed into the national grid but may also involve decentralisation.

	Heat Supplied or fuel saved (PJ)	*% projected primary*
Wind	650	10.7
Biofuels	200	3.3
Geothermal	200	3.3
Solar	60	1.0
Tidal[a]	70	1.1
Hydro	55	0.9
Wave	5	0.1
Total	1240	20.4

Note: 1PJ = 37600 tonnes of coal
Note a: this figure does not include the Severn Barrage

Fig. 5.12. Summary of possible target renewable contributions by 2025[65]

---

62 Donald Prowler and Douglas Kelbaugh, 'Building Envelopes', in Bruce Anderson (ed.), *Solar Building Architecture*, MIT Press, 1990.
63 Patrick O'Sullivan, 'Passive Solar Techniques and their Application in Existing and New Technology', in Patrick O'Sullivan (Ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd, 1985.
64 S. Boyle, *An Alternative Energy Path for the UK*, Friends of the Earth, London, 1988.
65 Tim Elkin, Duncan McLaren, Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991. p105

Elkin notes how a diversified supply system is important in reducing dependence on particular finite resources. It also fits the social ecological brief outlined in *Chapter One*. All Scandinavian countries have moved over to decentralised energy systems.[66] In the city of Malmo, Sweden, 'waste' heat from industry goes into the district heating system. Distribution losses from centralised stations can be minimised by decentralised energy systems and combined-heat-and-power (CHP) plants with surplus heat put into regional distribution systems. Such forms are consistent with local self-reliance and confederation.

In conventional electricity generation excess heat is dumped. In a CHP system after electricity generation energy can be pumped through district heating mains to houses and other uses. Energy efficiencies of more than 80% can thus be achieved.[67] CHP is particularly prevalent in Scandinavia. In the Danish city of Odense 95% of the housing is heated by the CHP system.[68] In Sweden 30% of heat is produced by district heating networks while municipalities that control these networks control 20% of the electricity produced nationally. Flexible systems allow various waste heat resources to be combined. Like district heating they depend on favourable land use patterns (since they distribute heat not gas or electricity). They can however be used with suburban densities. Towns with a dense core and CHP site close to the centre are preferable with industry as a supplementary supplier or consumer. Existing large cities with dense development are also suitable "CHP is one of the stronger arguments for the ' compact city, concept".[69] Hospitals and educational institutions are also potential clients. Another possible decentralised scheme is CHP energy from waste (anaerobic digestion to produce methane or non polluting direct incineration). Clearly the most efficient energy supply methods will depend on locations and layouts of urban areas. In some areas district heating and CHP will be options in some not. Elkin notes however that decentralised concentration is an ideal form. A major problem is installing CHP and District heating from scratch in existing towns and cities. Further CHP depends on producing electricity using fossil fuels.

Neighbourhood Design

Layne Ridley describes the Site and Neighbourhood Design (SAND) program that explored neighbourhood aspects of solar design.[70] The SAND program was based on idea that residential, commercial and transportation sectors of the economy used 60% of energy in the US and energy efficient land use and development techniques could have a substantial impact. The program followed a two step approach of initial energy-efficient option screening, followed by more detailed analysis of promising options. Both were based on thorough survey of site conditions. Layne Ridley lists the many and diverse considered techniques under four headings Land/Site Planning, Architectural, Mechanical, Consumer/Community Systems and Operations.[71] They included, encouraging non-motorised travel, multi-use buildings, compatibility between uses, total solar community systems, central thermal plant, waste recycling, energy monitoring devices, night use of school buildings, central utility, transportation - park and ride, van pool, bus, car pooling, and rail commuter services. One SAND program the *Philadelphia Solar Planning Project* involved a city wide effort to assess solar potential with a survey of the potential of different house types for solar retrofits. This survey produced two solar applications particularly relevant to *urban housing* - a roof aperture system and the notion of a sunspace enclosure linking two adjoining row houses and designed to prevent heat loss in the winter.

It seems that if we can develop more communal forms of housing then the art of designing with the contours, the climate, and the character of natural and man made surroundings can be fully exploited. Given an understanding the movement of the sun over a particular site, the effects of shadowing, and the cooling effect of the wind; building form and landscape elements can be used to maximise solar gain and reduce heat loss whilst stabilising microclimate around appropriate elements of buildings. They can also prevent driving rain that may saturate walls. Combined with this microclimate analysis, at the community level use of solar energy and insulation within the existing city fabric can be balanced for a given site. Consideration should start at the community level not only to ensure good distribution of solar energy but to beneficially use community shared activities and variety of function with different heating schedules. Some homes in a group will have lifestyles suited to passive design, some to high insulation. Some may have other priorities. Cluster housing, mixing of single and multifamily units, and higher densities reduce the energy needed in each unit. Combining single family and multi-family housing with recreation and others facilities such as shops, laundrettes, workshops and offices may also allow for appropriate solar

---

[66] ibid. p103

[67] Adrian Webb and Chris Gossop, 'Towards a Sustainable Energy Policy', Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993. p56

[68] ibid.

[69] ibid.

[70] Layne Ridley, 'Site, Community and Urban Planning', in Bruce Anderson, *Solar Building Architecture*, MIT Press, 1990.

[71] ibid.

radiation use, local auxiliary heat distribution, waste heat use and utilising the different energy demands and appropriate building forms of these activities. These combinations may also be more suitable to today's society than the provision of three bedroomed houses in single type housing estates for nucleated families that I have argued may no longer exist. Major uses of the site can be allocated in relation to favourable microclimate 'zones' e.g. high density housing can be placed on sites with the best solar access and the most favourable microclimate; sites with poor solar access can be used for car parking. If solar access is low insulated housing forms, atria or district heating may be better starting points. A communal heat source may be provided using a solar, wind or CHP system. Dense well integrated housing and mixed use functions based on refurbishment may increase the 'microclimate potential' of the built environment and its energy efficiency generally. Co-housing provision (with shared facilities and the potential for solar retrofit) is discussed specifically in *Chapter Nine.* Mixed use also increases the potential for spaces occupied at night and day with different activities (workshop or living room).

The range of options available to save energy in a project is very wide. Land use arrangement to cut transportation costs; site planning and passive solar designs to make the most of the inherent character of the site; building design that emphasises conservation; the use of other renewable resources such as active solar, wind, co-generation, and district heating; and the development of techniques for the reduction of embodied energy are all possibilities - but which alternative or combination of alternatives can be applied to a specific project depends on the unique characteristics of that project.[72] Groups of existing buildings have embodied energy and present new problems but also significant opportunities.

5.2.2. Participation and the Neighbourhood Level

As noted the way people live and work in buildings is vital with regard to heat loss and particularly so with implementation of energy saving techniques. Participation in design and construction may aid communication and thus the successful operation of passive solar designs by inhabitants. In addition choice between a passive solar and highly insulated building will be influenced by occupancy. Effective inhabitant participation in the design process may be important to the designer in effectively targeting the exact balance of measures.

I have also noted the benefits of design beginning at the level of urban morphology. Opportunities for improving a buildings energy performance occur early in the design process with basic decisions concerning site, orientation, configuration and passive solar strategies. Otherwise opportunity will be lost to make significant savings by relatively simple adjustments. As design progresses increasingly costly efforts are needed to save energy. Participation is then, also best addressed at a 'neighbourhood level' allowing the potential variety of demands to complement each other. A group will vary in their occupancy, enthusiasm and comfort requirements. A role can be seen for:

- a flexible green strategy (solar design as one 'option' open to occupants where appropriate but not imposed);
- co-ordinated group housing schemes involving site negotiation and based on local knowledge and occupancy types derived from participation and feedback;
- a system that delivers appropriate information at appropriate stages of decision making to aid communication between architect and users in a green design process;
- a prioritised list for participative design consultation in terms of low energy design;
- use of solar enveloping at the start of participation;
- development of physical 'core' structures based on group consultation and allowing flexibility;
- constructional limitations and appropriate material choices for these architect designed 'supports' and occupant 'infill' selection;

In Chapter Nine I discuss participative systems with the aim of forming passive climatic design versions that may enable architects and *groups* of occupants between them to produce effective, adaptable and sustainable buildings. Such issues suggest a 'supports' approach that I also explore in *Chapter Nine.* A support structure can be developed on a neighbourhood level to suggest a green strategy for the site and isolate areas of overshadowing where non living zone functions may be located and passive design replaced by superinsulation and active solar collection. Such a concept can also be extended to a city scale.

While houses may have a design life of 60 years, in building for particularly poorer sections of society, we have not achieved anything like this life-span. In *Chapter Seven* and *Chapter Eight* I go on to look at whether participation (and self-reliance) can increase 'socially sustainability' of projects and increase local

[72] ibid.

environmental responsibility generally. Participative architecture involves people in, and informs them of, their environment although it needs systems that allow this to take place in an existing specialised society. In discussing solar architecture with reference to 'self-build' in particular the 'marginal' nature of solar power and its reliance on 'tight' construction may be seen as an impediment to successful application. Alternatively the greater concern for the finished product may improve construction. Solar power and low energy design is potentially decentralising (in terms of control) and empowering since it reduces reliance on central supply.[73] I also discuss in *Chapter Seven* and *Chapter Eight* whether such empowerment can aid development of a more decentralised society (in terms of control). As noted in *Chapter One* a critical question is whether or not energy efficiency in our present economic context simply maintains lifestyles that are fundamentally unsustainable. McKibben describes such techniques as a *defiant reflex*.[74] Considered at a neighbourhood level the empowering possibilities of environmental design are amplified.

The Solar Cities and Towns Program described by Layne Ridley focused on inner cities and older suburbs characterised by high density, old, fuel-inefficient buildings for rehabilitation and retrofit. It demonstrated the potential of neighbourhood design and the possibility of generating enthusiasm. It involved in one case publication and distribution of manuals and workshops for local energy co-ordinators. Another project in a low-income densely populated urban neighbourhood produced a six month solar building topography study, several demonstration projects, workshops and a community information campaign. In a third project, through an urban design panel including residents, the plan for building new homes on vacant plots and alleys, retrofitting existing homes, landscaping to protect solar access, and evaluating a district heating system evolved. Further reports Ridley "tenant owners of a dilapidated 1870's tenement building in New York City demonstrated what neighbourhood co-operation and innovative system design could accomplish in perhaps the most difficult environment for solar design - the inner city. The five-storey, 15 unit co-op at 519 East llth Street in Manhattan was renovated by its 'unskilled' tenants, using improved insulation, solar water heating, and an electric wind generator. The first year's heating bills were cut by 70%. A design for the entire block featured roof-top greenhouses for shared food and energy production, and photovoltaic cells for electricity production.

5.2.3. Urban Planning Levels and Conclusions

Neighbourhood action will however need support at an urban level that may include: renewable energy generation and strategies; encouraging public and pedestrian transport through density; encouraging mixed patterns of use and developing existing nodes; developing a city form to enhance the microclimate background; reduction of energy capital in the infrastructure and buildings, reducing energy in building use through policies and regulation; development of urban timber production forests and urban farming techniques; and setting up green advice centres within the city. Considerations should be to getting neighbourhood support for common systems, such as collectors that serve entire buildings, or shared food production projects. In the next chapter I discuss how city scale planting initiative of trees, plants and pocket parks can enhance climatic conditions of streets and the city generally and reduce pollution (associated with reduced car use). A municipal strategy could enable communities to link to it either by for example buying compost or supplying waste.

Solar Design in Green Cities

The possibilities for passive solar design will vary considerably in cities. Access to sunlight can be prioritised not only within neighbourhoods but between functions depending on their relative potential use of solar energy. The potential for passive solar design will also depend on the form of the future city, for example, reduced car provision would reduce noise levels and air pollution enabling natural passive stack ventilation (clean air intake at low level) and increased solar gains. Reduced car provision would also increase the amount of land available and increase the potential for passive solar gain retrofit to existing buildings. With terraced houses facing directly onto the street it may then be possible to add a sunspace. Low energy and solar design strategies seem compatible with densities required to reduce car use. Further in a mixed use and integrated city complementary heating schedules can be utilised. There is a need for coherent city wide scale approach into which strategies at community and individual levels can fit.

Solar Design, Microclimate, Transport

It is clear, from an energy point at least, that trends towards ever greater fragmentation are inefficient. With existing technologies passive solar designs become marginal in the UK if attempting to provide above 30% of space heating load. There seems to be an optimum glazed area for the UK climate (20% of

[73] Kirkpatric Sale, *Human Scale*, Secker and Warburg, London, 1980.
[74] Bill Mckibben, *The End of Nature*, Penguin, 1990.

the floor area in south England). Shelter and the benefits of shared wall space and uniform density seem more important principles than individual exposure to the sun. In addition mixed building use enables benefits to be gained from complementary heating regimes. From these perspectives medium to high density mixed use development of slightly varying height in terraced form and enclosing courtyards is ideally suited to the UK climate. Sufficient solar access can also be achieved at this density. There are also considerable transport energy benefits in denser more mixed use cities. It is clear that the individual suburban house, solar powered or not, does not offer a panacea for green cities.

Levels of Sustainable Design

I have discussed the various techniques available to reduce capital energy and particularly energy in use of housing. As noted in the two previous chapters that such techniques must fit in to a city wide policy. Goulding, Lewis and Steemers recommend a three level approach to the urban fabric with regard to optimising use of energy.[75] The first, *urban planning*, would involve transport, density, and the general arrangement of form and fabric for shelter and solar exposure. It would also involve developing food production and water systems and renewable energy supply (although this does not involve city form). The second, *urban morphology* applies to groups of adjacent buildings and the spaces between then. It would involve microclimate design, atria design, complementary location of functions, and neighbourhood heating production (energy supply). It would also involve water processing, waste recycling and food production as discussed in the next chapter along with social arrangement and appropriate ownership of housing discussed in *Chapter Seven* and *Chapter Eight*. The third, *building design* would apply to individual buildings including solar design and construction methods. These three scales approximate the tissue, support and infill levels of SAR discussed in *Chapter Nine*, and provide an excellent format for discussion of coherent sustainable urban design in the context of this thesis. I attempt to develop this concept in *Chapter Ten*.

In the next chapter I go on to discuss city farming, landscape and water systems that tend against the dense forms of city described so far but continue the theme of decentralisation. Transport involves: specific transport of construction materials; energy embodied in the transport infrastructure; and the general structure of life in our cities thus energy in commuting, shopping and food transport as already described. Development of city farming and forestry discussed next will be important considerations in all these respects. I also discuss ecological landscaping techniques that can reduce energy use in landscape maintenance and introduce natural process into the city.

[75] John R. Goulding, J. Owen Lewis and Theo C. Steemers (eds.), *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C.E.C, 1992. p155

Chapter Six:

Urban Agriculture, Water Systems and Ecological Landscapes

6.1. Urban Agriculture

- Properties of Agricultural Systems
- Environmental and Health Costs
- Sustainable Alternatives
- Food Processing and Distribution Mechanisms
- Exploitation and Over Consumption
- Production in the City Hinterland
- Potential for Urban Agriculture
- City Farming of Necessity
- City Farms
- Density
- Designing Edible Landscapes
- Permaculture
- Conclusions

6.2. Water Systems

- Cities and Water
- Treatment
- Separation
- Filter Beds
- Reduced Consumption and Water Saving
- Collection
- Conclusions

6.3. Ecological Landscaping

- The Dutch Landscapes - A human and Ecological Response
- UK Ecological Landscapes
- Defining an 'Ecological Approach' to Landscape
- Planning for Ecological Landscapes
- Co-ordinated City Forestry

6.1. Urban Agriculture

Introduction

Clearly a city cannot be sustainable unless the production of food for it inhabitants is sustainable. Globally the food production system must be able to continually feed the population. At present surplus food is produced in Western Europe and stored at high cost or dumped, depressing world market prices. I have noted how global shortages of food can be attributed to Western consumption levels and inequitable markets. Lower levels of production can thus be tolerated in Europe. These surpluses have been produced by highly intensive agricultural forms utilising mechanical techniques, and chemical based fertilisers, pesticides, and herbicides that depend on finite oil reserves and result in high pollution levels. Recent research shows that more sustainable agricultural patterns can be achieved by utilising plant succession and mixed farming taking advantage of complementarity between species and between plant and animal combinations.[1] Such methods can reduce the dependence of today's agriculture on fossil fuels and maintain soil conditions. They may also enable production for local consumption of more diverse and nutritious food. Further research suggests such methods may be of comparable productive efficiency to intensive methods.[2] They involve directing ecosystems (and their efficient use of sunlight) towards human use to encourage yields comparable to those of our traditional crops while avoiding the consequences of monocultures.[3]

It is argued here that such ecologically sustainable mixed agricultural systems *in the hinterland of the city* are of particular importance since they reduce transport costs and can increase nutrient recycling. Sustainable urban development it is argued will be aided by increasing rather than reducing integration of the city with the surrounding countryside as a hinterland that supplies food for the city. If production is orientated to the city, both travel, and need for processing of fresh goods can be reduced. Given development of appropriate means of separation and collection use can be made of city nutrients in human and vegetable waste. It would provide easy access to fresh foods for inner city inhabitants as in Holland's vegetable markets. I also argue that some food production can take place *in the city*. Elkin suggests accepting the problems of air and land pollution, the city has many advantages - heat, wasteland, nutrients, labour, markets.[4] The diet of those in the inner cities may be improved by the availability of fresh food, within and around the city, and connection with the processes involved in production. Increased knowledge of process may also produce demand for more sustainable and less chemically based techniques generally and increase local control over life. Neither can we ignore the benefits of exposure to natural and productive process described by Bookchin.

Nationally a policy of obtaining most temperate food from the UK and others from the closest possible source should be followed. Such a distribution system, in order to meet local city demands, would be consistent with a more diverse mixed farming economy with less specialisation and thus a greater variety of locally produced food. Moore Lappé has pointed out the myth of global scarcity of food.[5] She notes that between 1950 and 1986 world production of grain actually increased by 260% and outpaced population growth. Shortages she argues are due more to problems of poverty due to ownership of land and export agriculture controlled by the West that drives over-consumption. Increasing self-reliance in the West will enable developing countries to use land for local production not, for example, growing coffee based on the economics of 'comparative advantage'. It must however take place within a context of political decentralisation and de-commodification discussed in *Chapter One*.

My point here is not to suggest a 'return to the land' within a dispersed agrarian city but that the basis of the green city described above can and should allow for a degree of food production within it and a more direct relationship between farming in the hinterland with their urban markets. The sustainable city I have outlined so far has been one of density, reduced car use and mutual warmth. The agricultural system outlined here is consistent with that form.

---

1 John T. Pierce, *The Food Resource*, Longman Scientific and Technical, 1990.
2 Rodger Mitchell: The Ecological Basis for Comparative Primary Production, in Lowrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.
3 Wes Jackson, 'Towards a Unifying Concept for an Ecological Agriculture', in Lowrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.
4 Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.
5 Frances Moore Lappé and Joseph Collins, *Food First*, Souvenir Press, 1980.

The following list summarises the global reasons for more mixed use farming suggested here:

• Human cultivation/harvesting prevents recycling of nutrients as occurs in ecosystems (e.g. grassland marsh or forest ecosystem) particularly because it is dedicated to human consumption of only a few species.
• Resource inputs are required (above and beyond solar photosynthesis and nutrient cycling).
• Early farming tended to denude land and then move to fresh pastures.
• Initial inputs retained *some* balance involving human labour, rotation, mixed farming, hedge communities, variety of species, human wastes (renewable resources) and local consumption (not swapping the same goods globally or multiplying 'needs').
• Now 'agribusiness' is based on fossil fuels (unrenewable and polluting) to increase 'productivity' in the short term for export as commodities (luxury foods and goods) in a competitive global market (where some countries enjoy benefits of power).
• Increasing production based on monocultures uses unsustainable fossil fuel, overt mechanisation, and has environmental impacts of pollution, soil loss and vulnerability to pests.
• Food has developed into a production, processing and distribution industry on a global scale that increases inefficiencies in the system (swapping of goods) and drives high Western levels of consumption while exploiting developing countries (unbalanced markets).
• Today some areas particularly in the West are over productive (due to inputs of external energies). The major food problem can be seen as not increasing production but:

- developing more sustainable alternatives based on ecosystems;
- reducing transport inefficiencies;
- reducing global swapping of goods;
- reducing energy in processing and packaging;
- developing an equitable global system based around emphasising short economic linkages at least for basic goods and not sacrificing local food of developing countries for 'luxuries' in the West;
- reducing 'overconsumption' and more particularly inefficient and unhealthy forms of consumption in the West.

• Solutions would involve:

- developing more self reliant systems locally and nationally in the West;
- more sustainable and productive mixed farming that can reduce fossil fuel use and pollution in supply but also address the city/hinterland relationship and its potential benefits in terms of resources and recycling;
- introducing some particular types of farming into the city that will also be of benefit in terms of communicating agricultural process and reducing processing;
- provide diversity of food locally.

6.1.1. Properties of Agricultural Systems

Hough describes how agricultural systems are [man]-made communities of plants and animals interacting with soils and climate.[6] Odum describes them as domesticated ecosystems. He notes that while a natural ecosystems is far from an equilibrium system, the properties of agroecosystems have changed dramatically as *dependence on* and *impact of* external inputs have increased.[7]

Agroecosystems today are solar powered as are natural ecosystems but differ in that:

• auxiliary energy sources that enhance productivity include processed fuels (along with animal and human labour) rather than 'natural' energies;
• the dominant plants and animals are under 'human selection';
• diversity is greatly reduced by human management in order to maximise yield of specific food;
• control is external and goal orientated rather than internal via subsystem feedback.

Cultivation and harvesting and the biological simplicity of a few species *inhibits* recycling of nutrients and makes the species vulnerable to attack from 'pests'. A natural ecosystem reinvests major part of its 'productivity' in 'ecological organisation' that is harvested in an agroecosystem. Ecological organisation

[6] Michael Hough, *City form and natural process*, Croom Helm, 1984.
[7] Eugene P. Odum, 'Properties of Agroecosystems', in Lowrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.

maintains fertility and stability that is replaced in an agroecosystem by inputs of energy and materials. The degree to which agricultural systems can be stabilised depends on factors such as soil fertility, the extent to which animal nutrients are recycled and the diversity of the plant and animal species under cultivation. Cox defines the essence of agriculture as the use of energy and material inputs to stimulate productivity of agroecosystems and concentrate it into forms useful to people.[8] To this end 'productive agriculture' requires the use of concentrated resources. The earliest shifting cultivation required exploitation of pools of nutrients accumulated over time while pastoralism involved moving animals from place to place enabling them to exploit concentrated forest nutrients. In today's permanent agriculture energy and material resources are brought to the production site.

Clearly agroecosystems meet humans specialised demands compared to generalised ecosystems especially perhaps in temperate regions. Inputs are required to; replace exported materials, maintain productive conditions, and protect 'allocation-selected' crop and livestock species. Prior to use of fossil fuels such inputs involved human labour, human and animal manure, crop rotation, a degree of diversity and interspersed natural communities. These traditional mixed farming techniques maintained a *certain degree* of balance. The evolution of new techniques in food production has however been based, increasingly, on plentiful supply of non-renewable energy enabling increased productivity. In theory this enables us to feed the growing global population. The cyclical flow of energy resources through natural systems is then simplified in agroecosystems particularly in intensive agriculture which is sustained by non-renewable energy at high environmental cost.

After 10 000 years and more of agriculture, crops and livestock have become streamlined for special human purposes through breeding. Only a few highly productive plant species are used to the extent that according to Hough eleven plant species now provide 80% of our food world-wide.[9] Jackson notes that there are upwards of 350, 000 plant species world-wide.[10] Of the top 18 sources for food, 14 come from two flowering plant species the grasses and legumes. Recently the diversity among each species is also low tending towards identical productive genetic strains. Herbicides and pesticides provide protection against attack for these large monocultures that is provided in a natural or less intensive system by diversity. Chemical fertilisers, herbicides, pesticides and machinery all demand larger undisturbed land areas and specialised monocultures for efficient operation.

In the development of what may be termed 'agribusiness' larger farms now increasingly specialise in either livestock or crops. The complementary benefits of plant and animal communities in natural (and also 'ecological') systems disappear in factory farming with high energy inputs and disposal of wastes and with chemical agents to prevent disease in constricted spaces. Factory farming can be described as monoculture for animals. Hough argues that the enormous quantities of manure produced by animals, estimated at 40 to 70 pounds per day per animal, are often uneconomical to transport back to the fields and thus must be disposed of.[11]

The rapid rise in food production from the 50's has largely been dependent on low-cost inputs of artificial nitrogen fertiliser.[12] In the US between 1910 and 1970 farm output doubled producing twice the amount of food on less land.[13] In a ten year period up to 1975 output *per worker* in the UK increased by 5% per year.[14] Incremental effectiveness of such inputs have declined as farms have increased in size, adopted more mechanical techniques and become more intensive in operation. Commoner has shown how these methods are subject to the law of diminishing returns whereby as cultivation becomes more intensive greater amounts of energy subsidy must be used for diminishing yields.[15] The EC is now overproductive and follows a policy of set-aside. Elkin notes how the turning point for increased fertiliser use came with the introduction of milk quotas in 1984 that had a significant effect on the demand for nitrate fertilisers.

6.1.2. Environmental and Health Costs

Continuing trends in production based agriculture using concentrations of artificial fertiliser, herbicides and pesticides has resource, health, and pollution consequences. Odum notes they have high input and

[8] George W. Cox, 'The Linkage of Inputs to Outputs in Agroecosystems', in Lowrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.
[9] Michael Hough, *City form and natural process*, Croom Helm, 1984.
[10] Wes Jackson, 'Towards a Unifying Concept for an Ecological Agriculture', in Lowrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.
[11] Michael Hough, *City form and natural process*, Croom Helm, 1984.
[12] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991. p152
[13] Michael Hough, *City form and natural process*, Croom Helm, 1984.
[14] ibid.
[15] ibid.

output environments.[16] The first and most basic issue is that of non-renewable energy. Agriculture is a renewable resource based activity (photosynthesis) and a depletable resource based activity. The production of agrochemicals is energy intensive and western agriculture is based on enormous fossil fuel energy consumption. Odum notes that people eat potatoes partly made of oil.[17]

Our resource base however is undergoing retrenchment both quantitatively and qualitatively. Pierce notes "[t]he decline in soil fertility from land degradation, loss of agricultural land and water resources, the contamination of water, the loss of genetic stock of plants and animals and the depletion of fossil fuels are all manifestations of this process."[18] The high concentrations of fertilisers and chemicals for homogeneous crops also destroy the soil life needed for its biological health. Streams, rivers and groundwater is polluted as is the air from 'factory' farming and spraying while heavy machinery and ploughing contribute to soil erosion. Further modern, increasingly productive crop varieties are more vulnerable to environmental variation and are thus dependent on high levels of input. Neither do our cells have any evolutionary experience of the chemicals used.

Since the writings of people such as Rachel Carson a global debate has been carried out over the impact of pesticide residues on health with environmental groups, Third World' groups and consumer bodies running campaigns to ban or control a so-called 'dirty dozen' pesticides (13 particularly persistent and hazardous chemicals).[19] Some pesticides are in use in the UK that are banned in other counties and are of increasing concern with the rise in consumption of fruit and vegetables in line with nutritional advice. A peak in fertiliser use in the UK has now been reached although demand has not fallen.[20] There is also a growing appreciation of the environmental and health consequences of chemically based monocultures generally.

It is clear then that highly intensive modern methods enable increased production for a growing population (and less grinding farm labor) but at resource and environmental cost while such methods are now becoming inefficient. It is also worth noting that such techniques have reduced employment in the country and have been driven by movement to cities for less 'grinding' labor. Sustainable agriculture for sustainable urban development must reduce dependence on such methods. I now look at alternatives before discussing who is increasing production for who. Thus far it has been possible to justify increasing production using unsustainable methods because of population growth.

6.1.3. Sustainable Alternatives

Since only 25% of the Earth's surface can sustain viable cropping systems the food problem today is seen by production agriculturists in terms of 'natural' limits to food supply .[21] If it is to be sustainable however it has been suggested that the long-term food security of the world cannot not be hitched to non-renewable resources such as fossil fuels and mined minerals and will, as in other areas, have to look for alternative energies and materials to power agriculture. Long term production is also dependent on preserving physical and biological balance that sustains systems and will maintain production levels of usable land. Sustainability involves (from a production point of view) running agriculture on sunlight, cutting soil loss to replacement levels and keeping soil healthy (food processing, distribution and consumption are discussed below in addition).

For Jackson sustainable agriculturists (as opposed to production agriculturists) do not discount the need to continue to maintain food production in the future and are sceptical that society can adjust quickly and safely to a changing future.[22] Clearly however sustainable agriculturists must be interested in production i.e. feeding people now. Jackson also notes that the development of production agricultural has been important in the emergence of sustainable alternatives developed from knowledge of ecosystems. Today's production surpluses are a good argument for implementing sustainable farming. Such techniques can however argues Elkin also have economic and production advantages.[23] Arguments for the efficiency of ecological methods over intensive have been made throughout the 20th Century.[24] A growing body of

---

[16] Howard T. Odum, *Environment Power and Society*, Wiley-Interscience, 1991.
[17] ibid.
[18] John T. Pierce, *The Food Resource*, Longman Scientific and Technical, 1990.
[19] Rachel Carson, *Silent Spring*, Penguin Books, 1962.
[20] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.
[21] John T. Pierce, *The Food Resource*, Longman Scientific and Technical, 1990.
[22] Wes Jackson, 'Towards a Unifying Concept for an Ecological Agriculture', in Lowrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.
[23] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.
[24] Anna Bramwell, *Ecology in the 20th Century: A History*, Yale University Press, 1989.

evidence has pointed to smaller, mixed farms as both more efficient and sustainable.[25] Elkin notes higher yields per acre for alternative low input systems.

		Cost/acre[a]
	Conventional[b]	*Alternative*[b]
Inputs		
Fertilisers and pesticides (including application)	72.52	15.00
Field operation (tillage, planting and harvest)	45.44	35.00
Overheads and insurance	11.44	6.82
Total	129.40	56.82
Average yield of winter wheat (bushels/acre)	60.3	62.6

Note a: Costs in US dollars per acre of rotation per year.
Note b: The conventional system was a four year wheat-barley-wheat-pea rotation with use of fertiliser and pesticide inputs every year. The alternative was a low input system with pesticide only on the peas.

Fig. 6.1. Costs of conventional and alternative crop rotations[26]

Odum argues that we need to view agricultural ecosystems as dependent ecosystems that form parts of larger regional and global ecosystems. A strategy based on nutrient cycling in natural ecosystems would:

• increase energy efficiency;
• reduce irrigation water wastage and soil erosion;
• increase nutrient retention and recycling so as to reduce fertiliser inputs;
• promote use of crop residues as energy sources (for plants and animals);
• increase diversity through multiple and rotational cropping;
• reduce dependence on 'broad-spectrum' pesticides;
• reduce plowing.[27]

The later alone he argues can reduce fuel and loss of soil by 50% with a moderate reduction in yield (and theoretically increase yields in the long term due to reduction in erosion and improved maintenance of soil quality).[28] All have the effect of increasing similarities between agro-ecosystems and natural ecosystems. Such a strategy argues Odum would increase net farm income and satisfy domestic demand although consumer food costs would increase (increasing income of the farmer). *Critically however surplus for export would decline.* Conservation farming is good for the long term but not for exporting food to balance oil and mineral inputs to national economies or for manufacturing of ever more machinery and agriculture chemicals.

In looking to a solution Jackson believes our present agricultural system critically denies species succession.[29] For Jackson species succession will be the basis of agriculture that is sustainable. It is the replacement of single species populations for diverse ecosystems that is at the root of non-sustainable agriculture. Use of species succession will exploit inherent virtues of plant mixes and thus reduce soil loss, increase resistance to insects, maintain appropriate water nutrient, and efficiently use sunlight. Jackson argues that natural ecosystems are 'information rich' and utilise the sun's energy in an efficient way. Further grasses (our prime source of food) are featured at the ecosystem level and thus a potential for ecological alternatives exists. Legumes do not dominate any ecosystem but have an abundance of generic and species diversity.

Similarly sustainable farming would involve livestock but at much lower intensity. The recent growth of vegetarianism has been largely based on problems of animal welfare not the inefficiency of using huge amounts of imported grasses to feed animals for Western consumption. While we can now decide that eating meat is inefficient (amongst other emotional arguments) and that in order to feed the worlds five billion population successfully vegetarianism may be more sustainable, systems such as Permaculture

25 Kirkpatrick Sale, *Human Scale*, Secker and Warburg, London, 1980.
26 Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991. p159
27 Eugene P. Odum, 'Properties of Agroecosystems', in Lowrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.
28 ibid.
29 Wes Jackson, 'Towards a Unifying Concept for an Ecological Agriculture', in Lawrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.

suggests another solution where plants and animals are used for mutual support. Its aims are to use and develop 'natural' systems beyond their present capacities for human purposes while recognising that ecological balance within an enclosed system is essential. This notion of ecological balance ensures humane treatment of animals.

Organic farming is one of several alternatives. The Soil Association defines organic agriculture as:

• the use of rotation as a means of increasing fertility and reducing the build up of pests;
• recycling and composting so that nutrients are used carefully;
• biological methods of pest control;
• humane animal treatment.[30]

Many European countries have started to monitor levels and legislate to reduce use of pesticides and nitrogen fertilisers. In addition the EC is also developing regulations for the monitoring, production, and labelling of organically grown products. These include: restricting production locations related to roads; prohibiting the use of mineral fertilisers, pesticides and sewage sludge; and limiting animal densities.[31] Elkin notes the premium value of organic land and the high cost of organic food. At present organic food is only available for those that can afford it. Clearly as with public transport and car the relative costs of organic food would be reduced if the true cost of chemical farming was included. An increase in sale volumes of organic would allow for benefits of scale. The development of organic farming is however problematic if located near conventional farms. Conversion to full organic production is not an alternative for the majority of the UK.

6.1.4. Food Processing and Distribution Mechanisms

Agribusiness argues Hough has three major separated components:

• an input processing industry of seeds, machines, fertilisers and fuel;
• the production itself;
• a food processing including transport of farm products, processing, marketing and distribution.[32]

Modern farming is dependent on fuel energy not only for growing food but also for processing and distribution. The replacement of labor by industrialised food production, despite high yields, tends to result in a less viable energy return to society. Long range supply lines (global and regional) also require high fossil fuel use in transport and energy intensive ways of maintaining freshness (refrigeration, packaging) or processing and preserving foods during distribution and storage before consumption. The amount of energy that goes into growing, shipping, packing and marketing food is then greater than the energy we get out.[33] Further with these divisions recycling resources becomes more problematic. A fourth component, consumption, is removed from the production process.

Hough notes how only 9.5% of all food consumed in Massachusetts is produced in that state. At a regional level more distant supply lines reduce the potential for utilising urban resources generally and recycling of urban wastes in particular. The current distribution system in the UK encourages lengthening of supply lines as individual supermarket chains control ever more suppliers. At present six companies control approximately 70% of the food market.[34] Including true costs of transport would provide a strong incentive to increase local supply even within a small number of companies. Neither can the process of concentrating on out of town retail dependent upon the car borne shopper be separated from the environmental impact of distribution.

The growth of cities, monocultures, universal distribution systems and supermarkets has isolated the consumer from the processes of food production. The supermarket is the outlet for a world-wide marketing and distribution net (identical goods exchanged around the globe) and has become peoples principle connection with food, usually of identical size and shape and in copious packaging. The disposal of this packaging adds to the mountains of waste moving out of the city. The obvious advantages of supermarkets in terms of convenience must be set against their impact on sustainability. Rachel Carson argues global distribution has resulted in a lack of knowledge in the use of intensive techniques such as

---

[30] Soil Association, *Soil Association standards for Organic Agriculture*, Soil Association, Bristol, 1989.
[31] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.
[32] Michael Hough, *City form and natural process*, Croom Helm, 1984.
[33] ibid.
[34] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.

pesticides, insecticides and factory farming that may have acted as a check to exploitative methods.[35] It can also be argued that reduced contact with food production processes affects patterns of consumption in overprocessed food. Health problems of the west stem from over-consumption of single food types. Some poorer sections of our society have become dependent on cheap processed foods lacking nutritional value. The marketing strategies of the food industry for out-of-season food has not only involved high expenditure and extended supply line but has to an extent had an effect on food quality. Elkin points out that forced growing of out of season food (whether organic or not) tends to concentrate chemical residues.[36]

The shortening of supply lines can make major contributions to sustainable food production but will depend on different forms of supply and consumption (dietary changes that are against current trends). In terms of production it seems more diverse forms will be consistent with reduced distribution.

6.1.5. Exploitation and Over Consumption

Moore Lappé and Joseph Collins have pointed out that the problems of food shortages are not due to global production but distribution.[37] As Bookchin and Chomsky, Moore Lappé blames global colonialism by the West using the land and other resources of developing countries to increase food production and material consumption in the West rather than food production for the host countries. Odum notes further that it is the *market commodification of agricultural products* that has been the predominant cause of increased pressure for short term needs not long term sustainability.[38]

Policies towards greater self-sufficiency in the West could aid developing countries by enabling them to use land for their own use rather than for exports. The global 'free' trade system has often forced developing countries, for example, to produce grain to feed our animals instead of food for themselves or to producing large amounts of 'luxuries' such as coffee for Western consumption. Kirkpatrick Sale argues that although needed in extreme cases redistribution is thus not an appropriate general policy. It can also be argued that the extreme separation of cause and effect on which such systems are based help drive our consumption patterns. Further such exploitation has enabled Western consumption to reach today's levels. It has turned 'wants' into 'needs'. Such a system also has inefficiencies in terms of transport (particularly of exchanging the same goods) and our distance from agricultural process.

Development of more sustainable methods in agriculture are thus not all, and perhaps not even, predominantly related to production. This is made clear by the fact, as described, that Europe actually overproduces today and follows a policy of set-a-side. While it can be argued that surplus could be redistributed, this would flood world markets reducing prices of third world goods. Sustainable development globally I argue is contingent with modifying demand in developed countries. The culture of excess and waste endemic of food consumption habits in the West is unsustainable on a world level. The continued diversion of a vast quantity of resources to a small percentage of the earth's population is the principle reason for shortage today. Addressing consumption in the West however is not only a problem of quantity but also type of consumption.

For Hough the dehumanisation of patterns of food growth affects patterns of consumption.[39] Many food problems of the wealthy industrialised countries stem from over-consumption and malnutrition. Americans consume nearly one tonne of grain per person per year, of which 150 pounds are eaten directly. The rest is consumed indirectly in the form of animal protein. In Canada it has been found that 50% more meat, fruit, tomatoes and sugar were eaten than is required for a healthy diet.[40] Pierce notes that the west overconsumed between 24 and 32 per cent in the first half of the 1970's.[41]

Sustainable development then not only involves improvements in management of agricultural resources but improvements in the *efficiency* and *equity* of distribution at regional, international and intercontinental levels. The colonial nature of global markets must be questioned. More locally based systems for at least basic goods is important and require a change in eating habits.

---

35 Rachel Carson, *Silent Spring*, Penguin Books, 1962.
36 Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.
37 Frances Moore Lappé and Joseph Collins, *Food First*, Souvenir Press, 1980.
38 Eugene P. Odum, 'Properties of Agroecosystems', in Lowrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.
39 Michael Hough, *City form and natural process*, Croom Helm, 1984.
40 ibid.
41 John T. Pierce, *The Food Resource*, Longman Scientific and Technical, 1990.

6.1.6. Production in the City Hinterland

In addition to more sustainable mixed farming methods, food production in the hinterland of the city is advocated here since it:

• further reduces transport and potentially packaging and processing;
• increases the quantity of fresh food available;
• may enable development of links between farmers and city dwellers in terms of exchanging produce and labour;
• utilises available city resources efficiently and productively (compared to alternative horticultural landscapes).

Production in the city will further:

• increase knowledge of food production process and thus may increase pressure for less polluted food and sustainable methods;
• introduces nature into the city as a working relationship (not aesthetic);
• empower poorer sections of society by enabling them to produce their own food (problem of enforced self-help should be noted however [see *Chapter Eight*]).

6.1.7. Potential for Urban Agriculture

The resources needed for food production present in the city include land, heat, nutrients, buildings and people (labour and markets). Developing forms and systems that can efficiently use such resources will be important to achieving more sustainable cities. With strong planning controls to keep land values down urban areas are, for example, an ideal location for market gardening due to the proximity of the market, high ambient temperatures and the potential to link with district heating and sewage composting. Perhaps more importantly however urban agriculture can change the perception of both rural areas and city open space alike as playgrounds not as a working resource. Farming in the city brings natural processes and cycles into the city and in the form of interactive processes not passive aesthetics. Nature becomes a working landscape within the city, not horticultural or elsewhere. Elkin argues that urban food growing by city dwellers (private backyard, community food growing initiatives, city farms and allotments or direct exchange systems) should be encouraged since they establish a connection with our dependence on the countryside for food and thus the notion of sustainability.[42] More cyclic or ecological farming may thus be encouraged by a degree of farming in the city. Further with food grown locally it is easier for the individual to perceive the potential dangers of overuse of chemicals. Predominant limiting factors for production of food in existing cities are air and soil pollution. Several categories of city farming can be defined - commercial production akin to market gardening, direct co-operative purchasing schemes and links, allotments on private or community land close to housing and on the urban fringe, city farms, and municipal edible landscapes.

Land

There are potentially large areas of urban land resources in our cities ranging from large areas of public land to private back-yards and rooftops. With external movement of city populations and outward growth of cities agricultural land is continually being lost while derelict land becomes available within the city (particularly in declining industrial inner cities). Potential land for local and city wide agriculture may also include; existing aesthetically and recreationally based parkland, railway and road sides, public utility property and industrial lands. These may be combined with city wide leisure initiatives such as green wedge pathways (Leicester Central Way). Other appropriate land may include streets freed of car domination, clearance sites, vacant lots and backyards linked to the building fabric. Clearly the type of food production will need to suite the type of land, its ownership and locality. Below, for example, I discuss urban forests as ideal for the city fringe. Allotments may be best located within view of associated housing groups. The immediate *hinterland* of the city today is often agricultural land waiting to be turned into housing and industrial estates with the owners hoping for increased land values. As such it is often derelict. It is however an ideal location not only for intensive market gardening but also non commercial allotments. Elkin notes that in Copenhagen in Denmark large areas outside the city are given over to allotment gardening. Many Dutch cities share this characteristic.

The demand for allotment gardens in or near the city has been growing rapidly in recent years. Hough notes increased leisure time, unemployment, early retirement, rising food costs and a rejection of over processed foods as contributory factors.[43] The small scale and labour intensive allotment is ideally suited

---

42 Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.
43 Michael Hough, *City form and natural process*, Croom Helm, 1984.

to awkwardly shaped space that has little potential for other uses. Allotment food production is usually concerned with high-value crops such as tomatoes, onions and lettuce. The productivity of allotments is potentially high. Riley notes that the standard allotment garden of 300 square yards may yield, 20 tonnes per acre or approximately 3.5 tonnes per plot per year under experienced management.[44] Elkin estimates that production from allotments is 2.2 times that of commercial production.[45] Allotments have proved popular despite often being considerable distances away from houses. Important to this thesis is their recreational value to a wide variety of people. Several co-housing schemes in Holland are developed around allotment type plots in a central space enclosed and protected by the housing (see Chapter Nine). Such developments maintain housing density. Productive land-use can be carried out individually, communally or by a member of the group paid for their labour by the co-operative.

Rooftops lie dormant in every city yet they present opportunities as open space resources that could be put to productive use both as community gardens and for commercial production. Hough describes a community roof garden project of 1000 square metres in downtown Montreal.[46] The roof is that of a local community centre and the project forms a demonstration area and a living classroom for organic gardening classes of the centre. It includes gardening containers, cold frames, several small greenhouses, a compost bin and shaded siting areas. Importantly the project has solved practical problems, generated considerable enthusiasm, enabled new skills to be acquired, and formed community associations.

Private backyards provide some of the best opportunities for food growing in terms of energy efficiency and direct benefit. Hough notes the energy invested in maintaining a lawn (human labour, fuel for the mower, fertiliser and pesticides) for zero production (if the clippings are discarded). Composting at such a scale provides immediate recycling of organic waste. Back-yard food projects are capable of development for semi-public or community mutual benefit physically, economically and socially. Balconies, roofs, walls and interiors can also be used for private food production if designed appropriately. Proximity to buildings may enable beneficial use of waste heat.

Heat
The energy wasted from the city fabric is another potential resource for food production. This includes waste heat energy from heating and cooling systems and from industrial process. Conservation measures involving higher insulation may be complemented by the collection and use of heat for food growing. Such initiatives may be particularly relevant where the growing season is limited to four or five months per year. As described the cities external fabric can be used to capture and store solar heat extending the potential growing season externally. The greenhouse further adds to this potential. It has been used in agriculture to increase crop production particularly in highly intensive market gardening although normally on the basis of abundant energy for heat and is thus highly energy intensive. Conventional greenhouse design, as opposed to sunspaces, are inefficient and dissipate unsustainably produced heat in all directions rather than collecting free solar or lost heat. Energy efficient solar spaces can enhance all year food production, help to heat buildings and reduce heat loss from buildings. Such initiatives may be applicable at domestic, community, commercial and municipal levels. Hough suggests lightweight hydroponic (soilless agriculture) techniques could be used efficiently on roofs of industrial buildings.[47] The development of energy efficient all year round or extended growing season agriculture can enable greater self-reliance in a variety of food usually imported during the non-growing season and based on high production or transport energy inputs. There is also the possibility of linking agricultural initiatives to district heating and CHP systems.

Nutrients
A key factor in urban farming is that of soil enrichment and management. Soil of reasonable quality is a scarce resource since many urban soils have been sterilised through constant disturbance and pollution. The city however has an inherent wealth in nutrient resources that can be used within the city and in its immediate hinterland. Elkin describes increasing the recycling of urban waste as one of the highest priorities in developing sustainable agriculture.[48]

Much of our sewage waste is presently discarded at sea after minimum mechanical treatment although some of Britain's major sewage plants compost sewage for sale to horticulturalists, gardeners and allotment owners. Hough describes how although somewhat deficient in potash composted sewage sludge is an excellent soil conditioner and fertiliser containing nitrogen and phosphorous.[49] Its organic content

[44] Peter Riley, *Economic Growth, the Allotments Campaign Guide*, Friends of the Earth, London 1979.
[45] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.
[46] Michael Hough, *City form and natural process*, Croom Helm, 1984.
[47] ibid.
[48] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.
[49] Michael Hough, *City form and natural process*, Croom Helm, 1984.

provides a source of humus; opens pore space in clay soils and improves soil aggregation in sandy soils. Processing of sewage waste is discussed in more detail below along with the potential use of city forests for handling effluent. Anaerobic digestion may be a valuable tool for dealing with both urban and agricultural organic wastes at various scales producing usable compost biogas. The solid digestate however contains minerals in such concentrated form that it may 'scorch' crops and should be composted with other organic waste. Sewage sludge may be contaminated by heavy metals due to mixing of human and industrial waste. Systems that maintain separation of such wastes are important.

Other organic wastes generated, for example, in households and cafes, along with leaf litter could also be collected and composed by local authorities. Again this could be used to increase the organic matter of poor soils in urban locations or on the urban fringe. At present such activities are a financial burden to authorities. Facilities for collection, separation and composting at a local level would perhaps be more appropriate. The overriding problems with the use of household garbage and sewage are our perceptions and its smell and health hazard. The processes involved in urban farming must recognise the density of city living.

6.1.8. City Farming of Necessity

Christine Furedy describes 'incidental greening' in Asian cities.[50] Incidental or informal greening she describes as the actions of the very poor in resource scarce areas, in their daily lives, as the product of necessity (for survival). There is no intentional concern for the ecology of city. It is 'greening' in the broad sense that Furedy describes as "activities that enhance diversity in the relations between the built environment and the natural, that are resource conserving and ecologically sound".[51] It provides basic self-sufficiency in a world that does not 'provide' and involves the growth of plants even in congested slums, keeping animals and use of animal and human wastes for food production. It thus provides some balance in the most desperately pressured cities. Its growth is often in association with squatter settlements forming an illegal but essential economy. While creating an ecological relationship such actions remain constantly under threat. The Calcutta Metropolitan Urban Development Plan, for example, calls for the filling in of the wetlands that have served food production, waste disposal and air quality.

In the 'developed' world similar examples of food production can be seen amongst less affluent neighbourhoods not because argues Hough "of any environmental conscience - this is a middle-class ethic - but because it is necessary".[52] Projects such as Ashram Acres (see *7.2.8. Local Environmental Action*) contrast with the 'pedigree' municipal landscapes of our cities. The former often hidden away in alleys, backyards and on rooftops demonstrate great specific responses to local situations. They often provide economic returns or may generate associated (empowering) environmental initiates. At Ashram Acres produce is shared amongst those who participate.[53] City to farm co-operative link schemes have also successfully been set up in many areas. These link local city communities to farms bordering the city helping those in the city on lower incomes and without access to car to obtain cheap fresh food. More generally developed such initiative provide a counteraction to the growth of 'supermarket culture'.

6.1.9. City Farms

City Farms in the UK also provide a source of fresh food in the city although they are not usually set up primarily for food needs but as demonstration and educational projects.[54] They are also discussed under *Local Environmental Action* in the *Chapter Seven.*

6.1.10. Density

The benefits of maintaining densities discussed in previous chapters need to be balanced with reducing divisions between today's city and countryside 'monocultures' (bringing nature into the city for, resource, pollution and communicative reasons). Sandra Higgins notes that the concept of partial self sufficiency with agriculture integrated into the city formed part of Howard's holistically green view of the environment given physical form in his social city.[55] The integration of city and countryside is often associated with suburban development of low density but I argue here that the opening up of space has

[50] Christine Furedy, 'Incidental Greening - Saving Resources in Asian Cities', David Gordon (ed.), *Green Cities: ecologically-sound approaches to urban space*, Montréal, 1990.
[51] ibid.
[52] Michael Hough, *City Form and Natural Process*, Croom Helm, 1984.
[53] Joan Davidson, *How Green Is Your City*, Routledge and Kegan Paul, London, 1987.
[54] ibid.
[55] Sandra Higgins, 'The City Green', *Architects Journal*, 5 February, 1986.

not achieved this end and to a large degree is irrelevant. While such considerations as city farming will be a limiting factor on density, the self-sufficient city (in food terms) is not appropriate or possible today. In particular cases food production introduced into cities and been extremely beneficial at a local level. Any strategy should then address existing cities, people and location of vacant space. Urban landscape and architectural design may address the problems of overt reliance on monocultures by addressing food production in the city within urban housing forms. The suggested city form would maintain density with a mixture of commercial food production, city farms, allotments and urban forestry where appropriate.[56] It would critically maintain a more direct relationship with the agricultural hinterland.

6.1.11. Designing Edible Landscapes

In 'Edible Landscapes' Mary Boyes-McLauchlan advocates the use of food plants as design tools.[57] This involves not restricting their use to private gardens and allotments, or specific farming zones. The benefits derived from designing with edible plants argues McLauchlan include having a wider choice of plant material, conserving non-renewable resources, having control over chemicals used in food production, using resources more efficiently (water, soil, fertiliser) and involving people directly in the landscape through harvesting food. She defines an edible plant as one that holds enough structure or form to be used in landscape design work and has a nutritional component. Examples include raspberry canes used for hedging purposes, orange trees as structure planting (nb Parc de la Citadella, Barcelona), strawberries as ground cover, or herbs and vegetables used for a visual effect in the herbaceous border. In addition the formal garden, allotment or urban food growing business argues McLauchlan "can be transformed into an attractive well designed edible landscape using a mixture of ornamental and edible plants or strictly edibles."[58]

In discussing the implications for design and urban form of food production applied to our existing cities it is clearly necessary to address attitudes to food production as not belonging to the city. As described poorer communities have turned to food production of necessity but for many these initiatives are perceived as a visual blight. Our perception of city landscapes as tidy and horticultural (not 'working' landscapes) stands in the way of the a more dynamic city landscape. Architectural and landscape 'design' of edible landscapes may however be a way of bridging this gap considering both their physical form and process.

Further integration of farming into the city must not take place at the expense of its urban character (producing a universal subtopia of self-sufficient farm-stead's). McLauchlan's aesthetic edible landscapes are clearly of a different form from city farms but can be applied to traditional urban spaces. Both public and private land offers potential for designed edible landscapes. The relegation of vegetables to vegetable gardens and herbs to herb gardens can result in unimaginative projects when they can be fitted into small spaces or among other plants. Edible climbing plants such as grapes and figs can be used to cover walls or trellising. Kourick describes 'multiple functions', for example 'the hollyleaf cherry makes a dense privacy hedge, has edible fruits, increases the bird population, and can attract beneficial insects with its blossoms'.[59] Derelict urban land can be transformed into usable parkland, community orchards, or food co-operatives that supplement the livelihood of the local residents. Edible landscapes can be established as pocket parks or introduced into courtyards. McLauchlan gives the example of the historical garden concept of the 'bustan' an enclosed domestic or communal space containing dense plantings of fruit and nut trees, vegetables, herbs and scented shrubs.[60] These ideas suggest an end of single purpose landscapes and an increase in diversity in our cities with the maintenance of a dense and fine grained fabric.

6.1.12. Permaculture

Permanent agriculture describes attempts at 'designing' self sustaining or self-perpetuating agricultural systems. Bill Mollison defines Permaculture as "the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability and resilience of natural systems".[61] Permaculture attempts to increase the productive capacity of ecosystems for the benefit of humans within a self-sustaining system providing energy from within the system not externally. It attempts to integrate landscape and people to provide their food, energy, shelter and water needs in a sustainable way.

56 Michael Hough, *City form and natural process*, Croom Helm, 1984.
57 Mary Boyes-Mclauchlan, 'Edible Landscapes', *Landscape Design*, November 1990.
58 ibid.
59 R. Kourik, 'Edible Landscaping?', *The Mother Earth News*, May/June 1985.
60 Mary Boyes-Mclauchlan, 'Edible Landscapes', *Landscape Design*, November 1990.
61 Bill Mollison, Permaculture: A *Practical Guide For a Sustainable Future*, Island Press, 1990.

Permaculture involves the utilisation of plant symbiosis; the study of the ways in which plants help each other. Some plants for example perform best in the shade of others; peas, beans, clovers and other leguminous plants inject nitrogen into the soil which benefits their neighbours and successors: other plants release nutrients such as calcium and saponin. Thus there is a continual interchange of nutrients between plant roots. Robert Hart argues that forests as the climax of natural succession have great potential as permanent symbiotic systems.[62] Mollison highlights robust systems such as rainforests where enormous diversity of species symbiotically combine to produce high productivity yields. In practice Permaculture is based on the growing of a highly diverse mix of perennial and non perennial food plants, especially trees. Permaculture systems include animals and rely on biological pest control.

Permaculture was devised first in a Southern Hemisphere context not in more densely populated Europe with its existing city fabrics. There are clearly restrictions to Permaculture within the existing city although its emphasis on 'design' makes it potentially applicable to devising ways to use more than the ground surface for food production. Restrictions in land area can produce creative and efficient solutions. Further in Permaculture the 'ecological dwelling' is part of the system. Roofs and rooftop glasshouses, trellises, balconies and balcony sunspaces will all be important. Reflecting surfaces wind and use of productive vines for wall insulation and wind protection will all need to be considered. Clearly to this extent houses would be best not considered in isolation so that benefits of different orientations and exposures could be considered and the variety of available skills combined. Christine Lillington describes city farms as a form of Permaculture since their concerns extend the use of city resources, for example, old car tyres become ponds or raised flower beds; pallet wood is turned into fencing, greengrocers waste become animal feed, builder's rubble is built into drystone wall. They thus demonstrate a similar new attitude to resources.[63] This thesis can be seen as extending the potential of the ecological dwelling as part of an agricultural system to the ecological community and city.

6.1.13. Conclusions

Both our current food *production* and *distribution* systems are wasteful of resources. I have outlined a need to introduce more sustainable production techniques based on utilising plant succession and mixed farming taking advantage of complementarity between species and between plant and animal combinations. I have also outlined a need to develop links between the city and its immediate hinterland moving towards self-reliance not creating self-sufficient dispersed settlement form. Such a system will be able to utilise city resources. It can also reduce energy use in transport and unnecessary processing and packaging. Links between city and hinterland to be established through, for example, co-operative purchasing of farm supplies negates centralised collection and distribution and provides access to fresh food for inner city residents. Less radically encouragement of mixed farming on the edge of the city will provide a greater variety of goods and thus encourage direct local distribution as opposed to national supermarket chains. Finally food production in and around the city and city farms can increase everyday contact with food production processes. An informed city population could have a considerable effect on reducing exploitative techniques. *Production* and *distribution* are tied to *consumption* demands. Knowledge of process may produce demands for less exploitative methods but critically may change consumption habits.

Resources and opportunities exist in the city for small scale, non-exploitative, productive and creative farming. Exploring alternatives to fossil fuel based techniques in the city may have a considerable impact on attitudes. The net effect could be to increase local self-reliance and reduce dependence (empower poorer sections of society). Such food growing schemes however should not be seen as a way of 'keeping the poor quiet' or the unemployed in jobs. Consequences for the built form occur at different scales. It may imply that each dwelling has sufficient land for each household to grow its own food. This idea however negates the city in favour of dispersed (not decentralised) communities. Such a system is not realistic when applied to the existing fabric and lifestyles of our cities. There is a need to address the existing city fabric and our specialised society. This includes recognising limitations to self-sufficiency for the great majority.

Architectural form that addresses such possibilities would involve provision of sunspaces, balconies, frames and suitable external areas and be combined with low energy heating systems within the city. Links between people and food growing can be creatively addressed. Some co-housing schemes discussed in *Chapter Nine* utilise the grouped form of their housing to produce certain food types. House design can incorporate elements that aid recycling and store unpackaged goods. Housing could be provided with facilities to separate compostable materials to be used within the city or locality.

[62] Robert Hart, 'The City Forest', *Permaculture News*, Summer 1990.
[63] Christine Lillington, 'Permaculture in the City', *Permaculture News*, Summer 1990.

Composting toilets could be incorporated particularly in group housing schemes with associated land. These materials would also be used on commercial or communal city farms and allotments where appropriate. Critically I suggest co-ordinated initiatives at various levels. Production in and around the city however depends on measures to reduce pollution.

6.2. Water Systems

Introduction

Sufficiency of water is not generally a major problem in UK although air pollution is now polluting rain water and thus many of our initial sources. Neither is the water problem critically related to sustainability at present. We do however use and pollute large amounts of water that may eventually reflect on sustainability and use large amounts of energy and chemical resources to clean (some of) it. The use of water for wholesale dispose of a wide variety of wastes also has a direct impact on the potential use of human waste as fertiliser for agriculture of different scales. The major sources of water pollution are toxic wastes from industries (chemical and engineering), run-offs of pesticides and fertilisers from farmland that enter rivers, and domestic sewage and chemical agents.[64] I have already described less polluting methods of farming. I deal here mainly with alternatives for dealing with domestic sewage and its potential use as a resource on farmland. Sustainable and safe methods of disposal and use of sewage, I note, are determined largely by avoiding mixing sewage waste with other pollutants.

Water pollution has a dramatic effect on the habitability of our cities (the rivers that pass through them and seas that border them) that add to reasons for living away from the city. Neither are water shortages unknown especially in the SE of England. Holliday points out that this is often a consequence of depleted ground water supplies in meeting *exaggerated* daily demands.[65] We also clean large amounts of water which do not need to be absolutely pure. The water problem is an important factor in discussing settlement form. The development of water systems was critical to the development and growth of cities and is relevant to this discussion on the form and processes of sustainable cities. It should be asked whether a city can put back pure water further down stream and what form this city should take. Clearly this is most efficiently done if less water is used and polluted in the first place.

6.2.1. Cities and Water

The development of a reliable water supply has been the primary determinant in the growth of large and densely populated cities providing the means of controlling disease and raising public health standards. Following the development of rainwater sewers in the 18th Century the private bathroom and toilet were made possible by the introduction of sanitary sewers in the 19th Century. Until this time human 'wastes' were emptied from cesspools by 'night soil men' and sold to neighbouring farmers.[66] As cities became larger and denser this system became unworkable and sewers along with piped water supplies were developed in response to epidemics that periodically swept 19th Century cities.

Water mains by allowing copious over-use have produced a need to clean and dispose of vast quantities of water while moving human waste disposal to beaches, rivers and seas has resulted in little attempt to utilise this valuable resource on the land. As a consequence of it's abundant supply water has been perceived as a free resource. Average domestic consumption today in the UK is 160 litres per head of population per day (220 litres in the USA). In order to survive the average human body needs only one litre per day.[67] This growth in water consumption has been combined with the huge growth in the use of toxic cleaning substances that make our homes ever more sterile along with soaps, shampoos, mouthwashes and all manner of 'essentials' that are disposed of down the sink and toilet further increasing pollution levels. We have perhaps become obsessed with cult of cleanliness to the extent that it is becoming detrimental to health. David Leigh describes how our systems presently interfere with the supply of water to the point of adding poisons to it *before* pumping it to our homes to drink.[68]

---

[64] Brenda and Robert Vale, *Green Architecture: Design for a sustainable future*, London 1991.
[65] John Holliday, 'Ecosystems and Natural Resources', in Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, 1993.
[66] Michael Hough, *City form and natural process*, Croom Helm, 1984.
[67] Brenda and Robert Vale, *Green Architecture: Design for a sustainable future*, London 1991.
[68] David Leigh, 'Water in the Landscape', *Permaculture News*, Spring 1991.

The public health movement and the systems it introduced clearly had an immediate and startling effect on the cleanliness of local environments but has also dramatically increased consumption and problems of water pollution by allowing a mixture of raw wastes to be disposed of through the same sewers directly into rivers. The combination of water from various sources in the same sewer increases the physical, chemical and biological problems of its return to 'natural' systems. Brenda and Robert Vale describe further how less than half the water for domestic use needs to be of drinking quality yet drinking water is supplied at increasing cost in resources and land in order to satisfy them all.[69] The same quality of water is used for domestic purposes (toilet and washing), fire fighting, car washing, irrigation, and industrial uses.

toilet	32%
personal 'hygiene'	28%
laundry	9%
washing up	9%
drinking and cooking	3%
watering garden and washing car	6%
losses	13%

Fig. 6.2. Use of water in UK houses - less than half need water of drinking quality[70]

6.2.2. Treatment

The oceans have long been regarded as too large to be damaged by human activities thus allowing wastes to be continually poured into them. The sewage of 12% of Britain's population is discharged *untreated* into the sea along with 30% of our sewage sludge. Sludge is the remains of primary and secondary treatment.

Primary treatment is a mechanical process that separates used water (effluent) from the materials that have been added to it (sludge) by screening and settlement or sedimentation. The organic material remaining in the effluent is then readily converted to harmless substances by bacteria and organisms present in the effluent itself. Facilitating this process is the function of secondary treatment and virtually eliminates the health hazard associated with this raw waste by breaking down the organic matter into its components. It has a higher degree of biological stability and is rich in phosphates, nitrates, potassium and trace elements. Secondary treatment usually aids biological process by simply increasing contact with oxygen in the air. For larger sewage works (over 50, 000 people) the process must however be aided by forced air and mechanical agitation. This is because strictly biological treatment requires large areas (particularly for high quality effluent) although it is more robust and running costs are lower.

At this stage the partially treated effluent is often discarded into waterways. Concentrated discharge of secondary treated waste waters from secondary treatment plants still causes pollution of our rivers due to increased mineral concentrations. Eutrophication (low O_2 levels, abundant weed and algae, low light penetration), a natural process of lake evolution is speeded up in ditches, streams, rivers, lakes and even the sea as a result of overfertilisation from nitrate and phosphate rich effluent even after secondary treatment.

Sludge has a solid content of only 5% approximately and dewatering can be used to reduce its bulk. Exact disposal has clearly depended on location. In coastal locations it is often dumped at sea. Inland this is more expensive and more often it is disposed of in landfill after treatment and dewatering. While the potential fertility of this sludge is being wasted enormous amounts of high energy artificial fertilisers are being used as described above. Much of this fertiliser leaches into groundwater supplies.

Advanced (tertiary) treatment of effluent usually involves chemicals and is expensive. It aims to remove 95% of the remaining substances leaving drinkable water. The soils micro-biological and chemical capacities are however able to filter out nutrients for re-use by plants, and return pure water to ground reserves. William Sopper has shown how forests can be used as land treatment systems to renovate secondary treated waste water for direct recharge of the groundwater table as an alternative to using waterways to simply carry it away. He describes how waste water can be applied to forested areas without health threats to animals or humans. It provides for water pollution abatement, for recycling of the beneficial nutrients, and replenishment of the local groundwater supplies. These areas can also be

[69] Brenda and Robert Vale, *Green Architecture: Design for a sustainable future*, London 1991.
[70] ibid.

used as green belts or wedges in the city as below (see *6.3.5. Co-ordinated City Forestry*). Secondary treated waste water has considerable fertilising value and can also be used on crop land during the growing season if additionally aerated and chlorinated. With some forest ecosystems such treatment can take place all year, a single species plantation (monoculture) however is less effective than mixed natural pioneer species. Tree growth rate is increased with the application of waste water but consequently the specific gravity and thus strength of the wood is reduced. Sewage is particularly appropriate in the establishment of young forests. It is a resource of the city that could be used to produce another potential resource.

The most widely used means of treating sludge is anaerobic digestion (other than dumping at sea or in landfill). The sludge is heated in closed tanks forming an inoffensive sterile humus like material suitable for application to agricultural land. Up to 50% of the organic matter is converted into gas - one-third CO_2 and two-thirds methane.[71] This process however can be upset by synthetic detergents and industrial toxins. Alternatives involve chemical treatment or heat treatment to sterilise before drying. Drying usually takes place on open beds otherwise it involves mechanical process (energy).

Thames Water have 11 sewage-to-electricity schemes utilising gas from anaerobic digestion and using the waste heat directly for the anaerobic digestors. Water authorities use large amounts of energy, 70% of Thames electricity demand goes on pumping and further proportion on aerating sewage during treatment. They can sell generated electricity to the grid to offset these costs. Thames water also use sludge on farmland transported by tankers to farms - land is monitored to check on heavy metal content.

6.2.3. Separation

Elkin describes how the lack of more widespread use of sludge use on agricultural land as opposed to landfill is a result of *contamination by industrial waste*.[72] Sale adds that recycled raw sewage holds no danger as long as toxic chemical wastes are excluded.[73] Soil can neutralise the normal load of human pathogens within weeks and even some heavy metals if left fallow for a year. There is thus a need to locate sources of other pollutants entering sewers and stop them. Such measures can considerably increase the potential of use in agricultural irrigation

Elkin describes how in Sweden industrial effluent is separated from domestic waste and sewage is not mixed with other liquid domestic wastes. The later (grey water) is conveyed in separate pipes to a treatment plant, treated and discharged into a river. The treatment required would be considerably reduced if products for domestic use (particularly cleaning materials) were devoid of potential pollutants. Sewage or 'black water' contains all the nutrient value and is a small volume compared to the 'grey water'. After simple treatment it can be used as fertiliser. Application in the UK however would involve high infrastructure costs given the condition and function of our existing sewers. Rainwater drainage systems have also resulted in no attempts being made to capture and use rainwater (polluted as a consequence of air born pollutants over the city) but instead mix it with sewage.

Large scale anaerobic digestion is not suitable for urban areas. Pure (not mixed with other pollutants) sewage sludge however could be piped to sites on the outskirts where it could be composted. This would overcome logistical problems that hinder its use as fertiliser i.e. the difficulty of transporting raw sludge, the related odour and the fact that farmers do not need it all year. Composting removes the smell and provides a fertiliser which can be readily transported and stored until needed.

6.2.4. Filter Beds

Aquatic plants can also be used to filter and recycle wastes. Reed bed systems have recently been developed with the potential for direct use in architecture and landscape within the city at a local level. They can work in restricted spaces often involving vertical arrangements. If the system is designed and constructed with care it will produce clear water. The water from a reed bed system still contains a rich diversity of minerals that can be used for irrigation although not for food crops. Where space is short reed bed systems can even be designed for installation on the side of buildings. The area required for both vertical and horizontal systems is dependant on the nature of the polluted water. For domestic sewage effluent 1m^2 per person is reasonable.

---

71 Barry Hague, Sewage Power, *Review*, dti, Summer 1992.
72 Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.
73 Kirkpatrick Sale, *Human Scale*, Secker and Warburg, London, 1980.

A reed bed or root zone system consists of a series of beds filled with layers of gravel, larger sizes at the bottom, covered with a layer of sand in which various species of reed are planted. Cristopher Betts describes them as an attempt to achieve sustained, cost effective and controllable purification efficiency in a reasonably small space.[74] Flow through the beds can be vertical or horizontal but with vertical flow a smaller surface area is required.[75] Reeds keep the beds oxygenated maintaining aerobic digestion of the sewage. The extensive root system provides numerous sites for micro-organisms while providing physical pathways for air to penetrate the system. A outlet pond is a common feature in such systems.

6.2.5. Reduced Consumption and Water Saving

Clearly emphasis is better placed on reducing consumption and pollution of water than cleaning polluted water. Ideally a toilet system would return waste directly to the soil, this saves water and provides nutrients immediately. Earth or compost toilets accomplish this but at present are unacceptable to many familiar with water based systems. Several types of composting toilets are now commercially available that provide a useful source of garden compost (and gas). We have however a huge infrastructure and culture based on the use of water to carry our wastes away. Sale argues that water borne sewage has outlived its day. It takes high quality drinking water and pollutes it with human and industrial waste and deposits it in rivers or the sea.[76]

In Europe and North America and Australia experience has proved that consumption has dropped 40% with installation of water meters. Toilets are particularly extravagant using nine litres per flush in the UK (45% of daily household consumption).[77] New models can use as little as 4 litres per flush.[78] Washing machines are inefficient compared to communal laundrettes since their is a tendency to use them less often. They may use communally collected water and have an increased potential for utilising recycling reed beds. Water conservation reduces investment needed in supply infrastructure - particularly grading water for different uses. Pearson points out that waste from underground distribution pipes can be as high as 40 - 50% of processed drinking water while five to ten per cent is lost in homes from faulty equipment.[79]

6.2.6. Collection

The water that falls on the city is at present wasted because it is available 'on tap'. Water meters would clearly increase the attractiveness of collecting water. Rainwater can be successfully collected from most surfaces. Again a combined architecture and landscape solution may be applicable on a local basis. Hough describes collection ponds integrated into housing developments also acting as landscape features.[80] Roofs make up a considerable proportion of cities area and thus represent a considerable untapped resource. Design of roofs for collection is discussed by Peter Warm and Keith Hall.[81]

While rain evaporated from the sea may be described as pure, leaving its minerals behind, when falling or moving over a city it picks up pollution from the air. Rain water collection in the city is clearly problematic due to the need for it's purification for drinking. It can however be used directly for other purposes while systems are available that can purify collected water.[82] An alkaline buffering mineral (Dolomite or Marble) can be added to the storage tank to prevent the take up of heavy metals.

The water and sewage systems designed by Herbert Dreiseitl at Gansendorf demonstrate the design potential of innovative systems although the project is not on an urban site.[83] The aim was to maximise the use of rainwater by catchment and purifying devises. The roofs are designed to trap a maximum amount of rainwater which is used for washing, and flushing toilets. It is also used after filtering for drinking. Only small amounts of mains water (5%) is needed and although 35% comes from groundwater that is site specific the remaining 60% comes from rainwater. Filters separate out the chemicals and leaves and the water can be warmed by solar collectors. Once used all the 'grey' water (bath and kitchen waste) and sewage from two-thirds of the dwellings runs into a reed and sand system. The system

---

74 Cristopher Betts, 'Hydrobotanic Treatment of Eutrophic Waste Waters', *Permaculture News*, Summer 1990.
75 Simon Pratt, 'A New Water Treatment System', *Permaculture News*, Summer 1990.
76 Kirkpatrick Sale, *Human Scale*, Secker and Warburg, London, 1980.
77 Keith Hall and Peter Warm, *Greener Building*, AECB, 2nd Edition.
78 ibid.
79 David Pearson, *The Natural House Book*, Conran Octopus, London, 1989.
80 Michael Hough, *City form and natural process*, Croom Helm, 1984.
81 Keith Hall and Peter Warm, *Greener Building*, AECB, 2nd Edition.
82 Bill Mollison, *Permaculture: A Practical Guide for a Sustainable Future*, Island Press, 1990.
83 Norman Beddington, 'Gartnerhof at Ganserndorf', *Architectural Review*, June 91.

consists of a sedimentation tank that removes the solid wastes from the water. The water is then pumped to a series of three 'cleansing basins' (reed beds) and finally oxygenated through cascades and stored in a holding pond. The whole process takes ten days and does not result in pollution or odour. The other third of the dwellings incorporate compost toilets of the Swedish 'Clivus' type now widely available in Germany and Scandinavia. This is basically a large box made which is not flushed. Organic kitchen waste and sawdust are also added. The Clivus system will take the waste of a four-person household, and because of the process of compaction which occurs does not need clearing out for around three years. Compost for use on certain non-food garden plants and shrubs is obtained at the end of this period. Situated in the basement of the houses, the compost toilets are a valuable source of winter heating. Beddington describes the project as integrating many different elements into an ecologically based whole and saving resources in many different but interrelated ways.[84] Again the idea of multi-functional landscapes is applicable and while the siting of the project is clearly favourable many of the processes can be applied to the city.

Less radical systems may be appropriate in inner cities. These may collect rainwater directly for use on gardens and via filters for use in toilets. A mains supply could be used for washing and the kitchen with effluent again diverted according to specifics. Read beds or compost toilets would be incorporated where possible.

6.2.7. Conclusions

Water is a crucial component of the cities support systems. Again however, the city cannot be considered in isolation since, at present, it relies on its hinterland for the supply of fresh water and the disposal of polluted water. The 'natural' hydrological cycle is short-circuited by urban systems of collection, storage and piping bringing water to our homes before it is returned to rivers, lakes and oceans via the drainage and sewage system. It may be argued that from an environmental perspective the history of urban growth since the 19th Century has been one of an improvement in human health at the expense of environmental health and that these are beginning to reflect back on local human environments. This is true on beaches and in rivers but also perhaps in the home with the use of highly toxic cleaners. Technological advances such as sewers and piped water have contributed today to the growth of a throw-away society with misuse of resources characterised by 'out of site out of mind'. In *The City in History* Lewis Mumford describes how water mains and sewers simply provided ways of removing the problems of the industrial city from the immediate to the wider environment.[85] The benefits of sanitation and well drained streets he argues have been paid for by the costs of eroded and polluted rivers and a deteriorated larger environment that is now beginning to reflect back on public health. The city clearly concentrates problems of wastes. Present processes of disposal are polluting and wasteful of energy and do not use the potential of waste as a resource.

Although water pollution of lakes and rivers often results from combined sanitary and drainage sewers without even basic treatment, domestic water in Britain accounts for only one-third of our consumption, the remainder being used by industry and agriculture.[86] Both of these, similarly, release polluted water back into rivers and the sea. Pollution of water by agriculture is, as described, a result of intensive production that can be addressed by using sustainable farming methods.

In moving towards sustainable cities there is a need to address domestic and city consumption and treatment using architecture, landscape and planning initiatives of varying scales. Water collection, storage and reuse of different grades are potential areas for investigation plus biological methods of purifying separated pollutants on a local basis. Local architectural and landscape solutions involve roof collection of rainwater, separation of organic and inorganic wastes, local recycling and reuse of organic waste on land, aquatic plant filtering and use of grey water from hand basins in toilets and gardens. They should be accompanied by appropriate city collection and treatment systems.

Proposals to supply water to the SE of England from NW do not question fundamentals of overuse. Addressing fundamentals involves reducing consumption and separation of water grades. Metering may be appropriate but allowances should be made for it's impact on poorer communities. Individual and neighbourhood rainwater collection systems empower in this respect. This may be from roof tops and pools and regionally in lakes. Following use separation should be the priority. Ideally compost toilets remove use of the water. Sewers exist and we need a balanced approach to maintenance depending on specific location and situations. A combined approach would involve appropriate use of dry toilets, reed

---

[84] ibid.
[85] Lewis Mumford, *The City in History*, Penguin, Harmondsworth, 1961.
[86] ibid.

beds, forest systems accessed by sewers, and maintaining and developing existing district and city treatment systems for use on agricultural land. In summary methods would:

- reduce consumption (house measures and lifestyle change e.g. smaller cisterns, showers);
- less pollution in the house (toxic cleaning fluids);
- consumption of grades of water (use of grey water on garden etc.);
- collection of rainwater (individual district and neighbourhood);
- treatment of grades of polluted water acceptable to the particular locality;
- reed bed systems that use flush toilets but ideally <six litres;
- dry toilets (no water pollution and compost but often less acceptable than flush);
- improvement and expansion of existing treatment, use of forest filters and connection to farms/anaerobic digestion.

6.3. Ecological Landscaping

Introduction

In advocating an 'ecological approach' to landscape design Ruff notes that our housing developments, roads and factories all obscure the individual's awareness of the composition and function of the natural ecosystem. Further, open spaces are bleak and barren, playgrounds are limited, natural phenomena are scarce, food sources are unknown and the built environment is constructed for individuals by people who they do not know. In all these fundamental aspects, he notes, life has become abstract.[87]

The ecological critique of today's city landscapes is that they predominantly consist of mown chemically retarded grass, scattered trees, standard sets of play equipment and occasionally, gardenesque exotic flower beds. Generally our landscapes (where resources allow) are tidy but sparse, sterile and monotonous environments with little opportunity for 'wildlife'. Roadside verges and parks alike are generally mown and manicured. Such landscapes are seen to be the result of both misguided health and safety concerns about tidy environments but also short term responses to financial constraints. Such restraints (exacerbated by the low priority given to landscape) mean that many 'open spaces' no longer feature even horticultural variety. Elkin notes how 99 per cent of managed green space in Knowsley is mown grass, over halve of which is cut sixteen or more times a year.[88] In addition ornamental civic parks are often surrounded by railings and forbid ball games, standing on the grass, and swimming. They are thus criticised as a denial of both real nature and life. Ruff argues that landscape architecture today is failing to build on a rich heritage of parks and gardens to create landscapes that progress today's *environmental and social debate*. Most landscapes he argues "are cosmetic and make no attempt to ameliorate the social and bio-physical problems of the site".[89]

Advocates of 'ecological landscaping' note that such landscapes have, social costs (in their failure to stimulate or recognise the importance to nature to the quality of urban life), and financial and environmental costs (in their need for management and high energy inputs). The ecological critique of horticultural landscapes is not only that they are 'aesthetic', static, inefficient and do not communicate natural process but more importantly (given that it is a principal criticism of ecological alternatives) that they are not successful in today's city context. In many cities constant re-landscaping has become a feature of many small open spaces. Tree planting lacking age structure leaves exposed trees vulnerable to storm damage or vandalism.[90] Participation of local people is seen as important to the success of ecological and traditional landscaping.

Reasons for the failure of traditional approaches may be summarised as:

- a landscape industry that insists on an imagery of intensely manicured landscapes achieved by the use of equipment and herbicides demanding high energy inputs and funds to maintain;

[87] Allan Ruff, 'An Ecological Approach to Landscape Design', in Allan. Ruff and Robert Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
[88] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, 1991.
[89] Allan Ruff, 'An Ecological Approach to Landscape Design', in Allan R. Ruff and Robert Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
[90] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, 1991.

• an aesthetics of 'attractive' and 'ugly' plants that contradicts the idea of an ecologically functioning whole which results in impoverished artificial systems that are difficult to maintain;
• the low priority given to landscape as decoration that can be dispensed with to save money;
• the idea that creativity in the external environment should be restricted to the trained;
• insurance regulations, and misguided health and safety acts and bye-laws that seek to eliminate risk, excitement and danger and create simplicity and boredom;
• administrative recommendations, guidelines, limits and standards that destroy any opportunity of spontaneity.

An ecological approach does not necessarily postulate the total replacement of traditional landscaping. Rather a balance of 'urban' and 'ecological' techniques should be used exploiting a great diversity of 'open space': formal and informal public parks, public squares, playing fields, public gardens, adventure playgrounds, streets, walkways and cycleways, small greens, copses and thickets, meadows, and rough wild areas.[91] The ecological approach recognises that other types of 'open spaces' exist in our cities - disused railway lines, abandoned quarries and woods, river valleys that have remained unmanaged. They give people an opportunity to observe the 'natural world' close to home although with development pressure their conservation is becoming increasingly difficult. Elkin notes that currently there is no statutory guidance for provision of such open space in relation to population.[92] Tartaglia-Kershaw surveying users and neighbours of Rollestone wood (16 hectares located in a built up area 5km from the city centre of Sheffield) described how despite low usage and some qualms residents recognised its importance for children in providing for activities not acceptable elsewhere - scrambling, lighting fires, swings. Local schools also used the wood for educational fieldwork. Locals valued the wood due to its picturesque quality, their memories of childhood (historical continuity) and their identity with place. It is the creation of such low energy landscapes, *dedicated to specific urban situations*, that 'ecological landscaping' has attempted to address.

6.3.1. The Dutch Landscapes - A Human and Ecological Response

While Allan Ruff traces the roots of the Dutch 'ecological' landscapes back to the turn of the century they reached their fullest expression with the reaction to materialism, industrial growth and paternalism in the 1970's.[93] David Nicholson-Lord describes the 'natural' landscapes that began to emerge in Holland in the 1970's as "an emphatic reminder of how a revolution in landscape values is indissolubly linked to new political, social and human goals".[94] Critically these landscapes did not simply *reproduce native landscapes* but dealt with the relation of users to landscape - how they view and use it and their involvement in design. Much of the Dutch experience has grown from a concern with the social consequences of urbanisation.

It has been suggested that the reason ecological landscaping developed first in the Netherlands is their long experience of land reclamation and the constant evolution of sea defence.[95] McHarg describes how the Dutch system of *dykes* responds to the dynamic workings of the natural dunes and their specially adapted grasses unlike concrete sea defences that are either undercut or increase erosion further down the coast. In their long dialogue with the sea the Dutch have learned that "it cannot be stopped but merely directed or tempered, and so they have always selected flexible construction.....the dunes stabilised with grasses provide an even greater flexibility than *dykes*, accepting the waves but reducing their velocity and absorbing the muted forces. In contrast concrete walls absorb the full force of the waves and finally succumb to the undercutting of the insidious sea".[96] McHarg notes how non-cyclic impositions have caused environmental catastrophes in physical, geographical terms with often disastrous human consequences. Ruff criticises top down planning in the same vain and argues that active participation of local people in their landscapes is inherent to cyclical i.e. ecological way of thinking. People give to and take from their landscape. Ecological landscaping as it emerged in Holland can be defined as *an interactive relationship with nature based on analysis of the natural processes involved.* It is a particular approach to the relationship of professional to resident to nature.

---

91 Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, 1991.
92 ibid.
93 Allan Ruff, *Holland and the ecological landscapes 1973 - 1987*, Delftse Universitaire Pers, 1987.
94 David Nicholson-Lord, *The Greening of the Cities*, Routledge and Kegan Paul, London, 1987.
95 ibid.
96 Ian McHarg, *Design with Nature*, Natural History Press, 1969.

Fig. 6.3. Heem Park, Molenwijk, Haarlem 1993

Heem Parks

The first evidence of a new approach to landscaping in Holland came in the 1930's with the pioneering work of Jacques P Thijsse.[97] Thijsse visualised the disappearance of traditional Polder landscapes and the consequent distancing of people from what he saw as the beauty and significance of this native landscape. He thus evolved the idea of the Instructive Garden, a new form of urban park that later developed into the Heem Park (Heem - home or surrounding landscape) containing native species in a series of what Ruff refers to as 'landscape pictures'.[98] The aim of these parks was to bring the flora and fauna of natural landscape into city and, essentially, to allow an interactive relationship with them. Traditional parks Thijsse saw as simply a demonstration of the technical skill of the designer, not to be touched or explored, but only viewed from a distance. The new park would allow young and old to actively experience, touch and smell, the whole season of native plants. It would, in other words, attempt to directly involve people in their landscapes.

Molenwijk Park was developed in the 1970's consisting of a waterside zone, transition zone and parkland zone. The landscape was originally intended to be ecologically developed woodland with open spaces and trees but has been developed specifically into a nature park due to local wishes. Molenwijk today is being managed as a nature park with progress to woodland climax avoided due to problems of scale in the dense urban fabric that surrounds the park.

Bos Park

A different early initiative, Amsterdam Bos (Forest) Park, was a large-scale exercise in afforestation on the urban fringe in the 1930's. Created as a recreational woodland of 2230 acres the intention was to produce a North West European forest on reclaimed Polder that was poorly drained and exposed to North Sea winds. The forest successfully dried the soil and created a recreational park in the city that today is actively used by 40-60,000 visitors during fine summer weekends. The durability of this mature landscape, arguably a product of its indigenous nature was an essential characteristic given its location and thus intensity of use.

Revolution

As noted the development of an ecological approach to landscape design in Holland from the early 70's was part of a wider reaction to dramatic changes in society and environment. Holland maintained a largely agrarian economy with compact urban structures and little industrial expansion until well beyond the growth of industrial cities in Britain. Following the war however industrial development was rapid and combined with population pressures increased by immigration from ex-colonies. Holland has become one of the most densely populated and urbanised centres in the world within a very short period of time. The result was acute environmental and housing problems and a consequent mass house building program. This mass housing took the form of suburbs and new towns around existing centres loosely based on Le Corbusier's Ville Radieuse using systematised mechanical building methods to produce high density slab blocks "large pieces of monolithic sculpture" arbitrarily arranged in their surroundings of close mown grass, scattered trees and car parks. Ruff argues that the fundamental human psychological need of distinguishing between public and private domain was thus broken while in disposing of the street the new architecture also removed the front and back of the house creating dehumanised environments.[99]

The general reaction to post-war materialism erupted in the student riots of 1968 in Paris and Berlin. In Holland it took the form of peaceful demonstrations by the Provos (later Green Gnomes), young people who were concerned with and demonstrated against the environment and the economic circumstances that produced it. Later the reaction took form in planning, architecture and design. Architectural solutions to the dehumanised environments concentrated on linking the blocks to create semi-private courtyards. The landscape response built on the earlier methods and ideas described filling the courtyards with natural spreading, woody vegetation, creating a new urban forest in an attempt to re-humanise the scale of the environment. The landscape approach was however an attempt to change the whole social environment not simply its physical form. In-particular it responded to the imposition of solutions from above. H J Bos a contributor to 'Nature in Cities' argues that responses such as developing landscapes around desire lines were a product of rejection of totally 'machined' environments.[100] The young "want to see and use green space......they want to walk where they like and not only on paths that someone else has laid down for them". In reaction to state machinery a closer relationship between designer and inhabitant, inhabitant and environment was demanded.

---

97 Allan Ruff, *Holland and the ecological landscapes 1973 - 1987*, Delftse Universitaire Pers, 1987.
98 ibid.
99 ibid.
100 H. J Bos, in Ian Laurie (ed.), *Nature in Cities*, John Wiley and Sons, 1979.

Participation
Allan Ruff describes how people such as Louis Le Roi not only helped to create new ecological awareness in society but also "liberated a creative force which was instrumental in convincing people that they could be responsible for their environment".[101] A holistic approach demands that participation is essential not only in design and features such as 'desire lines' but also beyond - that the design process and project are never a *fait accompli* but an on-going process in which residents have an on-going say and responsibility to maintain. The notion of incompleteness an integral part of ecological/cycles thinking was an anathema to 60's architecture and planning in Holland and Britain that produced finished 'products' often with short life spans.

Bijlmermeer
Bijlmermeer, the last of Amsterdam's 'extensions' ('suburbs'), South of the city, is 260 feet high and designed for 100,000 people. The landscaping strategy demonstrated attempts to address the social and physical implications of this scale; problems of self identity, loss of privacy and buffeting from North winds. It involved applying the techniques of the Amsterdam Bos with native trees and flowers set against the 'suburban' housing landscape. Allan Ruff describes the planting as *functional and structural* but not decorative with careful climatological analysis informing the design.[102] The sun angles of different seasons and the effects of winds were calculated and native species appropriate to specific soil type and degree of shading and use were chosen. Vegetation was also used to provide sound and pollution protection from the roads. Amsterdam's official guide to green space describes how attention was focused on providing a variety of functions, experience and scale. Near the blocks tall trees were to act as wind breaks protecting and breaking up the facade while subdivision into smaller sheltered and protective compartments provides sunny or shaded spots with potential for all facets of play and relaxation, formal or informal space.

At Bijlmermeer today, two-thirds of the area has been returned to traditional landscape forms. Ruff notes several reasons principally; security problems in the low cost mass housing scheme that conflicted with encircling forest, and a planting strategy that resulted in maintenance problems. Initial planting contained too high a proportion of fast growing pioneer species that needed thinning from the fifth year onwards. The planting strategy was also criticised by residents for its uniformity throughout the scheme and thus the difficulty of identifying one's own block. Ruff notes that the remaining remnants of Woodland strategy today compare well to the alternatives that no longer give benefits of reduced turbulence and dust filtering.[103] The woodland strategy shows a richness and diversity that has emerged gradually with careful management that has also greatly reduced maintenance. Perhaps also the woodland strategy has benefited from being reduced in scale by the introduction of other forms (added diversity).

Landscape Strategy
Ruff notes that use of native species to artificially create semi-natural communities is based on the broad definition of plant communities found in Europe as woodland, grassland and the ecotone that exists between the two. Woodland is the climax of most uninterrupted successional sequences - its encouragement will include thinning and introduction of tree and other species at appropriate times. Grassland needs higher maintenance. The ecotone is defined as mixed communities formed by overlapping and characteristic of glades. Where the glade is small it will be influenced by woodland conditions and woodland herbs will result where the glade is larger it will tend to grassland communities. The exploitation of this ecotone is the main difference between ecological and traditional horticultural techniques.

There are also two principal forms of grassland. Ruderal species include Skotch Thistle, Couch Grass, Broad-leaved Dock, Hedge Mould and Great Burdock (those species commonly known as 'weeds'). They can adapt to a wide range of conditions as long as soils are relatively fertile and in the majority of cases are first to develop especially on vacant urban land where they are vigorous and often extinguish all others species. The ideal of 'wild flowers' such as Willow Herb and Poppies are, in contrast, found in areas such as dunes, hayfields, dikesides, limestone and chalk (environmental stress) or in long term management operations such as hayfields. These are areas of environmental stress (poor fertility) to which ruderal species are less adapted. In these areas species rich communities develop. These species are less competitive and rarely seen in urban areas. A similar grading is achieved with artificial mowing and grazing that increase stress. Mowing (environmental stress) will however encourage ruderal species if cuttings are left on the ground increasing fertility or cutting takes place before seeding of the less competitive species.

---

[101] Allan Ruff, *Holland and the ecological landscapes 1973 - 1987*, Delftse Universitaire Pers, 1987.
[102] ibid.
[103] ibid.

H J Bos describes peoples appreciation of nature as culturally biased "In the case of Willow Herbs or Poppy, people say 'nature' can be seen in the town and they think it is beautiful".[104] If only Goosefoot or Dock play the leading part then people don't think of nature and they think of it as weed growth and ugly. Since often artificial planting and maintenance are required to develop species rich communities there is a clear conflict between the views of Le Roi who argues for letting nature take its course and H J Bos who believes that due to the in-built prejudice of our views a compromise is needed. Ecological landscaping argues Bos is not necessarily a cheap and easy alternative to traditional landscaping. At Delft exploitative species were encouraged creating species poor communities capable of considerable wear and tear with little maintenance. Species rich habitats for less heavily used areas require more maintenance. The exact nature of landscaping strategy will vary from project to project. Participation in process may aid 'translation' and acceptance of more or less 'natural' landscapes.

Hadynlaan

Perhaps the best illustration of the human scale of consideration in these Dutch landscapes is the appreciation of children's' play as active and not passive. Every opportunity to fulfil the desire of children for adventure is utilised, to enable children to make their own discoveries. It may be argued that today's high standard of living has to some extent resulted in an emotional poverty in our environment. Every corner is planned producing a lack of enchantment and mystery in our cities and countryside. Ruff goes as far as to argue that while there is less hardship in the West than ever there is high delinquency, depression, mental illness and violence that are partly due to environmental factors and lack of control in decision making along with poverty.[105] H. J. Bos the then Director of the Parks Dept Delft during the development of Hadynlaan and several other ecological landscapes describes how children play "for hours at a stretch, creatively and intensively, on the beach with the sand, water and shells; in woods with branches, leaves, moss and trees; near ditches and streams with water, sand, stones and rough vegetation".[106] He describes the purpose made playgrounds of adult standards - safe, neat, tidy, indestructible and boring concluding the they are a poor surrogate for nature. Ruff quotes Lewis Mumford "if man had originally inhabited a world as blankly uniform as a 'high rise' housing development, as featureless as a parking lot, as destitute of life as an automated factory, it is doubtful if he would have had a sufficiently varied experience to retain images, mould language or acquire ideas".[107]

The landscape produced by Bos at Hadynlaan on the Gillis Estate in Delft reflects these sensitivities in its ecological framework. Ruff notes how at Hadynlaan, a child leaving the home enters a gentle landscape of soft earth and plants as opposed to a car park. The landscape allows children to explore with hands, mouth and eyes.[108] As children grow Hadynlaan provided an environment for fantasy and group games. The only building located in the 'wild' courtyard is the primary school giving scope for education in a near natural environment. Adolescents were provided with land away from the buildings for a youth club and camping area and many have become involved in all areas of community life. Community involvement was encouraged and continues at all levels in maintenance and involving new proposals. Residents for example recently designed and built a children's play area. Much of the inspiration for this argues Ruff was from being involved in the initial proposals.

The Hadynlaan project involved extending the natural landscape that had already been developed around the area into the courtyards between houses. It aimed to assist nature in colonising the site by adding trees and shrubs that would occur in the later stages of succession to the herb vegetation of primary colonisation and allowing nature make the final selection. Thus the existing primary vegetation, land subject to flooding, walls and ditches were all retained and only indigenous trees and shrubs were added (suited to particular situations) to supplement the primary colonisation. Some grading of an otherwise flat site was carried out to create 'wet' areas. This grading was left to the builders to use their experience of the site and observations of children at play. Some standard trees were used to make an early visual impact, give planting a mixed age appearance and provide initial shelter.

---

104 ibid.

105 ibid.

106 H. J. Bos, in Ian Laurie (ed.), *Nature in Cities*, John Wiley and Sons, 1979.

107 Lewis Mumford quoted in Allan Ruff, *Holland and the ecological landscapes 1973 - 1987*, Delftse Universitaire Pers, 1987.

108 Allan Ruff, *Holland and the ecological landscapes 1973 - 1987*, Delftse Universitaire Pers, 1987.

Fig. 6.4. Hadynlaan, Delft, 1993

Ruff describes how the new landscape at Hadynlaan was socially successful (participation and children's play) but less so in management terms. Problems that emerged included the domination of certain species by other highly competitive ones such as Dock, Nettle, Thistles and Cocksfoot. The thistles had to be cut back according to Provincial regulations (a move that was opposed by residents). The growth of herb vegetation retarded growth of trees. While such features involved natural selection and while the domination of herb growth was only temporary immediate impact was considered an important part of the strategy as well as visual variety of species.

Cutting of herb vegetation was also necessary in June/July and August/September to avoid fire problems within the courtyards by keeping the vegetation green and alive. Unfortunately problems of management of this cutting including lack of harvesting of grass cuttings (thus increasing soil fertility that promotes 'weed' growth) and the cutting before seeding of certain desired species of grass. Such measures and the domination of species able to cope with children's play has meant the Hadynlaan has become gradually less diverse.

Low lying areas were eventually filled in due to complaints from parents. Absence of management enabled pioneer or nurse species such as poplar and white willow to dominate and suppress the long term climax species. While thinning eventually occurred giving the opportunity to create woodland and woodland edges this did not happen. Instead thinning was of the understorey shrubs with the ground regraded and grass seeded. As result much of the woodland character has been destroyed and the opportunities for creative children's play limited.

Some Conclusions

As the first of her 'Visionaries' of the green city movement Sandra Higgins quotes Louis Le Roi "Ecologists cannot isolate themselves and look at nature only in nature reserves, because isolation does not make an ecosystem".[109] Urban ecology involves natural processes and ecosystems in the city attempting to create a balance including people. Attempts to develop natural variety and sustainable ecosystems replace technology for technologies sake. Participation of people in landscapes is part of this view and essential to communicating process.

There are many problems of implementation of ecological landscaping techniques in cities. The relation of type of vegetation to types of activity must be considered within the context of establishing these plant communities in city environments. A low energy, low maintenance approach will depend on the form of landscape required and the conditions given. Different general landscape types emerge in response to different conditions not simply based on the initial seed mix. Certain species are resistant to wear and tear (generally those species we consider 'weeds') and they are the ones that will tend to dominate naturally colonised city sites. From experience at Bijlmermeer it is possible to see the restrictions of ecological approaches in terms of universal application to 'solve' social problems. Neither should they be seen as management or maintenance free although careful management can reduce maintenance needs in certain cases. The landscapes cannot be considered a *fait accompli*. They are not simply 'naturalistic' landscapes.

While ecological landscaping only ever commanded a minority of support among professionals in Holland it seems to have taken a permanent place amongst other forms. Roadsides are often left un-managed and are the site of species-rich grassland. Reed fringed wetland is common around the *dykes* that weave in and out of housing and office developments. *Heemparks* are also common while woodland surrounds most cities. The extreme urban nature of the Netherlands is thus ameliorated. Such landscaping can introduce participation and ecology in a way that architecture cannot. It can also communicate natural process and with specific management techniques perform different urban functions. Emphasis may be placed on conserving diversity of flora and fauna for passive environments or less species diversity active recreation.

Dutch ecological landscaping has had a small but continuing influence on landscape architects in the UK who are also responding to overtly horticultural landscapes. In the UK the 'ecological approach' to landscape design has been projected as an alternative way of looking at city landscapes since the influential book *Nature in Cities* in 1979.[110]

---

109 Sandra Higgins, 'The City Green', *The Architects' Journal*, 5 February, 1986.
110 Ian Laurie (ed.), *Nature in Cities*, John Wiley and Sons, 1979.

6.3.2. UK Ecological Landscapes

Birchwood

In the Birchwood and Oakwood districts of Warrington 'cells' of housing and commercial developments are set in and enclosed by a web of ecological landscaping - wild flowers, meadows, shrubberys and woodland encroach right up to garden gates. Robert Tregay describes the approach at Oakwood to "design and plant a forest park and put the houses and other buildings in this green framework rather than the other way round - putting bits of greenery around the houses".[111] In describing their approach at Warrington Greenwood and Moffat note the importance of developing techniques that can enable the philosophy of 'natural' landscapes to be successfully carried through in practice.[112]

They describe how the ecological approach at Warrington developed from early landscape evaluations carried out for each individual area separately and leading to the development of management and planting policies for existing and new landscaped areas.[113] Plant mixes were to be indigenous and reflect local conditions such as soil type and existing landscape features. This they describe much in the way of Ian McHarg as working with the site rather than superimposing an unrelated design.[114] At Birchwood the planned landscape structure formed an important element in the redevelopment of what was a 400 acre derelict site. The large area of the site made utilisation of its limitations essential.[115] The compacted clay soil with large areas of rubble, cinders and shale stimulated the implementation of techniques that avoided the introduction of large areas of topsoil. For grassland areas not expected to receive intensive use, the clay subsoil provided an excellent base for species rich grassland (low nitrogen content) while the wide range of natural colonisation following demolition provided a diverse local seed source. For grassland areas expected to be intensively used and for creation of wooded areas subsoil was deep ripped and its structure improved by the use of bulky organic ameliorate. Such measures cost one-third of estimates to import a 300mm layer of top-soil. Where water logging of the clay soil was liable to be a problem the land was drained but open ditches were used instead of underground drains thus creating another habitat.

Greenwood and Moffat note how planting of 'Woodland' (or plantation) was based on the management experience of Dutch landscapes (e.g. Bijlmermeer) that suggested reducing use of 'nurse' species that as noted often dominated the slower growing species.[116] Another method of avoiding problems of 'nurse' species has been to use group instead of random planting. Such an approach makes the timing of the first thinning, to protect slow growing species, less critical. Care must be taken, however, to avoid oversimplification and thus loss of diversity. It should be noted that herbicides were used at Birchwood. Greenwood and Moffat describe this as 'means to an end' assisting the achievement of an early closed canopy in plantations by removing initial herbaceous competition (although the eventual aim was to develop a diverse, uneven and dynamic vegetation structure with an 'open canopy'). A fertiliser was also applied for the first two springs. Close to housing the variety of planting was increased. It is clear then without discussing planting and management in detail that ecological landscaping does not simply involve planting a few native species and then leaving 'aftercare' to nature.

Species rich grass land was divided into areas left as meadow (one cut in late summer) and areas mown four to six times a season. The latter was used along paths and roadsides and to create tracks through meadows. The late season cut of the meadows allows seeding but maintains a low fertility substrate (thus encouraging species rich grassland) by reducing nutrient recycling. The grass is baled and removed by farmers on large sites but cut and raked off by contractors on small ones.

Greenwood and Moffat argue that 'native planting' at Birchwood offered opportunities for recreation, education and conservation and presented an economic alternative to traditional methods over the large area in *adapting the site, planting* and in its *maintenance.* Some areas have been left alone to develop but others still need regular maintenance. The use of existing soil, open drainage ditches, naturally colonising seeds, and other appropriate plants clearly have financial benefits especially on this scale. Economy is not

---

[111] Robert Tregay, 'Nature and an Ecological Approach to Landscape Design', in Allan R. Ruff and Robert Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.

[112] Duncan Moffat and Roger Greenwood, 'Techniques for an Ecological Landscape', in Allan R. Ruff and Robert Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.

[113] ibid.

[114] Ian McHarg, *Design with Nature*, Natural History Press, 1969.

[115] Duncan Moffat and Roger Greenwood, 'Techniques for an Ecological Landscape', in Allan R. Ruff and Robert Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.

[116] ibid.

guaranteed with 'natural' landscaping but with careful design and management savings may be made. Moffat argues that the successful adoption of a natural landscape at Warrington depended on careful management and aftercare.[117] One of the main elements of the structure plan was to obtain early impact - an idea particularly relevant to existing urban areas in order to maintain community interest and minimise the time plants are susceptible to vandalism. Planting was geared to rapid establishment and a relatively intense maintenance program was carried out in the early stages. Clearing of litter has been a predominant maintenance concern since.

Participation

As noted physical establishment was only a stage in the successful adoption of the ecological landscape. The investigations aimed to find appropriate vegetation to obtain healthy growth but Greenwood and Moffat stress the close consideration of established local uses and people.[118] Efforts were made to establish local connections and responses discussed before commencement. Involvement has been encouraged throughout the project and is continuing indefinitely on an informal basis through a newsletter and public meetings.

The principle vehicle for interpretation at Birchwood is the Park Ranger Service that Steve Sankey describes as a means of developing a relationship between the local population and the new landscape.[119] The service employs two full-time and two part-time rangers on an MSC scheme and includes patrolling, providing a presence for information, a means of collecting suggestions, working with schools and community groups and interpreting the parks by organising exhibitions, guided walks and theatrical events. It breaks the distinctions between the professionals (managers and designers) and users while increasing awareness of the environment generally. Steve Sankey notes that the new landscape was for people and the brief was to maximise its use "By increasing awareness of their surroundings (via enjoyment), a greater understanding and respect for the environment can be expected.....landscape cannot be planned, planted and forgotten - people are important". Steve Sankey also argues that a close relationship with local schools is vital noting that today's child is tomorrow's future and that it is often the best way to establish contact with parents. Activities are carried out with schools both in the classroom and on visits using the parks as an external classroom. There is a clear contrast between this locally based nature education and the once a year field trip that removes nature to 'elsewhere'. Many local children have become ranger helpers looking after the park in exchange for the freedom of the rangers cabin etc.

As an extension to community involvement a voluntary ranger service has also been set up. Volunteers patrol the park (possibility in urban area) and organise events including the Birchwood Carnival and Bonfire held in the park. Other services include guided walks, community art events, concerts, public talks, tree planting and workshops both relevant to greening and not. They produce leaflets with events and nature information and a quarterly newsletter 'landscape news' distributed to every household in the area. Steve Sankey argues that as a result their has been negligible vandalism and heightened environmental awareness but he admits that it will probably be a generation before a real evaluation can take place.[120]

Ecology Parks

If Birch wood and Oakwood are influenced by Dutch schemes such as The Hadynlaan at Delft then London's ecology parks clearly originate in the Dutch Heem Park. Ecology parks are usually no bigger than two hectares and located within the city. The designs generally include mounding and ponds to create habitat diversity, sometimes incorporating naturally colonising vegetation. Native meadows, woodland and shrubs are common features with pathways to allow visitors to explore the habitats without destroying sensitive species. All ecology parks to date have utilised derelict land often earmarked for redevelopment but lying idle. They offer rare opportunities for local people to enjoy wildlife but often cater for more traditional recreation in addition and are usually associated with local schools.

The William Curtis Ecological Park was Britain's first ecology park built in 1977 near tower bridge. It was developed on one hectare of temporarily vacant land and thus was closed in 1985 and replaced by an office development (the common fate of many greening initiatives). The park was the responsibility of the Ecological Parks Trust (now Trust for Urban Ecology) who employed the BTCV to build it for a

[117] ibid.
[118] ibid.
[119] Steve Sankey, 'Environmental Interpretation and the Birchwood Park Ranger Service', in Allan R. Ruff and Robert Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
[120] ibid.

minimal fee.[121] It was designed by Lyndis Cole of Max Nicholson's Land Use Consultants. In its marriage of the different ingredients involved in design based on ecology and community involvement it pioneered a new craft. About 150 species of plants were used and combined with species that had self seeded into the park to create a base for wildlife and the community.[122] By its close the park had attracted 50000 visitors, 30% of whom were from local schools.

With the closure of the William Curtis Park the Camely Street Natural Park became the most popular of London's ecology parks. It was set up with the main objectives of promoting nature conservation, recreation and education - providing a facility local people could enjoy. In doing so it demonstrates the immediate potential of derelict urban land. Located at Kings Cross amid railway lines roads and gas holders the site was a derelict coal yard that had developed a profusion of wild-flowers and willows. Typically it is centred on a pond fringed with reeds and other aquatic plants and includes areas of native marsh, meadow, shrub, woodland and a children's garden. A nature centre includes a classroom, an interpretation area, small kitchen, office and toilets, meeting room/youth club and a base for the park nature club. Again interpretation is important element in success or failure. Camely Street Natural Park is run by the London Wildlife Trust employing a manager and project officer on site who see to day to day management of the site and vegetation while over-seeing the voluntary Camely Street Support Group.[123] The LEA employ a teacher full time and 10 000 school children visit each year. Most local residents know of the parks functions by word of mouth, local publicity and via their children at school. Staff and the support group encourage everyone to use the park. The support group is the main vehicle of gathering and responding to suggestions of local people - local amenity groups, youth clubs, environmental organisations, resident associations and individuals. Its success and value are demonstrated by the vocal opposition that met a recent treat of closure.[124] Similar Parks have included; Gillespie Park, Islington, and Lavender Pond and Stave Hill Nature Park's in London's docklands.

Landlife

Landlife began in 1975 as the Rural Preservation Association (RPA) in Toxteth, Liverpool. Grant Luscombe one of its founders stated their aim as starting with the premise that inner city problems "stem from a kind of spiritual malnutrition caused by a distancing of people from nature".[125] It is perhaps more likely the product of poverty, unemployment, disenchantment and neglect. Liverpool has been savagely hit by, slum clearance and comprehensive redevelopment (and its clearance), recession and the exit of people. Greening was used by the RPA to involve and activate local groups. It was a voluntary organisation with a basic design team of a manager, landscape architect and ecologist with consultants and active participation of local people sought in design and planting of the sites. Youth opportunities projects, local volunteers and schools children were also involved.

The RPA's first project was a 'community creeper' scheme where residents of terraced houses without gardens in Granby and St Michaels were given ready planted creepers. In 1979 the Greensight Project was set up according to Grant Luscombe to use a ecological approach to tackle derelict sites in inner city Liverpool.[126] He describes the importance of softening what was an unconventional approach to landscaping by blending the planting with the urban setting. Thus a considerable proportion of the budget was set aside for hard landscaping integrated into the planting by means of a mown edge treatment or formal soft borders. There is a clear recognition of the need to balance the human setting with the ecological approach to produce site aesthetically pleasing to local people, recreational, ecological and educational. Luscombe argues that "these functions can be combined in the landscape by careful selection and composition of species, by footpath networks and play structures that relate to the area or are natural, sculptured features such as rock outcrops".[127] He also argues that in the initial stages exotic species may be used to offset the appearance of plants generally considered to be weeds. Planting was generally chosen to be compatible with the site ground conditions but often these had to be altered artificially to prevent natural development of the sycamore shrub. Plant mixes as far as possible were derived from local sources and used in combinations sympathetic with developing vegetation.

---

121 Jacklyn Johnson, 'Establishing Ecology Parks in London, in David Gordon, (ed.), *Green Cities*, Black Rose Books, 1990.
122 ibid.
123 Joan Davidson and Ann MacEwen, *The Livable City*, RIBA Publications Limited, 1983.
124 Jacklyn Johnson, 'Establishing Ecology Parks in London, in David Gordon, (ed.), *Green Cities*, Black Rose Books, 1990.
125 David Nicholson Lord, *The Greening of the Cities*, Routledge and Kegan Paul, 1987.
126 Grant Luscombe, 'The Greensight Approach', in Allan R. Ruff and Robert Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
127 ibid.

The design is not static and represents only a beginning. Once settled environments have been created nature is left alone and invariably the landscape changes. Often it is not acceptable to the public especially in an urban setting. Maintenance and management is thus needed over an indefinite period and much of this is on an ad hoc basis. Drastic action such as mowing and thinning is infrequent and once problems of plant competition have been resolved, a degree of stability and diverse species population results. The sites have been maintained by designers and botanists but success again appears to depend on the interest created in the local community and the enthusiasm with which they maintain their project. Sites such as Linnet Lane in Liverpool are overgrown, litter strewn and vandalised. In this respect they are similar to many other inner city landscape initiatives perhaps because of a lack direct involvement initially and in maintenance. Roger Barber describes how Landlife in using native plant species to improve derelict and degraded sites have now isolated the crucial nature of management and how the relevant skills and experience are not usually available to maintain the landscapes.[128] In response they have now developed training schemes for local participants.

Participation
Chris Baines notes that direct involvement of the community in creation and management of its local landscape is beyond dispute (whatever form that landscape takes).[129] It reduces vandalism and increases public awareness. At a more sophisticated level, local people can make possible the precisely timed labor-intensive aspects of detailed management which are so difficult to accommodate in municipal park maintenance schedules. This may include for example hay making.

6.3.3. Defining an 'Ecological Approach' to Landscape

Bradshaw notes that "An ecological approach to landscape design has meant recently certain specific design solutions which had some sort of ecological basis, since they involve the planting of a variety of indigenous species which could be expected to occur together in nature. However to an ecologist, an ecological approach to landscape design involves a great deal more, in particular treating units of landscape as ecosystems".[130] This consideration of landscapes as ecosystems argues Bradshaw acknowledges that living organisms cannot be considered without their surroundings. Plants, animals, soil, climate (and in addition people) are all interrelated. Plants are one part of an integrated system in which there is considerable interdependence. Not only do all the components and species influence one another reciprocally but there is also the physical movement of crucial elements from one component of the ecosystem to another.

In attempting to establish new landscapes all these interactions (component interaction, species interaction and nutrient cycling) must be considered.

• First is the interaction of components in an ecosystem. Bradshaw argues that the major interactions, such as of climate or soil on plants, are obvious and yet because one part of landscape design involves challenging nature by the introduction of alien species into new habitats, the consequence of these major interactions are not always appreciated. While anything can be made to grow anywhere *the ecological approach involves utilising species in relation to their particular ecological preference.*

Such discussion Bradshaw continues takes no account of the 'lesser' interactions such as the way vegetation influences soil, climate animals. Soil as we know it only developed under vegetation cover. The vegetation stabilises soil, prevents erosion and gradually builds up organic matter in amongst the parent mineral material improving its physical qualities and mineral content. Today however topsoil is still usually imported at great expense when plants could do the job of soil improvement themselves. In a similar vain the effect of plants on urban climate and pollution are now beginning to be recognised as noted in *Chapter Three*. In *Chapter Three* I also noted the need to link the building fabric, external spaces and vegetation to increase human comfort and building performance.

• Second is the mutually dependent interaction of species. Interaction between plants for example includes the effect of tall trees on light demanding species or 'suffocation' of 'plants' by 'weeds'. These are both elements of competition for resources. In natural communities there are also associations of plants

---

128 Roger Barber, 'Trained by Whales', *Landscape Design*, May 1989.
129 Chris Baines, 'Community Involvement in Creative Ecology', in Allan R. Ruff and Robert Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
130 A. D. Bradshaw, 'Landscape as Ecosystems', in Ruff and Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.

that are complementary for example species that grow and photosynthesise at different times. Wild flower mixes are often not compatible and after a period of perhaps five years only a few will remain. Species can be valuable at different times such as those that make early contributions to a scheme and 'nurse' slower growing species. Alder and hawthorn, for example, can be planted with oak and lime. Ecological planting consists of - *species chosen for their contribution to succession and species chosen for their ability to coexist.*

• Third is the notion of nutrient cycling. Nutrients have to come from somewhere. They are however often in short supply in a system. Nitrogen is required in greater amounts than any other soil derived element. It has a well defined cycle being released by the decomposing activities of micro-organisms. If artificial fertilisers are not to be used this is crucial. Nitrogen fixing plants will be needed. In certain circumstances low nitrogen levels can have positive effects on encourages high species diversity

Bradshaw concludes that the ecological approach involves acknowledging interactive processes and cycles and using them *for our own ends.* This is particularly the case in urban settings. Ruff argues that creating ecologically inspired landscape involves:[131]

• using the physical and biological factors of the site to determine form rather than technical muscle;
• using variety of topography and biological structure to avoid monocultures;
• not having a preconceived idea of final solution but developing a structure capable of responding to changing social needs and biological requirements;
• design on site allowing response to particular conditions;
• involvement of users with the landscape architect as catalyst and advisor;
• minimal energy consumption - initially through use of locally available soils, regional building materials, recycling of local waste - after labour intensive establishment (involving local people) maintenance should be reduced;
• use of coppice biomass systems, food production and forest farming;
• proximity to the front door using landscape for the creation of privacy, physical comfort, education.

Observations in Holland and Britain suggest that 'ecologically established' landscapes are potentially resource efficient and durable since they can reduce requirements for artificial fertilisers, pesticides and maintenance. While this is not necessarily the case with attention to process such landscapes can become low energy. In introducing ecological landscapes into human environments participation has often been important in 'translation' of unfamiliar landscapes and in encouraging maintenance of constantly evolving and living designs. The close relationship of participation to Ecological Landscaping can be seen as a need to 'translate' new ideas in the city, the emergence of techniques at the same time as increasing awareness of the need for participation in architecture and planning, and the holistic nature of an 'ecosystems' approach that must involve local people in landscapes by definition.

Birchwood provides an example of how the 'ecological' method can provide a cost effective alternative to traditional landscapes on the urban fringe. In responding to Local Authority spending cuts that often lead to the run down of parks due to their expense, native semi-natural planting can cost less than a tenth of orthodox grass with trees and a fifth in both laying and cost of concrete on hard-core. Birchwood cost a tenth to quarter of conventional methods and is self sustaining. Ecological surveys of trapped and unofficial countryside have indicated natural colonisation of derelict sites without any resource input.[132] The problem is one of communicating these as 'landscapes'. Chris Baines argues however that the low cost-argument for ecological landscapes is inappropriate at a time of mass unemployment.[133] An alternative philosophy is for the use of labour-intensive landscape management system employing people in "interesting and rewarding outdoor work" in connection with their own local environment. This could give a quality of landscape rarely achieved and landscapes that may last and develop.

Stephen Rettig criticises Allan Ruff's wholehearted belief in the ecological approach and his attack on traditional landscape design.[134] His criticism is based on Ruff's view that "the physical and biological factors of the site should determine the ultimate design rather than man and his technical muscle".[135] Rettig answers that presumably "the social requirements and functional needs are to be ignored, as are all

---

[131] Allan Ruff quoted in Stephen Rettig, 'The Rise of the 'Ecological Approach' to Landscape Design', *Landscape Design*, No. 6, 1983.
[132] Richard Mabey, *The Unofficial Countryside*, Sphere Books, 1978.
[133] Chris Baines, in Ruff and Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
[134] Stephen Rettig, 'The Rise of the 'Ecological Approach' to Landscape Design', *Landscape Design*, No. 6, 1983.
[135] Allan Ruff quoted in Stephen Rettig, 'The Rise of the 'Ecological Approach' to Landscape Design', *Landscape Design*, No. 6, 1983.

the benefits of technology". This criticism is perhaps unfair to a landscaping technique that has emerged primarily in response to social requirements and functional needs. It is imposition of technical muscle that Ruff differs with not technology *per se*. Rettig accuses the advocates of the 'ecological approach' of a simplistic view of complex workings of the city; a tendency to reduce or ignore the wider sociological, political and economic issues of the urban condition. He argues that "better design training and more understanding of the social complexities of the city, would perhaps be more suitable areas for improvement than the dogma of the ecological approach".[136] What is clear, however, is that the ecological approach has rarely been dogmatically applied and has raised the level of discourse of "social complexities". As described the ecological approach must respond to social ideas by definition. It responds to top down imposition of horticultural urban parks, urban squares, or 'ecologically established' landscapes.

Rettig does highlight the fact that 'ecological establishment' is only one of many possibilities available to the designer. Naturalistic landscapes have been successful in cities but are one element in the diverse city fabric advocated by Hough combined with market places and squares.[137] A genuine 'ecological approach' involves consideration of microclimate, Permaculture and city farms, allotments and gardens in response to their human context. Rettig also highlights the ease with which ecological landscapes can be romanticised. The 'failure' in maintenance of projects such as those in inner Liverpool by Landlife is testimony to this fact. Ecological landscaping is clearly not a universal panacea but has forced questions to be asked of traditional techniques.

Allan Ruff argues that the 'ecological' approach aims for interaction and unity of the social and the physical environment offering the concept of the ecosystem as a framework from which man and his natural environment can be understood.[138] Robert Tregay agrees that ecological cannot exclude man and social aspects "An ecological approach is a conceptual framework, a way of thinking about inter-relations and interactions".[139] A line where landscape as habitat for man stops cannot be drawn. Tony Bradshaw defines the approach as attempting to use natural processes and solutions for landscape ends or 'working with nature'. The term 'ecological he argues has been misused - it is not wild flower mixes but a holistic approach integrating all elements of nature including people. John Handley asks whether advocates are imposing nature - do people want daily contact with nature?[140] The relevance of natural process to the city is a question asked by many contributors to *An Ecological Approach to Urban Landscape Design*. Elkin notes how if local residents prefer allotments, bedding plants or alien species then they should not have naturalistic landscape forced on them.

Michael Cregn describes how since the Nineteenth Century the public park has been seen as a refuge where nature's benefits would provide 'temporary' relief from the stresses and discomforts of city life. Cregn quotes French urbanist Eduard Henard in 1913 "large areas planted with trees and shrubs in the middle of urban agglomerations are as indispensable to public hygiene as water and light".[141] This case is however weakened if the space is static, decorative and demands high energy inputs. The new holistic model looks at how open space, as an integral part of settlement form takes account of natural and social processes, and their inter-relationships in shaping good cities".[142] The quality of open space becomes linked to the health of the city, human 'growth' and the concept of ecological soundness in contrast to the Victorian 'ornamental' view of nature. "Finally it presents a participatory model of experience in its integration of human values and spatial forms, and its holistic perspective in which the city is perceived as part of nature, and where mankind is a participant rather than a spectator".[143]

---

136 Stephen Rettig, 'The Rise of the 'Ecological Approach' to Landscape Design', *Landscape Design*, No 6, 1983.
137 Michael Hough, *City Form and Natural Process*, Routledge, 1989, London.
138 Allan Ruff, 'An Ecological Approach to Landscape Design', in Allan R. Ruff and Robert Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
139 R. T. Tregay, 'Nature and an Ecological Approach to Landscape Design', in Allan R. Ruff and Robert Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
140 John Handley, in Ruff and Tregay (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
141 Michael Cregn, 'Open Space and the Quality of Urban Life', *Landscape Design*, June 1990.
142 ibid.
143 ibid.

6.3.4. Planning for Ecological Landscapes

Derelict re-colonising land is available in copious amounts in many cities especially in the North. Landscape architecture based on natural colonisation offers the possibility to exploit the diversity of different locations - each with its unique geology, microclimate and topography *and people*.[144] Such landscapes are designed to be played in, walked through, touched and smelled, provide freedom and excitement. They introduce natural process into the city. Ruff highlights the communicative power of the natural landscape arguing that the real message of nature has been obscured. As Bookchin he argues that "nature today is being harnessed to the selling of material products and life-styles that indirectly bring about its own ultimate and perhaps final destruction".[145]

It is clear then that in defining ecological landscapes we are not concerned simply with leaving land to natural colonisation or planting native species and then leaving aftercare to nature although both may be appropriate in certain circumstances. The careful development of techniques is required for the benefits of such landscapes to be realised. Roger Greenwood emphasises that ecology, is not the total answer to environmental problems in urban areas, but it is an important element that has received inadequate attention. Each inner city site is unique and will provoke an ecological response. This may involve using natural succession or not. For large scale schemes on the urban fringe ecological landscaping techniques will be particularly important in reducing energy use.

Some form of ecological establishment can be introduced in a variety of ways (uncut meadow grass to ecological parks) on a variety of scales; on buildings (meadow grasses on roofs), in community gardens, along road verges, and in public open space. It can offer psychological, economic and ecological advantages, reduce pollution and provide wildlife habitats. An ecological approach to landscape can:

• reduce cost and resource and pollution use in establishment;
• reduce costs, resource use and pollution in use given careful management;
• communicate natural process;
• provide wildlife habitats;
• provide more diverse environments.

In the UK along with voluntary organisations some local authorities have taken the lead in policy making. The West Midlands was the first local authority to produce a nature conservation strategy in 1984.[146] It designated inner city wildlife action areas, green reservoirs, corridors, stepping stones and implemented plans for hedges, flower meadows and 'wild areas' in parks and on road verges. The strategy document noted that such action could prevent such rapid movement to the suburbs. Manchester and London also developed strategies for conservation as part of strategic planning before the abolition of the Metropolitan County Councils. The use of old railway lines has formed the basis of city wide naturalistic schemes in the West Midlands Greenline Project and in Leicester.[147] Greenways and blueways or linear space systems based on rivers canals, parks, disused railways, footpaths, bridleways have in many ways become the new motif of large scale urban restructuring. Manchester, Birmingham, London, Glasgow, Liverpool, Cardiff, Swansea, Newcastle, Sunderland, Sheffield, Coventry, and Stoke have all developed such systems. Notably at Leicester a traffic free route through the city centre has been developed following the old railway and River Soar (*see also Chapter Two*). The Liverpool Loopline and Greenwedge policy allows for safe and quiet pedestrian routes in the city. Leicester has also developed semi-natural grassland in parks and sells the hay produced.

Sandra Higgins argues however that the cornerstone of the green city movement is the local nature and smallness of scale on restricted inner city wasteland. These schemes often express some highly idiosyncratic *genius loci* in areas of extreme decay - Brixton, the east end of Glasgow, the Ardoyne in Belfast and Toxteth in Liverpool. They are at their best when people join together to improve their environment or protest against unwanted development. Such initiatives are difficult to quantify although the membership of the Wasteland Forum that acts as a central organisation for activities under auspices of NCVO grew from 12 to 160 between 1978 and 1982. Many more groups however do not belong, many are temporary and last only until the wasteland is plugged back into its traditional function in city. The predominant obstacle to such initiatives is often development pressure.

---

144 Michael Hough, *City form and natural process*, Routledge, 1989, London.
145 Allan Ruff, *Holland and the ecological landscapes 1973 - 1987*, Delftse Universitaire Pers, 1987.
146 Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, 1991. p134
147 Sandra Higgins, 'The City Green', *The Architects' Journal*, 5 February, 1986.

6.3.5. Co-ordinated City Forestry

Within the EC the UK has a high proportion of its land dedicated to agriculture (76.5%) but a low proportion dedicated to forestry (9%) while it currently imports 80% of the timber it uses.[148] As I noted in *Chapter Five* forests, in or close to the city, managed for timber production, could provide a renewable building material with minimum transportation costs. Timber is highly suited to low 'energy in use' construction. Such timber would also be particularly useful used to regenerate existing derelict and decaying brick buildings or used in conjunction with recycled materials. City forestry however, has numerous other advantages, including: its CO_2 absorption, dust filtering and sheltering properties (referred to in *Chapter Three*); its potential for recreation, wildlife, nature and adventure education and as a biomass crop for energy production. Sopper also describes the potential of urban forests to act as living filters for sewage and water from the city although increased rates of growth and thus ring spacing reduce the structural strength of the timber (see 6.2. *Water Systems*).[149]

Joan Davidson argues further that the urban fringe is so often a wasted asset.[150] She notes how sewage works and refuge tips usually proliferate within this area of uncertain growth potential despite Green Belt designations. The pressure for land and possible value for housing has often resulted in farmers using it for intensive livestock units, leasing the land for tips or simply leaving it vacant. Farmland is often poorly managed with problems of trespass. Continental cities such as Amsterdam and Paris have however long exploited the urban fringe potential of forestry (and allotments). These areas favour timber production with its relative resistance to vandalism, associated recreational possibilities for city dwellers, and small transport distances for the material to local markets. The city may play a role in processing timber to offset the costs of recreational facilities and park maintenance. Clearly the quality of agricultural land around a city will be important in decisions over urban forestry or city orientated food production.

Large scale afforestation examples on the urban fringe include Bos Park, Amsterdam and West Forest Park in Copenhagen, the later was planned to cover 3200 acres and begun in 1967.[151] Sweden's urban forests are used mainly for timber production and have a minimum size of 125 to 250 acres. In Zurich a major proportion of its park space (a quarter of the urban area) has been given over to forest and common land (some 2200 hectares within half and hour's street car ride of the city centre).[152] This area is maintained on an integrated management basis to provide timber, recreational and athletic facilities, wildlife interest, agriculture, visual amenity and educational opportunities. The forests are a mixture of deciduous beech, oak and maple stands and conifers. The basic aim of the forestry is the production of commercial timber for sawlogs and pulp. These products bring a financial return and help support the recreational facilities. Part of the management strategy is to produce an unevenly aged forest of young and mature stands with a major emphasis on an "aesthetic forest quality".[153] Within this integrated urban forest park system commercial agriculture is also practised. Farmers rent space on common land surrounding the city and use the land for crops, pig farming and related pursuits that can be carried out on a small scale. The recreational trail system of the park provides access through these areas and through the managed forests. It is clear that at a municipal level a self-sustaining landscape that provides social, environmental and economic benefits can be developed. Bringing rural occupations to the city in the form of urban forest resources provides benefits that conventional park systems are unable to do.

In the past few years twelve new urban fringe 'community forests' (approximately 15 000 hectares each) have been jointly proposed by the Countryside and Forestry Commissions in the UK to cover 200 000 hectares.[154] Objectives include timber production, recreation, encouraging scientific interest in wildlife and ecology and integration with agriculture and settlements. In Tower Hamlets ten derelict sites were planted in 1985 designed to provide wood for local timber companies and craft industries.[155] A recent study by the London Borough of Hounslow recommends the planting of hardwoods as more versatile, hardier than conifers in urban situations, with a wider range of uses and potentially achieving higher yields and higher financial return. The study suggests markets exist for veneer wood, sawlogs, fuel wood and energy cropping. The potential of even saplings as structural material should be noted.

---

[148] John Holliday, 'Ecosystems and Natural Resources', in Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, 1993.

[149] Dr William Sopper, 'Forests as Living Filters for Urban Sewage', in David Gordon (ed.), *Green Cities*, 1990.

[150] Joan Davidson and Ann MacEwen, *The Livable City*, RIBA Publications Limited, 1983.

[151] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.

[152] Michael Hough, *City form and natural process*, Croom Helm, 1984.

[153] ibid.

[154] John Holliday, 'Ecosystems and Natural Resources', in Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, 1993.

[155] Tim Elkin, Duncan McLaren and Mayer Hillman, *Reviving the City*, Friends of the Earth, London, 1991.

Management guidelines for Bristol were laid down by its woodland advisory panel in 1977 to the effect that the woodland canopy should be retained and trees kept beyond economic maturity.[156] Clearing of large tracts is prohibited but instead small, random irregular areas are treated with the aim of creating a multi-storeyed woodland with greater wildlife diversity. Native species such as the old English sessile and pedunculate oaks predominate. Further public access is not used as an excuse for overtidiness. The plan notes that as well as harvesting and marketing woodland products there is also a need to market a recreational facility.

Hough argues that ecological methods of forest management can aid creation of low cost self sustaining landscapes.[157] He points out however that urban forestry requires a management philosophy that integrates aspects of horticulture with ecology to provides environmental and social benefits. They can also rehabilitate sites that have degenerated over time through soil compaction and removal of topsoil resulting in the reduction in productivity and nutrients. The species rather than being monocultures such as the plantations that have become familiar in our countryside should be diverse, self sustaining and appropriate to their site. Holliday notes growing public acceptance and desire for mixed forest in lowland UK.

In his seminal *Design with Nature Ian* McHarg sites land-uses at this scale according to existing ecology and the needs of the green city.[158] McHarg describes how each city has its own particular natural habitat and landscape. Urban forests can use diverse plant associations that are in harmony with the nature of the site, its soils, topography, climate and related environmental conditions. Reforestation of urban fringe areas involves land that has not supported trees for a long period of time.

Conclusions
As well as larger scale agroforestry the city forest may also include many small scale projects around a city that increase the amount of vegetation - fruit trees planted in gardens or orchards, street tree planting of *Woonerfs* and use of vegetation for shade or shelter. With the development of city forestry practices the management, removal and disposal of old existing city trees on public land can be incorporated. This includes the few forest fragments that already exist in our cities and need protection. Mark Johnson expresses the urgent need of individuals to have a direct and creative input into their own environment and suggests that urban forestry is one channel for "the greening of the hearts and minds of the population". If we are to have "sufficient impact to reverse the environmental crisis, it is on the urban battle field that the campaign for trees must be fought".[159] The emphasis of the urban forest on resource management, energy conservation, use and recycling of timber and tree debris, improved air quality is relevant to the built environment and has wider global significance. Urban forest along with city food production, landscaping for energy and ecological landscaping will be important techniques in sustainable cities and may take place within a dense city fabric.

[156] ibid.
[157] Michael Hough, *City form and natural process*, Croom Helm, 1984.
[158] Ian L. McHarg, *Design with Nature*, Natural History Press, 1969.
[159] Mark Johnson, 'Urban Forestry and the Environmental Crisis', *Landscape Design*, October 1990.

BLANK IN ORIGINAL

Chapter Seven:

Sustainable Development, City Form and Process

Introduction

In the last five chapters I have described several technical (*environmental*), or perhaps more correctly, 'biotic' (social ecological) methods by which UK cities can become more resource efficient and less polluting. I have thus drawn some conclusions as to appropriate city forms and processes and redefined the form of the social ecological city. I have also described some qualitative benefits of such methods and forms. As noted in *Chapter One* in *green* terms we cannot isolate the application of technologies (efficiency of consumption) from the consumption demanded by continued *growth*. If we wish to address these problems of growth an important approach will be to explore means of personal satisfaction or 'development' other than increased consumption and material wealth. This has consequences for city form and process and is the reason I have discussed biotic measures. Further, however implementation and prioritisation cannot be considered in isolation from the social, economic and political forces that have impacted on the development of our cities (and dictated their physical form) or the economic and social problems of many cities within a growth economy.

Social Ecology, Self-reliance and Consistent Implementation

SD (Sustainable Development) has been proposed in opposition to economic growth as a means of meeting social and economic 'needs'. In *Chapter One* I noted the problems of defining SD in terms of 'development' as opposed to 'growth' and the weight given to the term 'sustainable' (thus a definition of needs). From a 'social ecological' point of view emphasis is given to the roots of environmental exploitation in human hierarchies and the need for a radical change in social, economic and political relationships that moves towards an anarchist society where control is based on direct democracy at the level of the *polis* (self-reliance). Implementation of the technologies described in chapters two to six has environmental (or technological) advantages but can also increase self-reliance (perhaps better described as self dependence) and communicate natural and production process. Implementation consistent with social ecology must however not see such technologies as a means of engineering solutions to environmental dislocations. *They are part of a social matrix. The process of implementation must also aim to increase empowerment.* Such a process demands participation at least. I have also noted some environmental advantages of participation on a practical level in low energy design and in ecological landscaping. In the chapters following this one I thus go on to analyse the precedents for self-help specifically in housing. *I propose a pro-active means of encouraging local housing provision and urban regeneration (or at least some participation in housing process) within the context of implementing environmental technologies (including environmental city forms) but also within a broader critique.* Such a policy, I argue has environmental and social ecological validity depending on the specifics of the relationship between resource bodies, architects and users.

Mixed Use City

I have noted the potential environmental efficiency of a mixed use city fabric (a technology). Mixing uses however (as with the biotic technologies discussed) is a means of increasing the potential for self-reliance (breaking the division of labour) and a means of increasing the communication of various processes of production. Such a city Hatch refers to as providing a 'structure of experience'.[1] Such measures I have noted do not necessarily mean 'dispersal' and I have thus redefined the social ecological city. Dispersal or concentration of populations however seems secondary to the avoidance of uniform monocultural zones (enabled by division of labour but driven by desires to escape the city) that is the present trend of our cities.

Here I briefly discuss this dispersal and how our economic definition of reality has influenced the basic form of the existing city. The connection between urbanism and forms of economic production and organisation is of course inescapable. The city is shaped in terms of form and process by our current growth paradigm. Remote and large scale production of goods and services based on the division of labor and global comparative advantage has consequence on city form (alienating form that emphasises inequality). The creation and maintenance of sustainable form will also be dependent on a certain types of economic, social and political activity. In *Chapter One* I have already suggested forms of economic activity based on a green definition of 'sustainable development' as opposed to 'economic growth'. City form needs to be created that is suited to more local production of goods and services (self-reliance). In short, alternative economic activity will demand alternative forms of city.

Self-reliance and the Social and Economic Problems of Cities

Some of the greatest contemporary problems of cities are economic and social and these must be tackled by sustainable development particularly from a social ecological perspective. Green politics questions whether they can be solved by economic growth. In fact greens argue that focusing on economic growth

---

[1] C. Richard Hatch, 'Toward a Theory of Social Architecture', introduction to C. Richard Hatch, *The Scope of Social Architecture*, Van Rostrund Reinhold, 1984.

(our economic definition of reality) causes many of these problems.[2] I noted in *Chapter One* that "the very notion of development in its widest sense has been subverted, and consequently debased, by a preoccupation with growth".[3] GSD demands a steady state economy (goods and services are provided sustainably) where growth is qualitative and emphasis is placed on greater equity, participation and self-reliance rather than material growth to overcome social and economic problems. *In this chapter I add practical benefits of greater self-reliance in cities. These are social and economic based on some problems of inner cities and suburbs today).* It should be noted that while employment can at present be considered an 'economic good', in terms of GSD it should not simply be seen as work for financial gain but should be part of social continuum.

Increasingly cities are competing for a finite cultural market and money given to inner cities is particularly geared to this end instead of needs of residents. It may increasingly be asked whether such competition offers any genuine employment prospects for those in northern industrial cities and whether increased self-reliance is preferable to competing with low wage newly industrialised countries. In many of our cities growing local self-reliance is increasingly the only way towards *economic viability of cities.* Bookchin's revolutionary need for 'objective realities' is thus emerging.

Dense Mixed Use City and the Social and Economic Problems of Cities
Michael Breheny and Ralph Rookwood argue that sustainably desirable city forms may not meet with social and economic ones and that a balance must be made.[4] They argue for example that focusing on density although increasing transport efficiency may lower overall 'quality of life'. I have already described how urban form (shape of settlement patterns) is a major factor in reducing environmental impact (it will affect private and public transport use, solar access, facility sharing, mutual warmth, agriculture and land uptake beyond the existing city). The means by which our cities may meet energy, shelter, food, water and transport needs more sustainably thus reducing their impact on the hinterland call for a more dense, mixed use city based around public transport and with a close relationship to the farming hinterland. I have also noted qualitative benefits of such approaches. This form, I argue here, is *consistent* with social and local environmental improvement of our cities although against current trends. Mixed use becomes more than simply efficient in terms of transport energy and mutual warmth but a means of encouraging more economically self-reliant districts and neighbourhoods that address social and economic problems of today's inner cities and suburbs. Further by promoting a dense mixed use city we can realistically improve health and equity and create a more liveable city thus reflecting back on sustainability. In environmental terms producing healthy, *liveable and equitable cities* will be important in encouraging a reversal in outward movement. In social ecological terms healthy, livable equitable cities will aid redefinition of growth as development.

Quality of Life
Cities are places of economic activity - production, marketing and consumption of goods and services but are also places of social interaction. As SD involves the distribution of goods associated with 'quality of life' not simply 'standard of living' the sustainable city does not involve simply conservation of resources with an economical function.[5] David Cadman and Geoffrey Payne describe an alternative city in which the analysis of the mainstream economist is necessary but not sufficient. They give 3 additional perspectives over and above that of economics - the physical city, the social city, the personal city. Another economy based on these other perspectives is needed. It is this city that I hope to develop here.

Equity
As noted it is important to look at how goals of equity can be met by, and how they may be necessary to, the adoption of a path of sustainability. Elkin argues that inequity is not only a problem in its own right but involves inefficient use of resources, particularly *human resources* and leads to environmental degradation and resource depletion. Sustainable urban development must thus tend to forms of social organisation that prevent inequality from damaging sustainability. Actions must also be taken to avoid penalising those less well off. Action must also be focused on improving the inner cities for local populations. I n *Chapter One* I noted, on a global scale how equity was essential to a steady state economy - the same is true at a local level.

---

[2] Jeremy Seabrook, *The Myth of the Market*, Green Books, 1990.
[3] David Cadman and Geoffrey Payne, 'Towards another city', Introduction to David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
[4] Michael Breheny and Ralph Rookwood, 'Planning the Sustainable City Region', in Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.
[5] D. Pearce, A. Markandya, E. Barbier, *Blueprint for a Green Economy*, Earthscan, London, 1989.

Participation
From previous discussions and this chapter I note that effective democratic participation is important in the development of sustainable cities environmentally in terms of:

• increasing environmental competence;
• successful implementation of projects - problems of economic development without democratic participation have been made manifest time after time;
• addressing social problems concerned with disempowerment ('alienating' cities);
• green technologies may be most effectively implemented in the context of encouraging direct control of local environments (implementation bottom up as opposed to top down).

....and social ecologically in terms of:

• consistency of means and ends in terms of attempting to replace hierarchies and material 'consumption' with 'control over life';

Participation is, in any case, an important accompaniment of environmental legislation if we are not to further disempower. I will go on to note however that participation involves the notion of shared local and specialist knowledge both of which are necessary to successful development. Such a notion is embedded in the Greek concept of the *polis* described by Bookchin as direct democracy informed by expert witnesses.[6] In terms of city development such a policy involves not 'de-specialisation' but 'redefining the role of professionals' that I go on to explore in terms of housing in the next chapters

Trends
A perceived trend today towards low energy in use but new-build suburban housing estates combined with 'natural gardening techniques' and more efficient cars but carried out within existing urban systems can be criticised for not greening cities in any real sense. This is true in *environmental* terms; in the conflicting technologies and inefficient urban forms (the city must be treated as a whole and the built form is merely one element of the urban system that must operate in balance with its hinterland); and in a *green* sense because such initiatives refuse to challenge present notions based on growth as the only means of obtaining the 'good-life' (they concentrate on a limited definition of technological *efficiency*).

Reducing dispersion and fragmentation should be a principal aim of city greening. Here I look at how this may best be achieved through small scale regeneration and refurbishment of the existing fabric with supporting public transport initiatives. This is not to argue for a return to 'traditional' patterns of complete self sufficiency but to move towards new ones that are relevant to their context generated through more direct democracy utilising human resources, and do not deny the 'city' but its capitalist form.

Summary
In green terms reducing divisions of labor and power may be a means by which *control over life* can replace *consumption* as the principle means of fulfilment. SD thus involves the means by which power relationships are resolved within the city including the processes by which development (in building terms) is implemented. It has consequences for city form, organisation and development process. It involves the creation of equitable, healthy and liveable cities that are democratically controlled. In producing 'another economy' and 'another city' we cannot however deny the economic forces shaping the city no matter how much we wish to question them. We must recognise the power of the economy and those who change it, and must be concerned with its direction and the values that underlie it. We must look at the extent to which the city in its present form is a viable place of habitation and how it can become so in a ecologically balanced way.

The form of the post-industrial city is broadly a product of:

• the division of labour, land and power;
• an overtly economic definition of reality (dependent on environmental and social 'externalities');
• continued trends towards suburbanisation and planned dispersal to 'green field' sites;
• enabling technologies - the car and telecommunications;
• post industrial change in, and outward movement of industry.

These factors have produced both a *spatially fragmented city* and a *dependent population* (linked problems) both of which have environmental, social and economic consequences due to factors such as:

[6] Murray Bookchin, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991.

• inefficient transport systems;
• reduced potential for energy efficient urban design based on mixed use;
• the division of labour enabling increasing production;
• *economic growth* for *consumption* and as the principal means of *development*;
• consumption as a substitute for control over life as defining human progress;
• simplified monocultural environments (suburban) and isolation of poor communities in the inner cities;
• lack of local control over of local environments;
• inefficient decision making by distant organisations.

Suggested economic, social and environmental solutions involve:

• focusing action on the inner city directed at local people and jobs;
• tackling the existing built fabric;
• promoting mixed use development in the inner city and suburbs and public transport initiatives;
• linking employment and housing developments;
• supporting local economic development initiatives;
• supporting socio-economic self-reliance and local control;
• support for local environmental action and community auditing (LETSystem);
• encouraging participation in the development process;
• increasing environmental transparency.

7.1. Fragmentation of the City and a Loss of Control

7.1.1. The Capitalist Context

In Chapter One I noted the capitalist division of labour, land and power, environmental and social externalities of capitalist market economies and global specialisation by comparative advantage that provide the basis of today's city form.

7.1.2. The Traditional City

The city is a focus for economic organisation, the management of which has, throughout history given power to a ruling elite, be they priests, kings, landowners, industrialists or financiers. The 'traditional' city cannot be described as a utopian democracy. Neither has it ever existed sustainably. For many however the medieval city provides a basis for discussing the sustainable city.[7] Hatch notes that spatial subdivision was based on guilds (which dominated the sphere of production) and their 'gross' division of labour.[8] Each guild was a parish and each household was a complete economic unit. Thus "Every dwelling was workshop, warehouse, training school, and home for family and apprentices. A garden at the rear door guaranteed sustenance in good times and bad". Workers owned and controlled their tools of production. [9] Harald Deilmann also describes how 'originally' the city was a place of habitation, a location for the production of goods, a centre of commerce and of intellectual, cultural and political activity. The urban residence he argues was usually characterised by a combination of living realm plus room for the practice of a trade or profession "for centuries urban life was inseparably linked with habitation".[10] *In such towns, a simple walk to market was an education in political economy and techniques.*

While realising a tendency to romanticise the traditional city the circumscription of human roles and powers and the growth of the capitalist economic order clearly impacts on our growth ethic (*Chapter One*) and the spatial order of the city. I will note how both are important considerations in producing sustainable and socially more cohesive cities. As a result of the processes of change that culminated in capitalism, the division of labour, and suburban flight, basic urban functions have become fragmented on a regional and global scale.

---

[7] ibid.
[8] C. Richard Hatch, 'Toward a Theory of Social Architecture', introduction to C. Richard Hatch, *The Scope of Social Architecture*, Van Rostrund Reinhold, 1984.
[9] ibid.
[10] Harald Deilmann, Gerhard Bickenbach and Herbert Pfeiffer, *Living in Cities*, Karl Kramer Verlag, Stuttgart 1987.

Such processes have progressively decreased the *need* and thus *ability* of people to shape their own lives (or at least provide the basis of life individually or communally). We rely on distant supply lines, the environmental and alienating problems of which I have discussed initially in *Chapter One*. Liberal historians tend to view this capitalist (or industrial) revolution as expanding opportunity and choice. It has alternatively been seen as replacing one set of freedoms for another, the sharp erosion of control over crucial areas of life, and the steady shrinkage of need until only one, the need to consume, remains. Environmental commentators such as Seabrook and Bookchin see this as a critical reason for global social and environmental problems. The social consequences are focused on those who do not have the purchasing power to compensate. The dramatic effects of which are seen in third world cities although they are also prevalent in the inner cities of the North. Here I note how the city form created amplifies the problems.

For Richard Hatch the central instrument of restructuring was the factory.[11] Two significant features explain the power of this invention: the use of machinery faster and more skilful than human hands, and the spatial organisation of hands (and it is to hands that workers were reduced) into specialised buildings under surveillance and control. For Bookchin, as I have noted, it is the gradual emergence of the capitalist economic order that has circumscribed human roles and powers (and produced our city form) not simply industrialism. He argues that the problem is rooted in the social structures of capitalist relations not the technology of the factory itself that followed the emergence of the factory as a social order. Capitalism concentrated power and land in the hands of a few, increased hierarchies, drives production for material growth and fragments city functions. If merchant capitalists had long seen the products of nature as commodities to be brought cheap and sold dear industrial capitalists, argues Hatch, have reduced us to the commodity of work to be brought for the lowest market price. Cullen adds "the capitalist city provides a new regime of consumption and accumulation which combines spatial dispersal and mobility, and flexibility in labour markets, labour processes, and consumer markets".[12]

7.1.3. Loss of Control

Critiques of the present social order note that the division of labour meant a loss of control of the individual over conditions of work and made it unlikely that workers would one day rise to ownership. Once forced to give up control of tools and materials (the means of production) personal control over other crucial areas of life was also removed, the place of work, the pace of work, or the product of work. Creativity also, was neither desired or permitted. Hatch refers to the ever finer division of labour that does not refine the skills of specialised workers but ensures they need know less and less about production. This process of 'de-skilling' he argues has also spread to the office and "is now reaching its apogee with the universal dissemination of computers".[13] Hatch quotes Adam Smith's *The Wealth of Nations* "the understandings of the greater part of [men] are necessarily informed by their ordinary employment's. The [man] whose whole life is spent in performing a few simple operations, of which the effects too are, perhaps, always the same, or very nearly the same has no occasion to exert his understanding, or to exercise his intention in finding out expedients for removing difficulties that never occur".[14] Cullen argues that by exacerbating a 'de-skilling' process inherent in capitalist enterprise post industrial society is a newer and more potent version of the factory system that appropriated workers control over the means of production and progressively de-skilled vast sections of society.

Further, this 'homogenisation' of labour which reduces distinctions between workers also intensifies the competition between them. In a society where unemployment is maintained at a high level, this competition colours all human contacts and exacerbates ethnic and racial conflict. The increasing division of labour is an obstacle to shared knowledge and co-operation while work is performed only for others. Bookchin notes that work has become labour time for money not part of a social life. Alternatively the development of techniques through specialisation has obviously had important contributions in human development. We need to ask whether it is still valid. Alternatives postulate a role for specialists but within the control of participative democracy. *Our growing reliance on experts and institutions in city planning and architecture has particular problems discussed later.*

---

[11] C. Richard Hatch, 'Toward a Theory of Social Architecture', introduction to C. Richard Hatch, *The Scope of Social Architecture*, Van Rostrund Reinhold, 1984.
[12] Joe Cullen, 'Mad Maurice III: metropolitans in the making', in David Cadman and Geoffrey Payne (eds.), *The Living City: Towards a sustainable future*, Routledge, 1990.
[13] C. Richard Hatch, 'Toward a Theory of Social Architecture', introduction to C. Richard Hatch, *The Scope of Social Architecture*, Van Rostrund Reinhold, 1984.
[14] ibid.

7.1.4. Fragmentation of the City (Form and Control)

As space the third and final factor of production also became an 'investment' speculation in social space became a principal root to wealth. Any independence and security, any building and modifying of workshop homes was destroyed. People became more dependent on markets in land and labor (the resulting form of the privatised city led to early municipal intervention).[15] The loss of individual control and fragmentation of 'self' is clearly linked to the division of space and fragmentation of the city. Capitalist processes and the contemporary city segregate functions, institutionalised as zoning and separate classes. The rich and the poor are invisible to each other locally and globally. Hatch refers to "the city as a machine to make money".[16] Society has been fragmented into interests that are the result of the competitive market. *The spatial structure of the city of capitalism isolates people and activities and further limits the legibility of the environment in which we live and work.*

7.1.5. Suburbanisation

The divisions described have enabled the inefficient city forms of today through suburbanisation. For the rural populations streaming into them the growing industrial cities of the 19th Century promised both a share in the proceeds of economic expansion (if at expense of environment and developing world) and a release from traditional 'social ties' and 'ties to the land'. The size of growth, exploitation and rapidity of *laissez faire* development guided only by the search for profit led however to the town losing many attractions as a place of habitation with the growth of what Lewis Mumford referred to as 'Coketown'.[17] Severe overcrowding and pollution meant that outward flight followed the surge to the cities, initially amongst the better off only.[18] This movement was accompanied by the growth of a more specialised tertiary sector; stores, banks and administrative organisations in the centres of cities replacing housing and mixed use areas.

In *The City in History* Lewis Mumford describes how the 20th Century has seen the inherently 'ecological' aspects of this outward suburban development being gradually degraded at the expense of the inherently 'unecological' aspects.[19] The early romantic suburb built in the arts and crafts tradition he argued solved, for a limited middle class population, the problems of the mechanised, polluted and crowded industrial city. Life could be lived closer to natural cycles and rhythms and the variety of human personality acknowledged in an environment of gables, towers and bays set in swathes of green parkland. While still small in scale the opening up of space appeared to create the potential for dwellings to achieve a new form respecting a whole complex of biological and spiritual interests. They were also, of necessity, pedestrian in scale and developed along public transport links to the city. They were thus close to and enjoyed the advantages of both city and country.

As a general and potentially ecological solution to the overcrowded and polluted city however the suburb has proved to be temporary and costly. Facilitated by economic growth and technological developments, in particular the mass production and popularity of the motor car, the *pedestrian* scale of the suburbs disappeared. Rising incomes and car ownership enabled the majority of people to respond to the push of worsening urban environments and the pull of more spacious living by moving out to the 'greener' suburbs and the countryside beyond. Further the monocultural forms of suburban development did nothing to link work and home spatially.

Today declining populations characterise all major urban areas in Europe.[20] As a popular movement (based around the division of labour, the mobility of the car [without accounting for externalities of pollution], and the 'free market') the essential suburban feature of the opening up of space combined with mass designed and produced *housing units* has resulted in a dispersed low density sprawl. With increased dispersal, connecting people to the necessary services of the city by public transport became more unworkable and private motorised transport essential. In this way argues Mumford the congestion, resource consumption and pollution of 'Coketown' has returned in a different form thinly disguised under a "chrome plating".[21] I have described the effects of suburbanisation on the efficiency of transport and consequent global pollution.

---

[15] ibid.
[16] ibid.
[17] Lewis Mumford, *The City in History*, London 1961.
[18] Karl Hutchison, *Greening British Cities*, BArch Dissertation, Liverpool University, 1991.
[19] Lewis Mumford, *The City in History*, London 1961.
[20] Joan Davidson and Ann MacEwen, *The Livable City*, RIBA Publications, London 1983.
[21] Lewis Mumford, *The City in History*, London 1961.

7.1.6. Virgin Soil Option

Not dealing with the Existing Fabric or Capitalist Divisions

The attempted antidote to this trend Peter Hall calls the Geddes, Howard, Mumford vision of city development.[22] In many ways it attempted to build on the essentially 'green' elements of the initial suburbs and apply them to the mass population. Mumford, Howard and Geddes differed on their attitudes to city development and in particular in their desire to address the existing city (or not). Hall argues however that they shared a desire to maintain densities and a balance of activities. According to Grover Foley "Howard like Mumford, was a child of the city. He rated social contact even higher than gardens, which also flourish in suburbia". Mumford's early enjoyment of the city as "immense, overpowering and flooded with energy and light" was however later tempered by growing pollution and congestion, "only if we can limit the city, restoring balance with nature and all life, has it a future".[23] In his introduction to 'Howard's Garden City of Tomorrow' Mumford describes garden cities as "an attempt to do away with the inevitable correlate of metropolitan congestion, the suburban dormitory, whose open plan and near access to the country are only temporary, and whose lack of industrial population, and a working base make it one of the most unreal environments ever created by man".[24]

In 'The City Green' Sandra Higgins quotes Howard "the simple issue to be faced and to be faced resolutely, is can better results be obtained by starting on a bold on comparatively virgin soil than by attempting to adapt our old cities"[25] Howard argues Higgins significantly for 20th Century planning went for the virgin soil option and utopian models *rather than addressing the existing city and its political complexities.* In trying to prevent the development of amorphous suburbia new garden cities were to be grouped and connected by rapid public transport into social cities that realised the need for the social and cultural functions of the city but on a human scale. They were to be partly self sufficient, integrate agriculture into the town and guarantee citizen control through collective ownership. The new towns that actually developed however lost these features. They became predominantly low density dormitory settlements linked to cities (London) by the car. They were a product of capitalist ownership, global markets and a national need to centralise to compete. They were also as product of a desire to *start again* away from the existing cities.

In environmental design terms in the suburbs and to a lesser extent the new towns the potential for geomorphic development on a human scale and an ecological regional city were sacrificed to mass produced housing arranged and designed totally for the convenience of the car.[26] Instead of buildings set in a park argued Mumford we now have buildings set in a parking lot.[27] Sun angles, wind directions and shelter, ecosystem development, food production, neighbourhood facilities and co-operation have all been ignored in favour of, 'separatist' villas that attempt to satisfy an unsustainable vision of utopia in the countryside! Mumford describes monotonous single function environments that are in many ways no more part of nature than the inner cities they left behind "a multitude of uniform, unidentifiable houses, lined up inflexibly, at uniform distances, on uniform roads, in a treeless communal waste, inhabited by people of the same class, the same age group, witnessing the same television performances, eating the same tasteless food, from the same fridges, conforming in every outward and inward respect to a common mould, manufactured in central metropolis".[28]

7.1.7. Planned Removal - Comprehensive Redevelopment

Institutionalised Spatial Fragmentation

While outward suburban growth was a popular movement reacting to city environments, planned comprehensive redevelopment in the second half of the 20th Century promoted outward movement often displacing people from their local areas against their desires under the guise of slum clearance. Colin Ward's description of the 'Battle for Coin Street' is one example of many attempts by government to remove housing (that the city depends on) to single function outer areas and replace them with speculative office and retail developments.[29] Vocal campaigns by residents attached to their locality as at Coin Street have sometimes effectively countered these policies towards even greater specialisation of functions. In many cases it has led to participation of people in regeneration of their own environments. These provide the basis of 'objective realities that I attempt to develop on in this thesis.

---

22 Peter Hall, *Cities of Tomorrow*, Blackwell, Oxford 1988.
23 Lewis Mumford quoted by Grover Foley, 'Mumford on the City', *The Ecologist*, No 3, 1989.
24 Ebenezer Howard, *Garden Cities of Tomorrow*, 1970.
25 Sandra Higgins, 'The City Green', *The Architects' Journal*, 5 February 1986.
26 for a definition of geomorhic planning see Ian McHarg, *Design with Nature*, Natural History Press, 1969.
27 Lewis Mumford, *The City in History*, London 1961.
28 ibid.
29 Colin Ward, *Welcome Thinner City*, London 1989.

Peter Buchanan describes how "The inhabitants of this old fabric would be decanted elsewhere while their overcrowded and underserviced slums would be razed and rebuilt".[30] New buildings would be set back from the road to let in light (in terms of solar design today light was used abstractly) and to let traffic fumes *escape*. "By this process the once continuous fabric of the city is opened up, and what was once from the air a dense crust - clotted, clogged and unhygienic - is now more like an electrical wiring diagram with a grid of routes and dot-like [individual building] destinations".[31] This city was shaped by deliberate creative acts of specialists and thus in design terms intrinsically impoverished creatively(self-help housing is discussed in the next two chapters).

The wiring diagram of modern town planning argues Buchanan saw the city as a circulation connecting the dispersed monocultural zones of dwelling, work and leisure. This he argues works in theory as a functional unit but is wasteful, inconvenient and ugly - "it disassociates each role played by the citizen and so fragments the self".[32] The traditional city enveloped the citizen, the citizen was central to the city's frame. Introducing sun, space and greenery on a mass Corbusian scale has rent the fabric to shreds and displaced the citizen to some restless fluid space between the prime agents of the motor vehicle and free-standing buildings that now hold central positions. The suburbs and high rise developments both form monocultural environments.

Cities originally designed to a human scale are now choked with traffic from the suburbs and beyond as a new order of city has been created. In Los Angeles and Milton Keynes for example human order is subservient to technology and no travel is possible without the car. At Milton Keynes a grid of roads has been imposed on the natural geomorphology with local housing areas located in some grid squares and shopping centres and the city centre in others as discrete units. In the area remaining between the roads that divide the town, one million trees have been planted. Brenda and Robert Vale point out that the CO_2 released by a typical car travelling 10 000 miles a year on journeys to work and shop will need some 200 trees to absorb it.[33] A million trees will therefore cope with 5000 cars. In new towns such as Runcorn arterial roads hidden by grass banks provide unbridgable barriers between communities and are separated from footpaths and cycle-routes leading to disorientation and increased length of journey for all types of travel.

7.1.8. Alienation

In the same way as Bookchin, Hatch refers to an "epidemic of alienation".[34] The principle causes are that:

• 'society' has become 'fragmented economic interests';
• the development of an economic order imposes an ever increased division of labour that is an obstacle to shared knowledge and understanding;
• docile specialisation at work splits social and economic life;
• work ends and means are inverted and life begins when work ends;
• the spatial order that has accompanied these divisions emphasises them and means people spend increasing time travelling.

Hatch argues much as Bookchin and Seabrook that "We are confronted with an extraordinary paradox. The economic system that created the greatest cornucopia of social wealth the world has ever seen also produces impoverished individuals. Human capacities and desires shrink to those that the market can satisfy at a profit. Needs formerly considered the most important are lost, among them the needs for many sided competence and creativity." Here I note how the development of city form highlights these problems already outlined in *Chapter One.*

7.1.9. Inner City Decay

Structural and economic changes have had an uneven impact on cities in the UK particularly industrial cities since the mid 1960's.[35] Such inequality, emphasised by disempowerment of inner city dwellers, I have argued, must be dealt with by SD. Concentrated unemployment and deprivation in cities often

---

30 Peter Buchanan, 'City as Natural Habitat versus City as Cultural Artefact', *Architectural Review*,
31 ibid.
32 ibid.
33 Brenda and Robert Vale, *Green Architecture: Design for a sustainable future*, London 1991.
34 C. Richard Hatch, 'Toward a Theory of Social Architecture', introduction to C. Richard Hatch, *The Scope of Social Architecture*, Van Rostrund Reinhold, 1984.
35 Elkin, McLaren and Hillman (eds.), Reviving the City, Friends of the Earth, 1991. p205

contrasts with a booming retail and financial sectors (notably London). Cadman and Payne point out that these are connected not isolated features. They are part of the same process of change "the life and death of the city, its growth, decline and transformation".[36] Conditions of the inner city are not as they were, presented after the riots isolated from larger social and economic forces affecting the rest of the city and all cities. Rather dismay of homeless in the inner city and 'success' of city slickers of money markets stem from the same root (capitalist paradigm). "The contrast between the two and the way in which they are presented separately as representing success and failure, is evidence of the real crisis of the city, evidence of the extent to which one perception of the city has come to obscure our vision".[37] This division is a microcosm of global divisions.

Regional and sub-regional movements of productive employment away from city combined with the general decline in traditional manufacturing have emphasised capitalist divisions and produced inner city unemployment or replaced productive employment with service and informal sector employment. This has been accompanied by a nationwide trend for movement to, and increase in wealth of, the non-metropolitan Southern and Central England. Population movements have been associated with parallel shifts in employment and strengthening of recipient local economies.

New light industrial technologies developed around national and international circulation of goods based on comparative advantage demand large, cheap, clean and accessible out of town sites, both encouraging and following outward movement. Ironically these industries do not produce the pollution at the local level of those that contributed to the outward flight. Suburban shopping centres, suburban factories and offices designed for the convenience of the car also provide only a minimum of facilities for association (with the production process and people). Their 'random' placement in local and pedestrian terms adds to wasted resources in private travel. *Even people living within short walking distances from hypermarkets find it easier to go by car rather than negotiate the road system designed for regional traffic.*

Meanwhile the poorer sections of society remain trapped in the inner city without jobs or local services. They are separated from the countryside by vast areas of housing and from schools by urban motorways designed for those who can afford to enjoy the city without living in it. Private road travel clearly does not have even handed social or environmental effects but only increases the divisions between car owners and others whose 'freedom' actually decreases. Suburb to suburb traffic generated by orbital motorways accelerate the decline of the city and make suburb to city public transport uneconomical.

This process is having a polarising social effect by leaving behind the poor in inner city areas - unemployed, low skilled, elderly and minority ethnic groups. Meanwhile the gain areas have become even more solidly 'middle class', affluent and environmentally defensive. Dennis Hay describes a vicious circle of decline within the inner city, as the most mobile social groups move out (particularly the younger skilled middle class families), leaving the most disadvantaged and immobile social groups (such as unemployed manual workers, the elderly, and the racial minorities) to cope with shrinking job opportunities, declining social services, and a decaying physical fabric of 19th Century housing and infrastructure.[38] Further he describes de-urbanisation as still in its early stages likely to be influenced by further changes to the post-industrial 'information economy'.

While I have described global economic factors European cities do have varying population developments according to their specific function and the stage of growth of the city. Traditional cities in the UK have often retained an ongoing nodal and market function and problems are merely of transition. In industrial cities however building and environmental quality and capital stock has declined with the loss of people. This is exacerbated by reduced tax income to the city with suburbanisation although suburbanites still make use of the city facilities. Industrial cities hit particularly hard with a decline in heavy industry include Liverpool, Glasgow, Belfast, or Sunderland along with parts of Yorkshire/Lancashire industrial belt, West Midlands and South Wales.[39]

In most cases the associated lack of investment in inner cities both public and private has fuelled outflow. Thus for example areas such as East Manchester (old industrial heartland) have become square miles of empty space as development has spreads to agricultural land outside the existing city. More recently investment has been made in inner cities but has concentrated on expansion of urban core activities, financial and administrative, providing jobs for mobile suburbanites not a social infrastructure for

[36] David Cadman and Geoffrey Payne, 'Towards another city', Introduction to David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
[37] ibid.
[38] Dennis Hay, 'On the Development of Cities', in David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
[39] ibid.

existing residents. The resulting increased land values run counter to provision of support facilities for inner city residents such as local shops.

These problems demonstrate the increasing economic dependence of people in cities as well as a waste of human and other resources. Further, a continued tendency to decrease labour through semi-automated technology seems counter to meeting peoples needs through employment (not simply for money) as I noted in Chapter One. Elkin argues that "The inner-city policies of sustainable development must renew the local social infrastructure and local employment base as first priorities if further environmental damage is to be avoided". Inner cities are potentially our most efficient dwelling location.

7.1.10. Exurbanisation

Figures given by Breheny and Rookwood indicate a persistent drift of people away from metropolitan areas since 1961 and since 1981 from industrial districts of Wales and Northern England to smaller towns and rural areas.[40] This process has been called 'counter urbanisation' since it is not simply extended suburbanisation but a clear rejection of urban living. Development pressures are thus on greenfield sites in the countryside. Dennis Hay looks at the 19th and 20th Century factors that have shaped city development and the role of technology in growth and decline.[41] Again he draws a distinction between 'traditional' and 'industrial' cities in moving towards 'advanced industrial cities'. Trends in first world cities will show:

- continuing decline of heavy manufacturing involving net job losses, outmigration and decay;
- continuing suburbanisation and exurbanisation for the most mobile sections of society effectively redistributing the nature and location of economic activity and service demand;
- emergence of new forms of manufacturing and communications industries with new locational preferences;
- a few 'traditional' cities only will develop new roles as centres for office, finance and knowledge based activity.

Any attempt to defragment the city and maintain density is clearly moving against a strong tide.

7.1.11. Suburbs, Citizenry and Consumption

Having described inner city decay it can also be noted that new suburban communities are often of isolated housing with limited social functions. Even with provision of social functions such developments are prone to isolation particularly for those without cars or those used to the informal network of the city. Elkin quotes Wedmore and Freeman "Commuting has a directly destructive effect on the home area, which is not worked in; on the business local, which is not lived in; and on the places in-between, which, used as passage ways inevitably cease to be 'places'. Public areas which were once intensively used have been reduced to mere arteries, mechanisms to get us from one place to another."[42]

Buchanan describes how "Today's citizen may play a role in the seclusion of nuclear family, another in the protocols and hierarchy of work and yet another at leisure. Each role is disconnected and prepared for by the time spent shielded in the cocoon of private car or anonymity of public transport".[43] Further in the traditional city the citizen is always liable to exposure and contradiction, which rather than being threatening, is the social milieu necessary for self-knowledge and maturity. We have argues Buchanan helped to create a city of alienation "the compulsive consumption necessary to support all these shallow roles, and of paranoia at the threat of exposure in a threatening world".[44]

Mumford also notes how suburbia creates families in space and favours silent conformity, not rebellion or counter attack. So suburbia has become the favoured home of a new kind of absolutism: invisible but all powerful and thus a considerable force against real change. What he describes as a desertion of civic and social responsibility it is argued here is also a desertion of responsibility to the planet and people in 'developing' countries. In such environments multi national corporations increasingly control taste due to erosion of critical ideology by consumerism "Attention is diverted from the internal contradictions of

---

[40] Michael Breheny and Ralph Rookwood, 'Planning the Sustainable City Region', in Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.
[41] Dennis Hay, 'On the development of cities', in David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
[42] Elkin, McLaren and Hillman (eds.), *Reviving the City*, Friends of the Earth, 1991.
[43] Peter Buchanan, 'City as Natural Habitat versus City as Cultural Artefact', *Architectural Review*,
[44] ibid.

capitalism into a kaleidoscope of fashions, crazes, movements. This gives an impression of real innovation, while its true purpose is to absorb revolutionary proposals and convert them into harmless images."[45]

Leaving aside questions about the equity of the recent growth in the SE, and wealth distribution intra-nationally and internationally, not to mention fundamental doubts about the sustainability of growth, the ironic fact is that the 'success' of the south-east creates its own problems for those 'fortunate to be living there! Not the least of these have been the rocketing house prices, traffic congestion, and constant pressure on the physical environment. For those without that choice, one wonders whether the quality of life is perhaps being eroded rather than enhanced by economic 'success.[46]

Holmes and Steeley describe the development of an 'alpha-gamma' society with some people working all the time. An alternative is more free-time for all and 'free time' not spent consuming. Holmes and Steeley use the N/S divide as an example of the 'poverty of wealth' with more choice to work in the South but *doubts about value of progress even for those enjoying the benefits.* They describe rocketing house prices, congestion and stress of 'success' and acute cases in Japan.[47] Such 'success' they argue brings characterless streets and a loss of identity. They link the growing division between land and people that such progress brings about to problems in diet.

As I have noted for our predominantly urban population, food comes from supermarkets - convenient, sanitised, with shape and size conforming to smooth marketing images. The direct contact with the land's productive capacities and the processes of growth have been largely lost, and, not surprisingly, are little understood or respected. As Elkin notes people see themselves as dependent on the supermarket, the shop, rather than dependent on the soil, so their concern for soil health is negligible. *A critical point here is that the poverty of wealth described by many greens and outlined in Chapter One is exaggerated by the form of city it creates. I also note the uninhabitable nature of that city in terms of pollution and a livable environment.*

7.1.12. Dependence, Vulnerability and Environmental Degradation

Life in all cities has then become extremely vulnerable to changes beyond the control of people who live in them. This vulnerability is related to economic patterns of separation "We separate producer from consumer, the farmer from the Kitchen, the power plant from the appliance, the dump site from the garbage can, the banker from the borrower and depositor, and inevitably the government from the citizenry. Development becomes a process by which we separate authority and responsibility, where those who make decisions are not affected by those decisions."[48] Local economies have become dependent on outside suppliers for employment, food, energy, clothing, shelter, entertainment. The often devastating social effects have been demonstrated in our inner cities particularly with the end of a quarter of a century of sustained economic growth and high employment.

Dependence can also be closely linked to *local* environmental degradation. Residents lack power to improve their environment since the environmental capital stock of their locality is not under their control. It can be exploited by direct actions and externalities of others. I have already described the actions of multi-national corporations that form a new international division of labour beyond democratic control. In terms of city *development* such separation has made people dependent on organisations and professionals. Decisions affecting communities have thus often been made without effective consultation and thus lack relevance and fit. Efficiency of decision making and responsibility are reduced. I expand on this in housing terms in *Chapter Eight.*

---

[45] Joe Cullen, Mad Maurice III: 'metropolitans in the making', in David Cadman and Geoffrey Payne (eds.), *The Living City:* Towards a sustainable future, Routledge, 1990.
[46] John Holmes and Geoffrey Steely, 'Town and country', in David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future,* Routledge, 1990.
[47] ibid.
[48] Morris, quoted in Elkin, McLaren and Hillman (eds.), *Reviving the City,* Friends of the Earth, 1991.

7.2. Towards the Compact, Mixed, Self-reliant City

The process of dispersion has thus not been that of Howard's self contained efficiently linked units. Postulating alternative forms to the single 'family' detached house conflicts with the ideals of a large majority. While criticising the suburbs they clearly cannot just be dismissed due to their perceived advantages and the energy already invested in the suburban fabric. Geoffrey Steeley has argued, however that the nucleated family is becoming less dominant and the existing housing market is not responding to a changing structure of urban population in its location and type.[49] He argues as does Harley Sherlock that there is a need for inner city housing that responds to changes in the population structure away from family housing and provides access to a wide range of facilities for people without cars. In this respect our older housing stock seems ideal for regenerating into a larger variety of dwellings. A critical green role for design professionals it would seem is to provide examples of alternative urban forms and systems and to utilise and develop the positive elements of the suburbs. The Dutch Co-housing movement (*Chapter Nine*) has perhaps more than any other form shown a realistic potentially popular alternative to single housing suburbs that can move towards sustainable and socially cohesive cities.

7.2.1. The Existing Fabric and Derelict Land

Arguments continue over the need to treat land as a scarce resource and thus restrict green site development. Robin Best argues that, for an urbanised country, Britain has been conservative in its use of land for building.[50] It may however be more appropriate to consider this debate from the point of view of 'loss' in the city not of the countryside. David Nicholson-Lord refers to the movement of population away from city centres as the leaving behind of junk-yards that he calls prehistoric slash and burn.[51] The riots of 1985 have been partially attributed to a reaction against desolate inner city environments inhabited predominantly by the poorer sections of society in increasingly disheartened communities left behind amongst the clutter and debris. In *Chapter Five* I noted the resource need for maintenance of old buildings. While new build can be more energy efficient over its lifetime the initial impact of construction is also important. Another important factor here, however, is the maintenance of a degree of continuity. Hough describes the effect of the loss of local landscapes and *genius loci* of comprehensive redevelopment.[52] Ironically many recent new build, speculative office developments that have destroyed any continuity and forced communities to relocate often lie vacant due to continued 'recession'.

Inner city decay has left large areas of vacant and derelict land in the cities. In Merseyside, for example, there are more than 12 square miles within the structure plan area. Derelict land contributes to poor often dangerous environments and represents a wasted asset. Land remains vacant for various reasons in our inner cities often despite the wish of local populations to utilise it. Some is caught up in the lengthy process of development while much is simply trapped by inertia often despite government incentives since peripheral sites will be the economic preference. Where development does take place Colin Ward describes how it is often inappropriate to the sustainability and long term employment of the local population.[53] Sustainable development argues Ward implies housing for the homeless and local job creation. Non-profit landscape initiatives in the inner city need special low rents in order to be able to use these sites as at Windmill Hill City Farm and The William Curtis Ecological Park (*7.2.8. Local Environmental Action)*. Many such schemes are temporary and eventually demolished for speculative development. Our growth paradigm (including the local residents) drives these initiatives.

I have noted the possibilities of ecological landscaping. Derelict land within the city however (despite natural colonisation) is often neither green nor accessible to local groups. Vocal local campaigning to protect existing sites and develop ideas in new schemes has often been essential.[54] Such spaces are increasingly important due to suburban growth and the decline in public transport. These have reduced access to 'natural' areas in the countryside for inner city dwellers thus cutting contact with the natural world absolutely. 'Natural' areas in the city are probably more important than those outside because nature is then part of daily life. Public transport link initiatives are now numerous but variable in their success but are no substitute for local access. Notably however we have a reservoir of land and buildings in our inner cities that could be used.

---

49 Geoffrey Steeley quoted in Joan Davidson and Ann MacEwen, *The Livable City*, London 1983.
50 Robin Best in Joan Davidson and Ann MacEwen, *The Livable City*, London 1983.
51 David Nicholson-Lord, *The Greening of the Cities*, London 1987.
52 Michael Hough, *City Form and Natural Process*, Routledge, 1989.
53 Colin Ward, *Welcome Thinner City*, Bedford Square Press, 1989.
54 Joan Davidson, *How Green is Your City*, Bedford Square Press, 1988.

7.2.2. Mixed Use

Kevin Murray argues that the provision of uses for activities in 20th Century planning has been to simplistic.[55] 'Dwelling' environments, for example, are not provided just by building 'housing'. I have described how separation of activities has developed due to many factors including division of labour and global specialisation but also the professional perception of non-conforming activities, desire for 'spatial neatness', the car, suburban ideals, a Modernist ethos, and often the fact that it is too difficult to do otherwise. The local consequences include less diversity and choice, less people/activity throughout the day and night (thus less security), poor social contact, and longer journeys. Hatch argues that "The making of cities where people can discover themselves out of our present situation requires a total overhaul of contemporary ideas of zoning and urban design. The deprivation experienced in the sanitised cores of our cities, with their faceless office towers and anonymous streetscapes, has often been described. An equal number of critics have remarked on the sterility of purely residential districts. Robbed of these human uses and the people associated with them, the industrial parks and loft districts of suburb and city, where millions spend their waking hours, are cruelly monotonous."[56] I have noted how the mixed use city provides a 'structure of experience'.[57]

7.2.3. The Compact City Proposal

I have described reasons why a denser city form may be *environmentally* advantageous. These include public transport possibilities, increased pedestrian travel, and possibilities of mutual warmth and micro climate design. The compact, high density, mixed use city is advocated by the European Commission, Friends of the Earth and Transport 2000 as potentially energy efficient and *offering a superior quality of life as contrasted with 'suburban sprawl'*. The forms developed in the encouragement of higher density may, with reduced carriageway provision, as described in *Chapter Two* physically enable provision for the sharing of facilities such as productive gardens and laundries that is also an essential element in the conservation of resources. Providing these initiatives would require the breaking down of the divisions between architecture and landscape planning.

The huge architectural possibilities of designing for public transport and density have started to be explored in areas of Germany notably at Kreuzberg in Berlin.[58] A strategy is outlined by Harley Sherlock for Transport 2000 in 'Cities are Good for Us'.[59] Michael Hough describes initiatives in Toronto and Stockholm.[60] Harley Sherlock argues that cities can keep their vitality, loose their irritating and costly traffic congestion, and again become places where children play in their own streets and where shops, pubs, schools and doctors' surgeries are close at hand.[61]

Clearly as Breheny and Rookwood point out that the compact city is contrary to present trends (the most persistent trend in last 50 years).[62] They thus describe it as 'Canute-like' noting that "policies of urban containment will no doubt continue to be appropriate, but they must be realistic". They argue that the solution also fails to accept that sustainability must balance other environmental aspirations and there is little point in creating an alienated community for the sake of energy conservation from high densities. Such criticism seems a misinterpretation of Sherlock's compact city which is not universally suggested and has more to do with mixed use than density *per se*. Further I have argued that we are already creating an alienated community by our low density single class monocultures. The common alternative to the dense mixed use city is the spread city - analogous to the 'social city' - a network of self-contained cities combining urban and rural life.[63] Breheny and Rookwood suggest addressing the whole Social City Region (after Howard) with policies attuned to the varying conditions and environmental potential of differing parts of the region. They define a six fold typology in the interests of manageability - city centre, inner city, suburbs, small towns and new communities, mixed urban-rural areas, and remote rural areas.

---

[55] Kevin Murray of Tibbalds Monro, 'mixing activities and uses', lecture from, *Making People Friendly Towns*, 25 November 1993.
[56] C. Richard Hatch, 'Toward a Theory of Social Architecture', introduction to C. Richard Hatch, *The Scope of Social Architecture*, Van Rostrund Reinhold, 1984.
[57] ibid.
[58] 'Who Cares About Ecology Now', *Architects Journal*, 25 January 1989.
[59] Harley Sherlock, *Cities Are Good For Us*, London, 1990.
[60] Michael Hough, *City Form and Natural Process*, Routledge, 1989.
[61] Harley Sherlock, *Cities Are Good For Us*, London, 1990.
[62] Michael Breheny and Ralph Rookwood, 'Planning the Sustainable City Region', in Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.
[63] John Holmes and Geoffrey Steely, 'Town and country', in David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.

7.2.4. Economic Change

Elkin isolates four general areas of economic reform in relation to ESD (environmental sustainable development):

- reduction of pollution emitted and consumption of resources (including energy) in the production of goods and services;
- reduction of pollution and energy *for distribution of raw materials, goods and services*;
- reduction of pollution resulting from consumption of products;
- *promotion of economic development that contributes to sustainability.*

In each case, he notes, both fiscal and regulatory (including land-use planning) mechanisms are needed. The fourth point involves economic planning policies to direct both public and private investment into economic activities that promote sustainability such as renewable energy generation, waste recycling, public transport and co-generation of energy and heat. It also involve projects that *add* to environmental capital such as land decontamination, ecological landscaping and city farming.

For SESD (social ecological sustainable development), as noted, future urban development must not however follow past trends of top-down development (fiscal and regulatory), but should aim to reduce dependence and vulnerability. This also involves changes in patterns of work and economic activity within the city. Robertson argues that policies need to encourage a change of direction towards more conserving patterns of production and consumption but also greater self-reliance. In fact, the two go together. Mixed use reduces distributional costs and increases the potential of self-reliance that can address dependence and vulnerability. Further conservation involves more efficient use of resources all round, including actual and potential human resources.

Moves in this direction should enable a reduction in dependence at every level (city as well as household and nation) on external employers and suppliers. Such self-reliance would be enhanced by effective democratic participation, in local government and within the workplace. *I have noted how for Bookchin such action should not be limited to the workplace but address the division between work and social life.* As noted self-reliance does not mean complete economic self-sufficiency on the local regional or even national scale but implies trade on equal terms, a reduction in dependence and a greater degree of economic self-sufficiency. Sustainable urban development needs wherever possible, to make use of available local resources, especially human resources and consume local products. It should be noted that while internalising a market could be achieved by banning, for example, export of waste, an informed population and technologies able to meet this ban are needed.

7.2.5. Social Change and Self-reliance

SD emphasises the need to raise the absolute standard of living of the poorest in society. For greens this cannot be done by continued economic growth but must involve redistribution. Such a strategy involves ensuring local communities benefit from regeneration of cities in terms of access to housing, employment and facilities. To achieve development we must redistribute resources but also replace 'standard of living' with 'quality of life'. Again arguably the best method to achieve this is to empower those people.

This can be aided by involving them in the planning and decision making of regeneration. Enabling communities to participate in planning and decision making has an additional benefit in terms of confidence and skill acquisition. It can be argued, in addition, that direct community involvement in the planning and management of the locality can develop a commitment to sustainability starting at the local level. Certainly local people will have the ability to reflect local needs e.g. building local parks and workshops with the result that demand for transport may be reduced. Self-build projects discussed in the next chapter have often taken place on waste land, provided jobs, satisfaction, confidence. As described public transport and mixed use is a critical 'support' to achieving socially cohesive environment and empowering inner city communities.

Participation and local control may increase responsibility and environmental competence but not necessarily reduce export of pollution (care for other environments) or consumption. *Economic self reliance and the satisfaction to be gained from responsibility may however challenge our conventional notion of economic growth. It is concerned with the development of the individual and the community in a continuing and evolving dynamic relationship with a socio-economic and physical environ*ment. *The social ecological case is that such actions reduce hierarchies and thus reduce the need to 'exploit' nature.*

7.2.6. Socio-economic Self-reliance

Elkin argues that considerable advances towards SD with associated social and economic benefits can be made through community regeneration particularly aimed at encouraging the economic self-reliance of those communities.[64] For social ecologists such action is imperative *and critically must involve the home and workplace*. I have discussed today's divide between economic and social aspects of life and the resulting inefficient city form. Work can alternatively be seen as a social activity and an alternative strategy (environmentally and from a green perspective) would need to increase the link between the two. More generally this involves considering better housing, health, education, job prospects, incomes and increase confidence and capacity of local people as a single constellation of needs. Arguably this can be best addressed through support for locally self-reliant, smaller, co-operative and community businesses. Currently imports of labour and materials reduce local independence. Alternative development would make use of local resources, especially human resources and consume local products where possible.

Robertson argues that local economic self-reliance requires that households and neighbourhoods become active centres of production of goods and services for the people living locally.[65] When a local community owns a business, at least some of the profits would circulate in the local economy. In looking to sustainable development the supply of energy, continued reduction of consumption of heat, light and power through modern conservation methods would thus be complemented by local supplies e.g. district heating and combined solar hot-water panels.

In implementation such strategies present problems of balancing an enabling approach that attempts to empower local people and local communities to take more control over, and responsibility for, their own economic and social destinies with the conventional 'top-down' or 'trickle-down' approach to community revival. Support can aid self-reliance for example in mixed use development plans but professionals may dominate and take over. Self managing residents associations are discussed below along with the collective provision of goods and services (Easterhouse, Ashram, Buyers Coops). Participative architectural schemes have also initiated local economic development and are discussed in *Chapter Nine* along with *SkillBuilding* that includes 'local employment' and 'social investment'. Such a move requires mechanisms for facilitation of local initiatives - enabling and pro-active schemes for people to 'sign-up' for. Elkin points out that this should not mean the removal of social support services but that mechanisms should ensure that training and support, buildings and land are available for such initiatives. I discuss this critical balance with specific reference to housing in chapters eight and nine.

7.2.7. Local Economic Development

Although local economic development is not necessarily environmentally advantageous there are reasons to believe that locally self-reliant, smaller co-operative and community businesses will increase sustainability since, as outlined, they can form the basis of increased local circulation of capital, materials and labour and *greater local self-reliance*.

In general labour-intensive businesses will decrease environmental impact and community businesses often have the specific goal of employment creation. Although replacing labour for capital may be seen as increasing drudgery this clearly depends on the specifics of the project. Elkin argues that increasing economic self-reliance also means the resource base is visible and thus environmental exploitation is reduced.[66] Efficiency may also be increased due to a more direct response (see *Chapter Nine* for Housing efficiency).[67] Some community businesses may be set up for environmental improvement (discussed in 7.2.8. Local Environmental Action). Community enterprises set up allow for targeting of resources to poorer communities. They also recognise that not everybody wants to be self-employed (self-reliant)

By contrast it can be argued that such employment creation provided in the city will increase equity but not necessarily sustainability if it is simply to earn money for material consumption within a growth economy. In addition pollution abatement technology may be more viable for larger firms. Small firms may still generate externalities particularly pollutants that have a limited local impact. National specialisation enables intensive research to produce technological solutions (confederation of community enterprises). Such issues underline the need for regulation and policies that are not simply towards local economic development but types of local production or businesses meeting local needs that are not small enterprises in a growth economy. A sustainable policy would then offer support, both technical and financial, for bottom up initiatives (as housing problem of government support for self-help). These

---

64 Elkin, McLaren and Hillman (eds.), *Reviving the City*, Friends of the Earth, 1991.
65 J. Robertson, *The Economics of Local Recovery*, New Economics Foundation, London 1986.
66 Elkin, McLaren and Hillman (eds.), *Reviving the City*, Friends of the Earth, 1991.
67 John F. C. Turner, *Housing by People*, Marion Boyers, 1991.

would however be of a particular type. Such initiatives include certain community businesses and co-operatives, neighbourhood service co-ops, food co-ops and housing co-ops. Increasing interaction between various local co-ops is an alternative method of support (anarchist federation) that aims at sustainability.

• *Workers co-operative* - A trading organisation owned and controlled by its employees, on the basis of one person one vote. Co-ops usually have 'common ownership', the assets being held collectively not individually. *This means that when a worker leaves, she or he cannot pull out a proportion of the company's capital.*
• *Community business or community enterprise* - A trading organisation owned and controlled by local people in a particular area, or people with a 'common bond', with both commercial and social objectives. Membership is open to all people in the community; benefits and profits go to the whole community. Community businesses are often 'multi-functional', with a range of activities, and often act as umbrella organisations for other sorts of enterprise. They may be partially subsidised. Employees and supporting organisations such as funders may also have some rights of control.
• *Community co-operative* - Similar to a community business but with the benefits and profits going to members of the enterprise, not the whole community it serves.
• *Development trust* - An independent non-profit organisation which takes action to renew an area often through refurbishment of buildings or provision of employment opportunities. They encourage involvement by local people and are managed by a voluntary board, often involving representatives of local businesses and local government! Often initially funded by local authorities they obtain financial and other resources from a wide range of sources including the generation of revenue from their activities.

7.2.8. Local Environmental Action

Community 'businesses' and voluntary organisations have been established specifically for environmental improvement. The growth of local environmental action demonstrates how 'greening' is often community led of 'necessity' and in response to desolate inner city environments. I have described how the flight of jobs and investment from the cities combined with recession and cuts in public expenditure has left behind many jobless and disheartened communities. Joan Davidson argues that the inability of conventional economic models to reverse this trend has resulted in growth of locally based *economic initiatives or environmental improvement projects*, often community based enterprises in the voluntary sector.[68] David Nicholson-Lord describes how the impotence of the central state in regenerating cities has resulted in it looking back towards these community initiatives for answers.[69] In recent years they have formed an increasingly active 'third arm' body of organisations often aided by enabling groups who provide advice and technical assistance and brought together by national co-ordinating bodies.

Davidson notes that with growth of environmentalism, the message of resource conservation and SD combined with derelict inner cities wastelands a growing number of local community initiatives are becoming associated with greening in various forms. Examples include practical resource conserving activities, city farms and food production, energy saving and insulation schemes, waste recycling, rehabilitation of buildings and greening of vacant land. Community gardens have often including natural green space inspired by the Dutch landscapes described above. Local renovation of and or buildings has often generated the enthusiasm and confidence to extend activities. Landwise in Glasgow for example have renovated the back courts of peripheral housing estates, creating community gardens, allotments and play spaces and attempting to create local jobs in the process. They are responding to the objective realities that Bookchin outlines.

Joan Davidson divides local environmental action into 3 broad areas:

• activities associated with greening (i.e. city farming, community gardens and food production);
• energy conservation;
• waste recycling.

While countryside conservation as it developed this century was the preserve of the middle classes local action in responding to the factors outlined is often the preserve of poorer inner city communities. These activities around the country of 'infinite' variety provide evidence to support Colin Ward one of body of anarchist writers arguing that urban regeneration will only come about with greater local self reliance.[70]

[68] Joan Davidson, *How Green is Your City*, Bedford Square Press, London, 1988.
[69] David Nicholson-Lord, *The Greening of the Cities*, Routledge and Kegan Paul Ltd, London, 1987.
[70] Colin Ward, *Welcome Thinner City: Urban Survival in the 1990's*, Bedford Square Press, London, 1989.

As noted green initiatives. in addition, often intrinsically promote local self reliance. Local insulation schemes for example will reduce fuel bills directly but also through raising of awareness of home energy saving techniques. The local action described here particularly the city farm are perhaps the best examples of a reintegration of functions within the city in response to the city form produced by the division of labour. Allotments and city farms are accessible but not based on complete self-sufficiency.

Neighbourhood recycling networks, city farms, loft insulation schemes also provide a focus for local meeting and organisation. Landscape schemes offer the opportunity to create shared space. In this way the city is co-operatively redesigned. Its waste space offers the opportunity for whole community to display its talent often through landscape design. David-Nicholson-Lord describes how "Art particularly landscaping and architecture, does not operate in a social vacuum. The tower blocks that litter our cities are as much the consequences of the mass packaging of instant solutions as are soap powders and polyunsaturated margarine's."[71]

David Nicholson-Lord uses the example of tree planting by the council to illustrate the potential sustainable nature of local action. Planting is another job in another hole in another pavement in another district. It is then caged against 'natives' but usually vandalised. The act may then be repeated perhaps following committee procedures and anti-vandalism conferences or since it is expensive the site may be abandoned. The point is that the moment of planting is a fraction of the trees life. Industrial society has done much to disjoin the mechanical from the human content of technology with concentration on the former and minor part. A tree will be around for 100 years compared to 30 minutes to plant it. This has economic and ecological cost. David- Nicholson-Lord points out that three-quarters of the shrubs and trees planted conventionally do not survive. By 1981 areas of Liverpool were being replanted for the third time in a decade.[72]

In concluding a report on ten derelict land take-overs throughout Europe Shirley-Smith argues that common to all was annoyance at vandalism and litter.[73] There was a concern for waste of resources in the inner city in the form of unemployment, dilapidation and futility. These small schemes represented rebuilding of hope, the idea that every one can be involved in greening the city. Many local authorities have recognised the benefits of aiding and partially funding such schemes while some in Holland were inspired by forward thinking local authorities. Stamp notes that "involvement of users in design requires flexibility".[74]

Community Technical Aid Centres (CTAC's)

Alexandra Rook describes CTAC's based mainly in hard pressured urban areas developing "out of an increasing awareness of the vulnerability of local communities to the economic pressures of environmental change which they too often appear to be worsted by".[75] This applies to both cycles of decay and regeneration. Those who lack economic clout are trapped if the area is a comprehensive redevelopment area or enterprise zone (or whatever the latest mechanism is called). The indigenous population are generally ignored and even if they are recognised better housing and alternative jobs tend to result in provision for those outside the area.

Technical Aid attempts to redress the balance enabling local communities to focus their needs on specific projects and achieve them. Rook stresses the importance of process not simply attainment of end product. CTAC's tend to be limited by guarantee, many have charitable status and some register as co-operatives. Further they encourage user control by elected management committees. The services offered are dominated by the design professions - architecture, landscape architecture, planning but also include community art and legal aid. The aim is to demystify the process through which a project evolves while steering the project through tortuous funding, winning local and political support and securing a site.

As a result CTAC's can help to express the innate abilities, strengths and resources of a community using it's local knowledge to benefit a project "The role of CTAC is to harness this local intelligence and enable solutions to be found that stem from the community itself".[76] CTAC's enable local communities to obtain resources. Rook argues that while local authorities are often reluctant to release land they will more often lease land and fund environmental improvements. Until however local communities have more control of

---

71 David Nicholson-Lord, *The Greening of the Cities*, Routledge and Kegan Paul Ltd, London, 1987.
72 ibid.
73 Chris Shirley-Smith, 'A Patchwork View of Action involving Community Groups on ten Derelict Land Sites in Europe', *Landscape Research*, 14(2) 1989.
74 Dee Stamp, 'Inner City Community Gardens', *Landscape Research*, 12 (1) 1987.
75 Alexandra Rook, 'Landscape Aid', *Landscape Design*, May 1989.
76 ibid.

resources they will continue to be at the mercy of handouts. CTAC's work under the umbrella group of ACTAC the Association of Community Technical Aid Centres formed in 1983.

Community Gardens
Chris Shirley-Smith describes action to reoccupy derelict land carried out by local people of all ages and abilities throughout Europe both with and without the consent of the authorities.[77]. Some authorities were opposed to the 'usurpation' of their own powers. The results show that "far from being a minority preoccupation, many citizens in Europe are becoming engaged in a variety of reclamation initiatives involving the natural environment".[78] Unfortunately the act of community improving blighted areas often brought 'unwanted' development pressure in their wake. Again this is due to no genuine transference of power (see *9.1. Byker: problems of participation* for a housing example) Dee Stamp describes the range of involvement in landscape: from locals taking over derelict land, to involvement in shaping council plans.[79] In either case a landscape architect working with a local group can produce more appropriate solutions an encourage discourse and maintenance.

Frederick Street Garden in London was developed in 1985. The land had been vacant since 1944 with destruction of four houses near Kings Cross Station. Several factors had however prevented commercial redevelopment. The plot lies in the heart of architectural conservation area and half is over a heavily used railway tunnel. In addition there are four owners of the land. As with many of these projects the garden has developed on tenuous legal standing since only one of the owners would give a temporary licence and has been created with awareness of its potentially temporary nature.

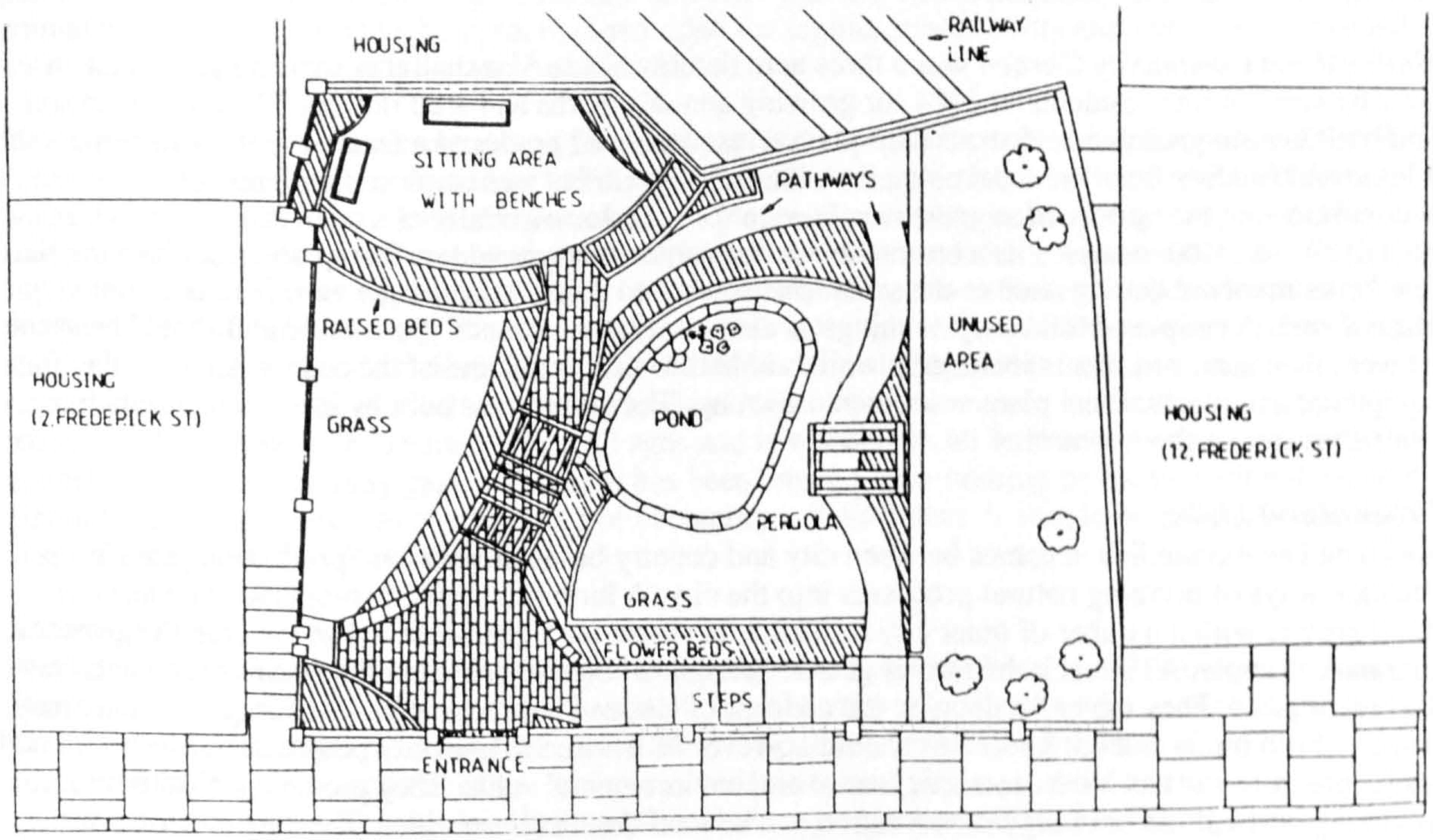


Fig. 7.1. Frederick Street Garden Plan[80]

A management committee of local people was set up to oversee and execute design of the gardens. Money was raised from a variety of sources but the project was given initial impetus from the London Borough of Camden and the DOE Derelict Land Grant. Growth unlimited, Camden's Community and Wasteland Project and Town Trees Trust, (an urban tree planting scheme) have worked with the local community to form Frederick Street Garden Association to create a specially devised garden. It is geared to serve the immediate neighbourhood - a day centre for the elderly, sheltered housing as well as local individuals many of whom are wheelchair bound. Special features thus include raised flower beds adapted for wheelchair gardening, a slip proof ramp as well as a pond, pergola, wildlife area and

---

[77] Chris Shirley-Smith, 'A Patchwork View of Action involving Community Groups on ten Derelict Land Sites in Europe', *Landscape Research*, 14(2) 1989.
[78] ibid.
[79] Dee Stamp, 'Inner City Community Gardens', *Landscape Research*, 12 (1) 1987.
[80] Chris Shirley-Smith, 'A Patchwork View of Action involving Community Groups on ten Derelict Land Sites in Europe', *Landscape Research*, 14(2) 1989.

greenhouse. The 'fit of the project is due to participation. Volunteers for more demanding maintenance are readily available due to the close relationship with the Day Centre and local community generally.

The St Gerrad Majella Allotments Co-operative in Vauxhall, Liverpool was developed by the Eldonian Community Association in 1986. The Eldonian Community Association is a self-help group who formed due to housing need in an area blighted by planned outward movement. The allotment co-operative was an off shoot of this utilising a one-third of an acre site nearby (allotment systems normally comprise one-eighth acre plots). In an area of high violence and overcrowding the project was initiated by several welfare agencies for "people trapped and isolated in their homes" originally with "neither the knowledge, money nor the energy to initiate such a scheme".[81] Some twenty elderly people who had never before cultivated vegetables now tend, water and plant crops. Heavy maintenance is provided by the Community Service Department with long term view of creating one or two jobs on the garden. The site is now run by a committee of those participating who are also looking for further sites. Shirley-Smith describes the intention to link back to the Eldonian's through the Garden Market Enterprise that has also grown nearby and sell some of the produce. Again a link is evident between social function and community business.

Falkland Place in London NW5 is a playground of approximately one-quarter acre. The surrounding residents were involved in decision making, design and opening although maintenance is carried out by the parks department and the park was built by contracted labour. A New York graffiti artist was employed to covered one wall on the site. Nearby householders are able to see the site from upstairs windows providing security and 'vandalism' is minimal. Stamp reports that interest in the playground among locals has been maintained.[82]

Harley Road Community Garden was a three acre derelict site in Vauxhall that was unofficially taken over by surrounding residents in 1984 for growing annuals, herbs and wild flowers. They moved in soil and built lean-to greenhouse. Locals then pooled resources and produced a feasibility study to help secure a lease and funding from the local council. A landscape architect was employed with role of accommodating the variety of suggestions. Design took the form initially of a open day on the site. A plan of site at 1:100 was used as a base with cut out garden features added. Stamp describes how the first few hours involved getting used to the scale "pacing up and down, imagining a view here or a sunny place there". A couple of follow up evenings to discuss what the council grant could and should be spent on were then arranged. Items included a wall to hide the sight and sound of the nearby A2, safe play equipment and plants. Final plans were then drawn up. The project was built by local residents and contractors under their control.

Urban-Rural Links
Social and economic link schemes between city and country based around food production provide strategic ways of bringing natural processes into the city. A farm link or food co-operative connects a small grower with a number of inner city residents. In return for a guarantee to bye the crop the grower guarantees supply. As a result the farmer gets better than wholesale price and the urban participants less than retail price. They may also develop the concept of labour for direct credit. The scrap of the city may also be of use on farm land. Strategies should however be devised to give city people access to land. Food production projects can have economic, social and environmental value. They promote self-reliance, recycling, horticulture or energy conservation and address derelict inner cities. They are of economic value in reducing the 'poor pay more' factor and as an essential part of regeneration of cities.

Windmill Hill City Farm
Windmill Hill City farm was developed on four and a half acres of derelict scrap-yard at Bedminster in South Bristol. The scheme was started in 1975 following protests against a proposed high security lorry park. Ideas for a city farm emerged at a local meeting held to gage opinion and shortly afterwards land was obtained at a peppercorn rent from local council. In 1977 volunteers began to build after a management committee of local people had been set up. The farm was registered as a charity and funds raised by local people. The farm now forms the home of The National Federation of City Farms the co-ordinating body which has a rapidly growing membership of city farms and community gardens and helps in extending their role as social and educational centres and to develop them into small businesses.

Joan Davidson argues that in ten years local activities transformed the area from a landscape of rubble and abandoned cars into a thriving community centre used and valued by thousands of local people.[83] She describes how continuous development and modification of farm layout and activities in response to local

---

[81] ibid.
[82] Dee Stamp, 'Inner City Community Gardens', *Landscape Research*, 12 (1) 1987.
[83] Joan Davidson, *How Green is Your City*, Bedford Square Press, 1988.

need has continued since its opening with the aim to produce a wide range of educational and recreational activities for all groups in the community and create an attractive useful and productive environment combining community functions with economic and environmental goals.

There are six main activity areas - farmyard (animal husbandry is free range), community gardens, paddock for grazing animals, chicken pen for egg production, nature reserve and all weather sports pitch with associated play spaces. Gardens accessible to the disabled have been a recent addition and a tree nursery and herb garden under construction. The buildings on site include a barn to hold farm animals, play centre, workshop, administration and craft space, cafe and dairy. The play centre and cafe are purpose built although argues Davidson every effort was made to acquire cheep existing buildings. The barn was designed partly by architecture students and built by volunteers, others buildings were existing. Unwanted and usable building materials are regularly collected from the locality and stored on a recycling yard on the farm.

Windmill Hill City Farm attempts to offer something for everybody in an area of high unemployment. With a range of 'green' and 'non green' activities green becomes part and parcel of every day life not a 'mystic' idiosyncratic activity. The play school operates throughout the week for disabled and pre school children. Children's clubs after school and on Saturdays are based on farm activities. There is also an adventure playground for older children and the sports pitch for teenagers and adults. Community care activities form a vital part of the farms growing activities and include support groups for new parents and those with handicapped children, a women's health project and counselling groups for young and old. The gardens and greenhouse produce plants for sale and offer training courses in horticulture. Craft and animal husbandry are also taught. A room is provided for regular school visits and links are maintained with local ecological farms (urban and rural links).

Volunteers created and almost sustain the farm and approximately 500 people are associated with it. A core staff of volunteers are now paid as MSC employees. Moneys are provided from urban aid grants while the peppercorn rent is gradually phased out as the 'community business' side grows. Avon City Council provide funds for the community care activities. The farm now has 19 permanent staff, half supported by the firms revenue (membership of 700+ families, weekly activities and courses, sale of produce and local fund-raising). The aim is to become increasingly self sufficient and increase training of staff and volunteers. Davidson describes Windmill Hill as "a working model for community resourcefulness. It makes productive use of wasteland, creating a green oasis within the city, offers recreational and education experiences for all ages and is working in an innovative way to realise the opportunities for community gain.". The farm has been created from nothing by locals within the city, not 100 miles away, and now has every chance of becoming self sufficient. It should be added that the form is specifically geared to fit local needs.

Ashram Acres

Ashram acres is a community land use project in Sparkbrook an inner city area of Birmingham. Joan Davidson describes Sparkbrook as a multi-racial area hit hard by recession and the decline of cities resulting in high unemployment and low moral.[84] At Ashram Acres however a small group have succeeded in using the resources of the area, namely derelict land and local skills to grow food for local consumption. Gill Cresing describes how they "looked not just at the problems but at the assets of the neighbourhood - its land and people".[85] The project is run entirely by volunteers and has developed into a focus of local activity, a meeting place for people of a wide range of age, race, class and culture.

Ashram Community Services Project was set up 1980 on Gratham Street, a street of near derelict Victorian houses. In 1981 two partly tarmaced and unused back gardens were dug up by community members and planted with vegetables. After initial success an adjacent garden was planted in 1982. In 1983 two more sites of demolished houses were given to the scheme by the city council. Goats were brought and kept and milk and cheese produced for sale. Activities continued to spread and by 1988 ten gardens made up the scheme growing a rich variety of fruit and vegetables with some goats, geese, rabbits, chickens and hens. They now conduct experiments in organic pest control and growing methods - raised beds, greenhouses and polythene tunnels that are evaluated on improved production and cost. Recycled materials are used where possible.

Main aims now include demonstrating methods to other local people and propagating seeds for other gardens. They also help with clearing new gardens in other neighbourhoods and hope to create new small businesses and permanent jobs in horticultural management and catering if start up funds become

[84] ibid.

[85] Gill Cresing quoted in Joan Davidson, *How Green is Your City*, Bedford Square Press, 1988.

available. Food was previously a major item of expenditure in peoples budget and fresh vegetables are now a vital source of vitamins and minerals in a generally impoverished diet. A wide range of exotic and native species are grown. Joan Davidson describes Ashram acres as "more than a land reclamation scheme. It makes use of wasteland and wasted skills in a way that has meaning for local people". As with Windmill Hill it has helped to generate local confidence and reactivate the area working closely with local schools and caring institutions. Again the needs are specific to the area.

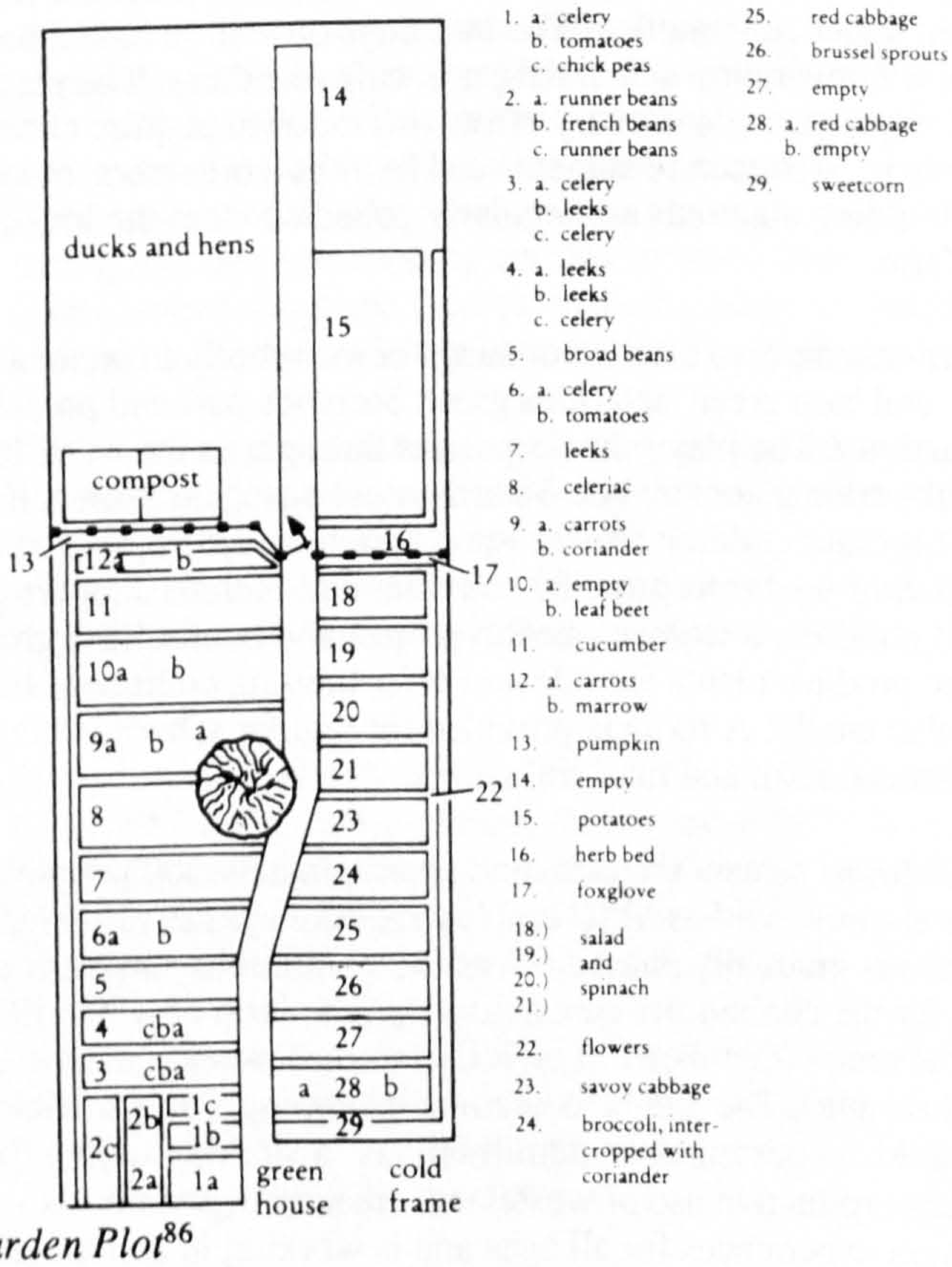


Fig. 7.2. Ashram Acres Garden Plot[86]

7.2.9. Cities and Citizenship

The Benefits of the City

A predominant green view is that urbanism broke down a utopia of symbiosis between people and their environment. Less comment is given on the problems of pre-industrial society that made cities liberating places - a means to escape being shackled to the land. Neither is credit given to how the city can stimulate and excite. The two poles of liberation on the one hand and disconnection, conspicuous consumption and exploitation on the other are what make up the city. This can be looked at as liberation of the *social space* but consequent exploitation of the *economic space*. It can be argued however that the Capitalist fetishism of commodities are not intrinsic to the city. I have noted how reduced division of labour and increased self-reliant if not self-sufficiency are possible in the city. Neither, I argue, is Bookchins notion of recreating the 'psyche' impossible in the 'city', rather some elements of the city are essential to it.

I have noted the connection between urbanism and forms of economic production and organisation. Cullen notes that "the great liberating force of urbanisation, bringing with it the capacity to change nature through the forces of production, has eroded the nature of citizenship".[87] It is in the city however that citizenship can flourish. Further, the emerging city while de-skilling created a hot-bed for insurrection by concentrating the masses within spatial production loci. Today's city has moved from a productive role to providing a new regime of consumption and accumulation which combines spatial dispersal and mobility, and flexibility in labour markets, labour processes, and consumer markets, while being tightly controlled by management systems operating powerful information agencies to monitor and respond to markets.

In the City in History Mumford describes how Rome eventually became not the centre of production but consumption dependent on extended territories. Its disintegration he argues was the result of over-growth,

---

[86] David Nicholson-Lord, *The Greening of the Cities*, Routledge and Kegan Paul Ltd, London, 1987. p153

[87] Joe Cullen, 'Mad Maurice III: 'metropolitans in the making'', in David Cadman and Geoffrey Payne (eds.), *The Living City: Towards a sustainable future*, Routledge, 1990.

the loss of control of economic factors and human agents that were essential to its existence. A further product was the destruction of soil conditions in large parts of North Africa (nb global exploitation today).

The Situationalists described the totality of domination by a new type of capitalism as the 'Society of Spectacle'. "As production becomes concentrated within the hands of giant corporations, their control over consumption is steadily increased. At the same time, a process of consumption transformation is taking place, where millions of individual consumer actions are being structured into 'spectacular lifestyles'."[88] Attention is diverted from the internal (and external) contradictions of capitalism into fashions, crazes and movements. A major problem of revolution is erosion of critical ideology by consumption. Basis of change must be power relations. This problem is however, I stress, not intrinsic to the city. The solution lies in greater political, social and economic self reliance not self-sufficiency. This is attainable within the city form I have started to define.

Future City

For Holmes and Steeley the intrinsic link between 'city' and 'countryside' makes the distinction between them inappropriate. The Spread City is the next evolutionary form of human settlement, reflecting human aspirations and ecological constraints.[89] The Spread City is akin to Howard's Social City - a network of self-contained, settlements containing the best of urban and rural life. Holmes and Steeley see the spread city emerging with developments in communication technology. In looking for a future set of interactions and the structure where they may take place they note that interaction, production, and accommodation no longer need to be in close geographic proximity.

Holmes and Steely see the decentralised city of telecommunications as liberated and freed from class conflicts. Joe Cullen like Bookchin however notes that "The pace of technological innovation, far from encouraging a general raising of educational and technical standards, and a corresponding expansion of job opportunities, simply exacerbates a 'de-skilling' process inherent in capitalist enterprise."[90] Post-industrial society becomes a more potent version of the factory system that as described appropriated workers control over means of production and progressively de-skilled vast sections of society. The technologies of the new dispersed city (interactive communication systems, electronic mail, home banking and purchasing), within the sphere of capitalism, serve increasingly to privatise individuals isolating them within the minute spatial locus of the home. By contrast the power of the state and corporation increases, "as the city appropriates functions which before gave individuals at least limited opportunities to indulge in 'liberating practices', via the community and the workplace."[91]

Neighbourhood Units

Rayner Banham notion of 'community of peers' sees the traditional community idea as parochial. Hansen also notes "It has been a cardinal belief for years that communities can only flourish if they are small and well defined; and if architecture creates separation as a way of establishing identity [through] small, highly localised living areas."[92] Traditional urban communities, he continues, were never like this but were unstructured and diffuse. What made them safe was that you would never know who you might meet in the street, but that you could be fairly sure that you would meet someone. Strangers policed public space while inhabitants knew each other well enough to police the strangers. Cadman and Payne also criticise the 'neighbourhood unit' "The neighbourhood unit concept is at best neutral and at worst antipathetic to the development of an integrated community life...basically because people are not contained or constrained in their behaviour by the planners imposition of a territory based community and because the delineation in territorial terms is neither desired nor perceived."[93]

Urban or Personal Self-reliance

James Robertson proposes what he refers to as a 'sane, humane and ecological' vision of city development involving greater self-reliance at *urban* and *personal* levels. [94] More self-reliant national economies could be added. Emphasis would be placed on 'quality of life' in which trends in technology are related to

---

[88] ibid.

[89] John Holmes and Geoffrey Steely, 'Town and country', in David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990. p145

[90] Joe Cullen, 'Mad Maurice III: 'metropolitans in the making'', in David Cadman and Geoffrey Payne (eds.), *The Living City: Towards a sustainable future*, Routledge, 1990.

[91] ibid.

[92] quoted in Elkin, McLaren and Hillman (eds.), *Reviving the City*, Friends of the Earth, 1991.

[93] David Cadman and Geoffrey Payne, 'Towards another city', introduction to David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.

[94] James Robertson, 'Alternative futures for cities', in David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.

changes in personal attitudes, work and life-style and the possibilities of a new economics. People would be less dependent on large institutions of government, business, finance, trade unions, and professions for work and provision of goods and services.

Robertson's city however is rurally based developed around modern communications and local small scale food processing (similar to Kropotkin). There is a critical green debate between:

- compact social city (e.g. Sherlock and Cullen) with greater self reliance,
- spread city (e.g. Robertson, Holmes and Steeley) based on tele-homeworking,
- both depending on applicability to existing situation (Breheny and Rookwood).

Extremes of rural village utopia spread over country linked by computer or keep cities as compact self-contained units. Here I propose the city decentralised in terms of control but centralised and dense in form. In both cases inhabitants will have more control over their economic destinies than most urban dwellers today. Clearly conflicting trends will emerge suited to particular situations but the city should be maintained and self-reliance developed at local, urban and regional scales.

Architectural Determinism

The future city then should be about the ways in which power relationships are resolved. Cullen criticises architectural determinism (the capacity of architectonics to uplift spiritually, morally, and materially, the human existent) as "the classic delusion of seeing angels in architecture". For Foucault "Architectural determinism is fallacious, it cannot succeed. There is nothing inherent in the structure of things to guarantee freedom. Essentially, the guarantee of freedom is freedom. The city, its built form and the practices of those who sculpt that form will largely conspire to impose those rigidities essential for the rationalisation of control over individuals"[95] For Cullen "architecture can create conditions under which the operation of liberating practices can be facilitated *a little*" (my italics). Architecture cannot however be liberating in itself. These views are similar to those of Bookchin (discussed in *1.7. The Social Matrix of Technology*). Riots are not simply the result of bad housing and unemployment but also the crushing of alternative urban economics. Oscar Newsman's 'defensible space' is architectural determinism in making generalisations about the needs of people by professionals without involvement with process. *Active participation at a community level is critical as is a vitality of local institutions and cultures within reach of all citizens not in alienated form of national media celebrities.* This is Bookchin's *Social Matrix of Technology.*

Koestler describes present citizenship as an interplay between a restricted set of fixed rules within which we can play out flexible strategies.[96] For Cullen however the nature of urbanisation is becoming more and more that of the dominant coercive force. Inner city riots cannot be traced only to environmental (or economic) determinism, focused on the part played by bad housing and unemployment but involve the role played by institutional agencies in crushing alternative urban economies. The 'alternative' economy presents liberating opportunities. The subversion of everyday life to capital is creating on the one hand a society of spectacle and on the other it is marginalising large sections that it has no use for. Cullen quotes Thomas "The vitality of local institutions and cultures, even in a differentiated society, is critical for forms of social organisation that are within the reach of all citizens, and not just present in the alienated form of national media celebrities".[97]

Architectural determinism is as flawed as economic determinism (the growth paradigm to social ecologists) but for Cullen "If there could be a blueprint for urban survival, its architects ought to be motivated by a concern to create the conditions under which liberating practices might themselves be allowed to flourish."[98] The problems faced by northern industrial cities are not simply rooted in regional funding but in power relations. In the area of political economy it is the institutional structure of power relations in terms of central and local government and their *bureaucratisation of the individual.* The 'problem solving' disciplines of architecture, planning and landscape design have a critical role. I go on to discuss how architects can address power relationships in *Chapter Eight* and *Chapter Nine.*

7.2.10. Delivering Regional and Local Sustainable Development

The EC's notion of 'subsidiarity' to accompany SD is that decisions should be made at the lowest effective level. This must however be combined with a need for close co-ordination of plans at all levels. The role

[95] ibid.
[96] ibid.
[97] ibid.
[98] ibid.

of authority should be of creating an awareness and understanding of environmental issues, providing the guidance of regional sustainability plans and using development control and building regulations. Support and enabling policies of local self-reliance may mean development of *locally derived regulatory controls* on a whole range of ecological criteria. Issues should be discussed with reference to particular contexts but subject headings would include;

- types of new mixed urban form and energy conservation,
- existing urban form and energy conservation,
- promotion of public transport initiatives,
- appropriate solar power and low energy design,
- promotion of local and district CHP,
- trade-offs between environmental and social criteria,
- local and regional waste disposal arrangements and co-ordination,
- urban greening, local ownership and city co-ordination,
- habitat protection, creation and local ownership,
- local and regional recycling schemes and co-ordination,
- maintaining urban densities,
- appropriate local building controls.

Resources for such projects could be made available by enforcing 'polluter pays' principle. Ralph Rookwood points out the importance of demonstration projects as practical evidence of what can be done.[99] These should be concentrated in the inner city.

7.2.11. The Livable, Equitable and Healthy City

Both SD and GSD promote alternatives to economic growth in terms of 'quality of life' for city dwellers. In development of sustainable cities it is critical to assert the notion that SD can improve quality of life in cities and that economic growth at present is destroying it. Three areas of potential benefit that I have developed are summarised here; livability, health, and equity.

Livability
The notion of livability discussed here includes social contact and diversity of experience, access to services and green space, safety and security. I have already described many ways that city forms, developed around public transport and pedestrians, can increase 'quality of life'. Cadman argues that the city is a place for social contact that would be increased if our bias towards the car was reduced within the city.[100] Elkin quotes Hillman "In cities today, where transport is based on the motor vehicle social contact, particularly incidental social contact is lost. The substantial rise in traffic and its ubiquity have had many adverse social and environmental consequences. Wide roads and streams of motor vehicles destroy the function of the street as a locus for social interaction and break community ties, particularly for children. Cars are more responsible than any other main methods of travel for a reduction in the environmental quality and a distortion of preferred travel patterns. And they are available on an exclusive basis, to a minority of the population."[101] Women suffer particularly from reduced social contacts as a result of these factors.

City life is given its character by the diversity of services and facilities but these facilities need to be accessible. In *Chapter Two* I described how the car, while perhaps increasing mobility, has decreased accessibility. Further those living in the suburbs enjoy residential mobility and spacious surroundings at the expense of those left behind in the city and the quality of environment generally. Congestion in cities is a result of people still requiring city facilities despite living in the suburbs. The immediate attractiveness of the suburbs are thus ultimately self-denying and enjoyed at expense of those left behind in the inner cities. They increase car use and danger for those who use streets to walk, cycle, and play especially on through-streets. An emphasis on urban housing densities should thus ensure the survival of shops, pubs, schools, doctors' surgeries, open spaces and bus stops nearby, in addition to accessibility of city centre facilities. Mixed uses make for lively, safer environments where the presence of people also reduces the threat of attack or abuse. Tenement-style houses and flats leading onto public streets with defensible garden spaces shared among several families. Such design is consistent with Francis Tibbalds' people friendly towns and the descriptions of Harlock of diverse lively, safe environments. Mixed-use

[99] Ralph Rookwood, 'Making it Happen', in Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.
[100] David Cadman and Geoffrey Payne, 'Towards another city', Introduction to David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
[101] Elkin, McLaren and Hillman (eds.), *Reviving the City*, Friends of the Earth, 1991.

development should be preferred over dormitory suburbs. Planning techniques can supplement such action. Amsterdam's structure plan for example includes guidelines for security:

• the ground floor of building blocks should contain dwellings;
• long blank facades should be avoided;
• public transport stops should be close to dwellings;
• cycle routes should be overlooked by dwellings;
• facilities and services should be located where they can be used after dark.[102]

It should also be noted that people are far less concerned about any environment if they spend no time there. Intricate mixed use development treats places as a whole rather than a city of individual elements that can be passed through and ignored. This may promote environmental protection. Finally such initiatives benefit those who do not often get out of their local environment (women, children, unemployed). Ekins also notes the importance of providing children with an introduction to the world beyond their family and not confined to the home or taken to the playground since these environments do not provide the freedom and unpredictability which are essential parts of the process of informal learning.

Health
Health advantages of the city outlined include, reduced air and water pollution, physical risk, healthy food and dietary awareness. They also include well-being of self-reliance and self-determination and the control over peoples own health. I have discussed the possible effects on food of a greater link between city and farmland. City life is based on processed foods or contaminated fresh ones. Most cannot afford organic vegetables. Neither can they grow them in the city due to contamination of soils, air pollution or lack of affordable land. The city farms and allotments described along with the potential resources show the potential of food production in the city.

City inhabitants have an increased risk of being involved in a car accident. In 1988 2446 people were killed in accidents on built-up roads (58% pedestrians) compared to an all road total of 5052. Every year 20 000 reported accidents involving cyclists and cars - these figures are in the context of 2.3% of journeys of over one mile are undertaken by cycle and 10.4% on foot. Despite recent advertising campaigns (usually based on drink driving increased by suburban distances) these figures are a forgotten consequence of car use. Asthma and exma are other growing problem particularly among children associated with mainly car pollution. Many other health and stress related consequences of the car are not measured.

R. Macdonald argues that their is a link between participation and health "unless people can, in some way, create, manage, change or participate in activities that affect their lives, dissatisfaction, alienation and even illness are likely outcomes".[103] Conventional economics divides creation of wealth and maintenance of health. People have become disempowered in shaping their local environment and maintaining their health. We have to refer to specialists for even minor ailments.

Equity
Some policies that are advocated to promote sustainable urban development may have a more severe impact on the poor. Taxes on non-luxury items are a case in point. Fuel poverty is an important issue particularly for the elderly, those with mobility disabilities, those in old houses and inadequately insulated and draught proofed houses who tend to be poorer members of society. Such environmental policies require counter-balancing mechanisms. Some of the proceeds on fuel tax must be directed at compensatory measures such as improved insulation and subsidies where necessary for those suffering fuel poverty. Elkin notes further how, in terms of development, "the poor are often qualitatively more environmentally damaging; we may therefore need to improve their incomes, or subsidise environmentally beneficial purchases, especially of capital goods such as insulation. The greater levels of consumption of the rich are quantitatively more environmentally damaging; their consumption of environmental resources must therefore be reduced in both qualitative and quantitative terms."[104] It should also be noted that in improving housing stock, if action is to constitute development it must benefit occupants not the property owners. This is expanded on in the next chapter. Usually however, as I have described, sustainable urban development will improve equity.

Clearly then the *environmental* city does not have to be a regression in terms of quality of life although it may be in terms of consumption of material goods and energy. Sustainable development demands a

[102] ibid.
[103] R. Macdonald, 'The European Healthy Cities Project', *Urban Design Quarterly*, April 1989.
[104] Elkin, McLaren and Hillman (eds.), *Reviving the City*, Friends of the Earth, 1991.

change in our notion of 'growth' and this can be partially addressed through livability, health and equity in our cities.

Conclusions

My aim so far has been to outline and give some social, economic and political context to city greening initiatives. I have discussed:

• the critical role of the Western city in global environmental and social exploitation (noted by environmentalists and greens);
• a need to address technological efficiency but critically material consumption (green);
• more efficient city forms and process (broadly mixed use and greater self-reliance or participation noted by environmentalists);
• city forms and processes that can address material consumption broadly mixed use and productive, governmental and personal self-reliance (noted by social ecologists).

In conclusion:

• The mixed use city is essential to greater self-reliance and communication of process described as meeting the *social ecological* project.
• The dense mixed use city is the most efficient form *environmentally.*
• The dense mixed use city can in addition provide 'quality of life' and equality by reducing local pollution, increasing road safety, providing vegetation and access to natural process within the city, providing better access to services.
• The dense mixed use city has social advantages of reducing 'alienation' but action must focus on existing inner cities and local communities. Action should focus on local regeneration of inner cities along with reducing the environmental and social impact of the suburbs on the inner city by increasing a mix of uses, group housing projects and public transport nodes.
• Development should encourage organisational and spatial association and confederation.

A new economics will be 'social' and geared to local production of a certain range of goods and services. Critically however greening the city is about power relations. Participation in development is critical in achieving greater political self-reliance. This outline forms a 'social matrix' within which green technologies can be implemented.[105]

Imposed Technological Self-reliance and Architecture
Self-reliance should reduce dependence at the level of the city, household *and nation.* A shift towards greater local self-reliance requires the revival of households and neighbours as active centres of production of goods and services by people living in them for themselves and one another; the substitution of locally produced goods and services for those now provided from outside. Architecture and landscape design can enable local supply of energy, solar power, water collection from roof, allotments but should not be 'imposed' but 'facilitated'.

Top-down Mixed Use for Self-reliance
Several powerful factors have produced dispersed interdependent urban development throughout extensive regions. They include specialisation and large scale concentration of modern production, the reliance for distribution of fewer larger warehouses, increased speed and availability of information technology and communication systems, decline of environmental quality in large cities. Fragmentation has mitigated against resource-efficient technologies such as: local supply of energy and food; public transport; utilisation of mutual warmth and local materials. These factors are in addition to the green critique. In moving towards more environmental cities reversing current trends towards the isolation of ultimate computer inspired dispersed living is potentially advantageous. New patterns of work, and the implications that they carry for the location of places of work, for the relationship of workplace and home, and for patterns of work travel, will require new urban forms. The location and density of new development, its mixes and uses and the modes of transport on which it relies, will be critical to urban resource consumption in the future. It also however addresses the tendency of fragmentation to extend divisions in society, enables effective local participation, and communicates process.

---

105 as defined by Murray Bookchin in, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991.

Policies Towards Local Control
To these techniques must be added a process of implementation in architecture, planning and landscape that empowers. An important policy will be directing resources to local initiatives and the smallest of small businesses that remain local (not footloose - e.g. non-equity housing co-operatives discussed in *Chapter Eight*) and to local residents for improvements to housing and environments in the inner city. In many cities, non-governmental and community-based organisations have already shown that they are more socially responsive and efficient in satisfying a wider range of needs than either the public or the formal private sectors despite widespread neglect and hostility. In some third world cities they have become the major single channel for providing land, housing and services. Although originating in a third world context these ideas are equally applicable to first world and not simply in desolate inner cities.

Low-cost technologies and support for self-help can provide a far better urban environment, for more people at lower cost. *What is needed is to formulate new roles for professionals and governments.* Cadman and Payne describe however how "Most of the successes in the community-based housing and neighbourhood development have so far been achieved despite, rather than because of, government action. They serve to demonstrate, however, the vast reservoirs of talent and energy waiting to be tapped for initiatives that create the kind of cities that people want, rather than the kind that even well-intentioned professionals want for them"[106] Several of these initiatives have been discussed. Local control however does not mean that governments can abrogate their responsibilities for the provision of basic services, affordable land, materials, finance and so on. We live in and must respond to a specialised hierarchical system initiatives must facilitate and educate from this point. More specific questions have been raised in architecture and planning about the top down provision of housing. Green urban redevelopment and the agenda it clearly sets must avoid the mistakes of 'top down' implementation of the past. The consequences of this for implementation of green policies in the local environment must also be examined.

It should be noted again however that greater self-reliance is not self-sufficiency or complete de-specialisation; concepts that are neither achievable or desirable. We need to exchange and trade and have specialist advisors. Self-reliance does however run contrary to the economists notion of overt specialisation by 'comparative advantage'. Similarly planning and co-ordination are important in sustainable organisation of the city. This does not however negate democratic control (anarchy) but is aided by it. The importance of 'support' transport policy in achieving more socially cohesive environments should be noted.[107]

Facilitators
Greater individual self-reliance and implementation of environmental techniques both move against the conventions and values of contemporary society. Consistent with Bookchin's notion of facilitators "the planning profession should perhaps also be reviewing how it uses its skills in co-ordinating, negotiating and enabling, with a view to supporting and encouraging local initiatives".[108]

Not De-centrist Anarchist Village Utopia but Political Participation
I have attempted to show here why the green city is a 'city' not a 'suburban utopia'. Neither is the city I have outlined the decentralised anarchist utopia of Kropotkin and later Bookchin since it fails to distinguish political decentralisation with spatial dispersal. Howard's proposals in addition were for new developments and failed to tackle the existing complexities. Defragmentation is an essential element in city greening. The emphasis must be on architectural and landscape solutions that can however maintain density where appropriate. Decentralisation can occur within the existing city. Essentially however consideration must be to the local population not the imposed master-plan - green or not. Participation involves decentralising town hall activities to neighbourhoods.

One of our problems, I would argue, has been the belief that specialisation and expertise is the only way to handle ever increasing levels of knowledge. This lack of an overview, the failure to make connections across subjects and between places, has led us to our present, perhaps perilous state.[109] Professionals need to work with local communities on equal terms rather than as experts since local people will invariably know more about their particular neighbourhood than outsiders whatever their technical skills. One

---

[106] David Cadman and Geoffrey Payne, 'Conclusions and new beginnings', conclusions to David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
[107] T. Elkin, D. McLaren, M. Hillman. *Reviving the City, Towards sustainable urban development*, Friends of the Earth, 1991. p214
[108] John Holmes and Geoffrey Steely, 'Town and country', in David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990. p46
[109] John Holmes and Geoffrey Steely, 'Town and country', in David Cadman and Geoffrey Payne (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990. p149

product may be more locally derived regulatory controls on a whole range of ecological criteria derived from the bottom up and specific to the area. For Bookchin citizens assemblies (community) must take policy decisions but administration (physical building) can be representational.[110] Bookchin sees role for experts (architects) advising the Polis (community) who then make their decision. A balanced policy would:

• direct resources to inner city self-help;
• set up support for pro-active self reliance schemes;
• develop public transport, cycling and pedestrian infrastructure;
• favour mixed use development;
• favour density and use of buildings in the existing fabric;
encourage group housing initiatives in inner cities and suburbs;
• democratise the development process.

I now go on to look at forms of self-help housing and participative design methods before outlining an application of a proactive self-help program that would develop the connections between self-help and biotic technologies. This involves: dissemination of examples and their benefits through 'green building centres' located in the city and based around initiatives already underway e.g. city farms; production of a green design self-help assistance package for co-operative self-help; and a green physical support or framework for participation in adaptable housing. Developing such methods would accompany development of green technologies that would aim at the following.

Reducing energy consumption by:

• energy efficiency in buildings and increased use of solar gain particularly utilising atria and sunspaces within grouped housing;
• design for microclimate and shelter;
• mixed development using complementary heating regimes;
• district heating and combined heat and power;
• public transport initiatives and appropriately located development;
• utilising ecological landscape techniques.

Reducing waste by:

• recovery of scarce inorganic material for re-use;
• design of buildings for re-use or dismantling;
• composting organic waste locally and regionally and developing appropriate density;
• developing farming and forestry that can utilise organic city waste;
• non-horticultural landscaping.

Increasing biomass by:

• tree planting and urban forestry initiatives at local and city scale;
• protection of existing green space;
• development of roof gardens where possible;
• city farms and pocket parks (small scale in the inner city).

Augmenting regional water supplies and reducing consumption by:

• applying closed cycle methods of water use;
• use of composting toilets;
• separating 'grey' water for local use and developing appropriate systems;
• use reed bed filters locally within grouped housing and mixed use initiatives.

Reducing urban decentralisation and dispersal by:

• greening and locally redeveloping the inner cities;
• increasing average densities in suburbs and concentrating on mixed-use,
• using more concentrated forms for new development around public transport notes.

---

110 Murray Bookchin in, *The Ecology of Freedom*, Black Rose Books, Montréal, 1991.

Reducing commuting distances by:

• more local production to meet local needs;
• local employment to match local skills;
• minimising separation of homes and jobs;
• mixed-use and developing local economic and social self-reliance;
• participative initiatives as a means of developing appropriate skills.

Reducing road traffic and encouraging public and pedestrian transport by:

• reducing travel demand in location of new development;
• reshaping urban areas;
• encouraging pedestrian and bike traffic;
• co-ordinating land-use and public transport;
• raising densities generally and around public transport notes specifically.

In addition pollution could be reduced by setting up inducements and penalties to cut existing emissions in the short term. Natural resources could also be conserved by encouraging rehabilitation rather than development and stimulating regional (and local production) of renewables to replace finite non-renewables. While I advocate moving towards a mixed use, compact city with decentralised administration, strategies must be appropriate to different areas and particular local circumstances. The development of dense 'nodal' cities to meet the technical brief described outlined needs policies that ensure that economic activity focuses on such nodes.

Inner-city Changes
The inner city is potentially our greenest environment with proximity to central area employment, high housing densities, mixture of housing and other land uses and greater accessibility to public transport. As described however they are the least popular locations for living and working. Clearly they are areas where a balance must be struck with benefits of densities, proximity to work, and public transport combined with other qualities such as open space based on pocket park provision. Further they are the ones with a large proportion of 'dependent' population where sustainable green technologies may be welcomed in their own immediate right. *They are areas where funds and facilitation should be concentrated.* Clearly design will have to fit local circumstances but typically will:

• provide local community facilities;
• re-use existing buildings;
• exclude through vehicular traffic and calm local traffic;
• provide for walking and cycling networks;
• increase variety of housing types, tenures and prices;
• mix uses and exploit the energy saving potential;
• increase frequency and reliability of public transport;
• increase vegetation and including some city farming and allotments.

Density may increase in some areas and decrease in others. Generally however infill will increase overall density.

Suburban Changes
The suburbs contain a high proportion of the existing population and will inevitably continue to do so. As I have described vegetation and the individual private home are combined par excellence in the suburb but with many failings socially, economically and sustainably. Sustainability demands changes in spatial arrangement of the suburbs. Strategies should:

• encourage more intensive development along public transport corridors;
• create people intensive nodes around public transport;
• increase density of new development;
• provide for more mixed use;
• exploit redevelopment opportunities to increase variety of housing types and densities;
• provide roots for cycling and walking;
• traffic calm streets;
• provide green corridors where possible;
• provide community facilities integral to housing development;
• develop alternative ownership patterns - various forms of co-operative and co-housing.

Chapter Eight:

A Co-operative Self-help Housing Framework

Introduction

In my introductory chapter I looked at green and social ecological arguments for increasing self-reliance and the need for a consistency of means with ends in achieving such change. In discussing 'biotic' technologies I noted the practical importance of developing participation to increase efficiency and effective communication of these technologies. In the last chapter I looked at the Western City (central to global environmental problems) as a political, economic and social entity based on system reliance as opposed to self-reliance and how in this respect it differs essentially from earlier organisations (primitive, early farming and early urban). Today we are increasingly dependent on outside produce and services based on increasing occupational specialisation. To a large extent we are vulnerable in our dependence on outside supplies of health care, food, energy, water, style, entertainment. I described the problems of inner-city dependence without adequate material compensation. Such reliance, I argued, reduces our capacity for tackling and overcoming problems in our immediate environment. For social ecologists the hierarchies it implies drive growth based on *material* consumption. Certainly it enables tastes and styles to be dictated and sold for ever increasing profit by fewer corporations. The inefficiency of resulting distribution systems and city form were also outlined as well as how local development based on increasing self-reliance can have local social and economic benefits. In summary greater self-reliance in the city is important to SD whether from a social ecological or environmental perspective. It has the potential to address the problems of the division of labour - 'alienation', spatial fragmentation and consumption patterns.

Various movements have emerged for whom self-reliance is either the only acceptable means of personal development or the only obtainable means of service provision. I have discussed some self-reliant initiatives within the city already. Below I discuss recent trends in self-help housing often but not exclusively 'of necessity'. An analysis of these initiatives provides a base point from which to consider the introduction of increased local control into housing. I use reasons for the development of self-help housing as objective realities on which to 'build'. *My point is not to criticise specialisation universally but to address housing provision in particular through a balance of central resources and local control.* I would also suggest extension of these ideas into food, energy and water provision along with city environmental creation generally but deal here with housing. Such a concept applied to higher levels than individual housing is characterised by ensuring effective participation in a democratic process as described by Bookchin (see Chapter One).[1] Practical methods have been developed by SAR (see *Chapter Nine*). The environmental nature of the self-help debate is perhaps summed up by Ward who refers to the anarchist question in housing as the shift from *passive consumption* to *active involvement*.[2] Some ideological and practical criticisms of self-help housing from the political left are also raised below and alternatives modified in light of these.

Self-help Housing as Environmental

Turner has perhaps come closest to defining participation in housing production in *environmental* terms arguing that economy of resources is increased by local self-management (with enabling professional services) "the necessity of greater economy in the use of resources is now generally accepted but its dependence on greatly increased local self-management is only beginning to be understood".[3] Turners argument is based on the notions of 'fit' and the use of people's own local resources: their experience and knowledge of their own personal and local situations along with the architects wider knowledge. It is also based on the idea that home and neighbourhood building and learning are different forms of activity from, for instance, inter-continental transportation.[4] He thus argues for policies that support and enable local self reliance. Turner also notes how most materials and energy are used in and for our homes and neighbourhoods, especially in highly industrialised countries. These countries use most capital resources and generate most polluting waste. I add to these arguments notions of: increased confidence among lower income communities; encouragement of greater environmental awareness and responsibility generally; increased 'fit' of particularly environmental techniques due to increased knowledge by the architect of clients; potential for adaptability and improved maintenance; the development of a more common language between architects and users; and participation in construction and its promotion of efficient 'operation'. Building on these initiatives is important in terms of solar control by occupants and fit of solar and environmental projects to specific requirements of occupants as noted in *Chapter Four* and *Chapter Five.*

---

1 SAR levels of control, John Carp, 'Twenty Years of SAR', in Richard Hatch, *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

2 Colin Ward, *Housing: An anarchist approach*, Freedom Press, London, 1983.

3 John F. C. Turner, 'The Community Base of Sustainable Development', in Vithal Rajan (ed.), *Rebuilding Communities*, Green Books, 1993.

4 ibid.

Co-operatives as Green
Below I outline criticisms of self-help as a palliative for capitalism and actually encouraging commodification. I thus recommend forms of co-operative self-help housing in particular. A more co-operative form of housing also offers advantages in developing the denser city described and encouraging solar design at a neighbourhood and thus a more effective level (enabling negotiation to environmental advantage as outlined in *Chapter Five*). While participative design and encouragement of self-help is a method of empowerment and regeneration of our inner cities, economically, socially and environmentally some green technologies along with co-operative organisation can expand this notion of empowerment. Green technologies do this by saving energy and producing it locally. Co-operative forms of ownership are an alternative to renting (with its reduced responsibility) and 'ownership' that can be distinguished from 'control' particularly in the light of recent problems of negative equity. They are an efficient method of local control.

Summary
In this chapter I begin by outlining various forms of self-help housing. I go on to look at arguments for and against self-help housing and design participation. I conclude that while criticisms have been directed at self-help housing ideologically it has many practical advantages that may aid moves towards more sustainable cities. I then discuss co-operative forms of self-help and self-build in particular since these forms respond to the criticisms outlined. As suggested in a social ecological context the notion of co-operative self-help housing has wider significance than individual self-help. In summary I:

• introduce various forms of self-help housing in the UK today as a basis for future initiatives;
• attempt to clarify the significance of self-help housing for those participating (occupants, resource bodies and architects);
• clarify some links to sustainability;
• clarify the significance of self-help housing in the overall structure of capitalism and commodification;
• thus attempt to suggest general principles for successful application within a sustainable framework.

I suggest an enabling framework for *co-operative* self-help as a rental and owner occupier alternative that tends away from commodification of housing. There are pros and cons of government or professionally sponsored and initiated self-help particularly that must be addressed in the structure of such a proposal. I argue that co-operative ownership should form the basis of a pro-active self-help policy. In the next chapter I go on to look at various examples of design participation and how they fit into the self-help process. I attempt to analyse which forms can be effectively developed for any proposed pro-active self-help application that can introduce green technologies. I go on to look at how to improve, support and enable self-help and appropriate participation in design and construction so that its connection with greening is developed. This involves gearing initiatives to a variety of income groups. I deal with cities that I have described as critical areas. I go on to discuss:

• the role of the architect as 'enabling' design, construction and maintenance within the self-help process generally and the particular co-operative framework discussed here;
• possible methods of introducing environmental criteria into the design, construction and maintenance of self-help projects.

I do this by analysing existing participative design and construction methods, within the critical framework outlined in this chapter.

8.1. Forms of Self-help Housing

Self-help housing occurs to varying degrees, and in response to varying circumstances, globally. Housing activity today is unlikely to be either entirely self-built or without any form of personal input. Many people structurally alter their own houses even when they buy a ready made unit while, few do not employ some form of skilled or unskilled labour in the financing, organisation, design, construction or maintenance of their housing. Motivation for self-help may be; housing necessity, reducing costs of 'appropriate' housing, an act of expression, or part of desire for wider self-reliance. It encompasses both squatting of existing property (or land) of necessity in cities and the development of new settlements for experimenting with self-reliance. Some initiatives notably community based insulation schemes are environmental although motivated by reducing running costs. Self help can characterise both individual and collective efforts. It has been identified as the progressive improvement of an existing house or settlement, and as the construction of an entirely new one. Perhaps most importantly in terms of the sociological debate on implementation it has been used as a description of a building process that occurs spontaneously or the outcome of a set of policies of housing agencies and policy making bodies (organised self-help).

Principally distinctions between types of self-help housing can be made between:

- *group* and individual action;
- *government, professional* or locally instigated action;
- the degree of self-help employed including, *self-build, participation in design*, rehabilitation, DIY and self-help with contracted design and construction;
- various financial arrangements including owner occupation, rented, and *various other forms* between these two, the exact form of which, depends on access to resources.

Many variations are possible within each of the generalised categories that tailor the project to the wishes, resources and skills of the participants and the context within which they are housed. In attempting to enhance the development of local control within an environmental framework and prioritise target groups and organisations a brief look at the structure of some different forms of-self help is required. *Self-help* and *participative* concepts in housing must be distinguished. Harms defines self-help housing as housing produced directly by users individually or collectively.[5] Self-help may be referred to as *bottom up* participation in the housing process. Participation refers to individuals or communities taking some offered part in the housing process - participating in a sponsor organised scheme. *Participative design* is simply the design element of development within the self-help process.

8.1.1. Individual Action

Independent Self-help
This is the most common form of self-help housing in the UK. It is initiated by individuals who require no financial support (other than a mortgage) and employ local builders and trades people to whom the majority of the building work is usually sub-contracted. The emphasis for the self-helper is on the accumulation of 'enterprise equity' (by providing administration, organisation and perhaps design). Reduced costs, design requirements or a desire to build or be more self-reliant generally may all be reasons for such initiatives. The participant is not part of a formal group or programme but builds an individual owner occupied house on an individual plot. It will characteristically be *outside* the city.

Independent Self-build
It is estimated that about 12, 000 houses were self-built in the UK in 1987.[6] Of those the great majority were initiated by individuals in a similar manner to independent self-help. In this case however they tackle much of the construction work themselves gaining 'sweat equity' (accumulated by providing construction labour) in addition to 'enterprise equity'. Some work may be carried out by sub-contractors. The Segal system discussed later allows for complete self-build by unskilled users except that external contractors are normally required to fix the roof.[7] Available time will often be a restriction to individual self-build. In developing countries individual self-help or self-build are often part of illegal settlement as the only means of securing appropriate housing. Informal groups usually develop. Squats occur in the UK but less frequently due to general wealth and welfare provision.

Environmental Developments in Individual Self-help
I do not intend to discuss these independent forms in detail. The environmental imperative in individual self-help will be how to communicate environmentally friendly methods and technologies at appropriate development stages, but also perhaps, *to encourage group developments* that go against trends in the UK. Co-housing I argue in *Chapter Nine* should, and can, be encouraged. There is I argue a need for information and literature on the benefits of co-housing to be given to individual self builders and perhaps a co-ordinating group should be established to encourage moves in this direction. Physical supports also discussed in *Chapter Nine* may be attractive 'design prompters' for those with the finance to utilise individual self-help but not the inclination or time to completely build a house. I argue in *Chapter Ten* that these could be developed within an environmental (energy saving and 'friendly' materials) framework. Much of the literature available to assist individual self-helpers includes sections on environmental measures.

---

[5] Hans Harms, 'Historical Perspectives on the Practice and Purpose of Self-Help Housing', in Peter M. Ward, *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.
[6] Jon Broome and Brian Richardson, *the self build book*, Green Books, Bideford, 1991.
[7] ibid.

8.1.2. Group Self-help

In both the above cases in the UK the result is usually an owner occupied individual house. Individual self-help clearly offers advantages of more closely meeting personal requirements for those that can afford it including design (choice of architect), choice of site, pace of work and tailoring the project and timetable to exact financial circumstances. An architect or other professional advisor may be employed to greater or lesser extent when required. Broome and Richardson however, note disadvantages of particularly individual self-build as opposed to group projects.[8] These include probable increased plot cost and scarcity of plots in cities, cost of access to roads and drainage, cost of overheads, lack of ability to hire expensive tools and plants as in group projects, lack of ability to share of skills as in group projects. In environmental terms the benefits of group housing for climatic design should also be noted.

In the 'illegal' settlements of the developing world people generate their own resources and use them directly in housing themselves. The housing is usually an appropriate use of those resources being based on an intimate knowledge of real needs and possibilities. Lack of organisation technical knowledge and capital limit their outcome. Groups may develop informally for mutual aid. Group self-help in the UK, generally although not exclusively, involves lower income people than individual self-help since building as a group is often a means of accessing resources (housing subsidy). State funding aimed at redistributing wealth can be made available to *organised groups* of low income people thereby supplementing their own resources. As I outline later a prerequisite for success of this form of 'popular control' among low income groups is often the existence of community organisations that can bring together users and define and assert their common needs and preferences in relation to those of other interest groups involved in the housing process.

Group self-help projects can be divided into those initiated by the members of the group and those initiated by the state, other agent or 'sponsor'.

• If 'externally initiated' (organised self-help) the participant makes a decision to join an advertised programme or is approached due to their position on a waiting list. The initiator is likely to be a local authority, housing association or a self-build consultant operating on a commercial basis. Molenvliet, Adelaide Road, Lewisham and informally Byker (see *Chapter Nine*) are of this form and discussed below.

• If 'group initiated' for the benefit of its members (mutual self-help) the project may still be sponsored, supervised or supported by the state or private interests. Macclesfield and Hesketh (see *Chapter Nine*) are of this form.[9]

In the UK group self help will normally take the form of a housing co-operative, building co-operative (Giroscope), or self-build association.[10] Participation may take place without formal constitution of a group (Byker and Adelaide Road involved unconstituted council tenants). Groups may form to fight demolition proposals. Tenants of local authorities, housing associations and private land[lords] may develop less formal groups to pressure for certain action. Individual homeowners may also form 'action groups' in response to particular circumstances. At Black Road Macclesfield private tenants and owner occupiers formed an action group to protest against demolition of their homes and succeeded in gaining improvement grants.[11] They then managed the improvements as a Building Co-operative.

Group self-help may involve a variety of tenure patterns: personal ownership, shared ownership with the local authority or housing association, co-operative ownership and rented from a housing association or local authority. The exact form will depend on resources/finance used. Ownership or shared ownership will be due to degrees of private funds or labour of group members. Shared ownership may allow for eventually buying the remaining equity. If on the other hand the project uses subsidised public funds and contracted labour properties may be owned by the community organisation with individual residents as both landlord and tenants (Common-ownership Co-operative). The property thus remains in public ownership accessible to other low-income people.

---

[8] ibid.

[9] an account of Macclesfield is given by Rod Hackney the architect for the community in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

[10] Giroscope is described by Colin Ward in *Welcome Thinner City: Urban Survival in the 1990's*, Bedford Square Press, 1989 and in *Freedom*, Vol. 56 No. 8, 29th April, 1995.

[11] Rod Hackney in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

Government support
In Britain the state has always given some support to the 'voluntary' sector although this has primarily been directed towards large paternalistic trusts rather than the small, democratic co-operatives. In the 1960's this support was directed through the Housing Corporation, and taken a step further in 1974 with the introduction of the HAG system of funding. The tendency has however been to favour larger associations due to both a belief in the efficiency of their housing production.[12] I criticise this view in *8.2. Benefits (advocacy) and Sustainability* below. In addition grants have recently been cut with the proportion expected from private funds increasing. Such policies are pushing housing associations towards the private sector and an even less accountable system of housing provision. This leaves the future of community-based housing associations and co-operatives uncertain and potentially side-tracked into owner occupation.[13]

Housing Associations
Housing associations are non-profit making organisations which rent houses, usually to families 'in housing need'. They are run by groups of people, often professionals, who are directly accountable to the Housing Corporation.[14] Since their emergence in the 1970's housing associations have provided an alternative to the two major housing sectors owner-occupation and local authority rented housing.[15] As they do not trade for profit they are also distinct from the private rented sector. This distinction has led to a debate concerning the exact status of housing associations as public or private sector. Until recently they were clearly located in the public sector with grant funding provided by central and local government but recent cut backs are moving housing associations towards the private sector for funding. HAG grants have been reduced from 90% in 1988/89 to 55 announced for 1994/1995. Initially small with erratic funding housing associations were probably less bureaucratic providers of housing. Most British housing associations are however (unlike their counterparts in say, Denmark), totally undemocratic, being run by a voluntary, un-elected management committee. They are potentially less democratic than the 'big brother' local authority housing they were to replace.

8.1.3. Co-operative Housing Associations (Housing Co-operatives)

A housing co-operative is a form of tenure that enables user control of housing, not as owner occupation does through individual ownership, but though collective ownership of dwellings by dwellers. Birchall has defined housing co-operatives as associations by which *dwellers control their own housing even if they do not own it.*[16] Control over the process of housing is the central concept of co-operative housing. It offers an alternative to traditional tenures of owner occupation or renting from public, private or voluntary landlords. Housing co-operatives are 'fully mutual' housing associations i.e. all members are tenants or prospective tenants and all tenants are members. Non-mutual associations (above) provide housing for others.

The various types of co-operative that have developed are principally defined through differing ownership of the property they occupy. Alex Laidlaw "The question of capital investment and each member's equity is probably the most difficult and controversial in the development of housing co-ops."[17] There are four main types of primary co-operative. Self-build societies are also housing co-operatives but are set up for the duration of development only.

Common-ownership Co-operatives
Common-ownership co-operatives (par-value or non-equity rented ownership) are the most common form of housing co-operative in the UK (Hesketh in *Chapter Nine* is a new build example). Tenants own or lease the property *in common* (the equity is held collectively) but as individuals they have no stake in the equity (thus non-equity co-operative) or the stake is limited to a share repayable on leaving at its original 'par' value (thus par-value co-operative). This share is more a membership fee than a stake in the property. There are some privately funded (externally) common ownership's but to take advantage of the Housing Corporations systems of grants and loans (HAG Grant) to housing associations common ownership co-operatives must register with the Housing Corporation. Fully mutual status excludes the

[12] David Page, *Building for communities: A study of new housing association estates*, Joseph Rowntree Foundation, 1993.
[13] Jose Ospina, *Housing Ourselves*, Hilary Shipman, 1987, London. p193
[14] Peter Stead, *Self-build Housing Groups and Co-operatives: Ideas in practice*, Anglo-German Federation, London, 1979. piv
[15] Helen Cope, *Housing Associations, Policy and Practice*, MacMillan Education Ltd, London, 1990. p1
[16] Johnston Birchall, *Building Communities the Cooperative Way*, Routledge and Kegan Paul, London, 1988.
[17] quoted in Johnston Birchall, *Building Communities the Cooperative Way*, Routledge and Kegan Paul, London, 1988.

housing from the right-to-buy. Such co-operatives are generally small and over 100 households is rare. The smaller ones are run by general meeting (Bookchin's face to face democracy) and larger ones by elected management committee although sub-groups involve nearly all in some kind of decision making. There are in addition two forms of co-operative where equity is shared in some way.

Co-ownership Co-operatives
Co-ownership is similar to common ownership where members collectively own or lease the property but members have a share in the collective equity (not of the equity of the individual dwelling as in a shared ownership co-operative). Tenants collectively own and manage their property but with a share in the equity the individual (family) will be entitled to a 'premium payment' equivalent to the increase in the market value when they leave. This is paid for by the higher monthly payments of incoming co-owners to the co-operative.

Shared-ownership Co-operativess
Shared-ownership co-operatives have been developed by housing associations. Members are offered new but occasionally rehabilitated housing for part-rent and part-purchase by housing associations i.e. they have a stake in the equity of the individual dwellings which they can sell on. The rental proportion may receive housing association subsidy. Shared ownership means the individual and collective equity are separated.

In practice there is a continuum between common and shared ownership. At Glenkerry the co-operative leased a tower block from the local authority (which remains the freeholder). Occupants were allowed to buy 50% of the market value of each flat without the right to buy the other proportion of the equity that remained with the co-operative. Other co-operatives have developed the idea of 'staircasing' to full ownership. In these cases the co-operatives cease to exist, having been bought out completely. Alternatively they may become a *condominium*, in which individuals own their apartments outright, but have a share in the resident-owned company which owns the freehold and the common areas, and which provides services at costs to members.

Tenant Management Co-operatives
If collective ownership was the only definition of a co-operative, then tenant management co-operatives would be excluded since they do not involve ownership. Tenants of a local authority or housing association enter into a agency agreement with their landlord to take over some or all of the management functions (and sometimes rehabilitation of their estates) but do not own or lease the property. The range of responsibility varies and may include allocation and transfer, draughting and enforcement of tenancy agreements, repairs and maintenance, and rent collection. In return co-operatives receive a management and maintenance allowance. Birchall argues that if efficient they can make a surplus which can be put back for future maintenance or provide environmental improvements. Tenant management co-operatives may be non-mutual. Byker and Adelaide Road discussed in (Chapter Nine) involved design *participation* without formal constitution of residents groups until after completion when tenants management co-operatives were set up. They were professionally instigated to increase individual say in housing without any notion of ownership.

Privately funded co-operatives
Private funding can be used to fund co-operatives (also building societies). Co-operatives have some built in advantages in this respect they are mutual housing societies, and so members do not have legal security of tenure and the right-to-buy, both of which may frighten off private *lenders* who would want to be able to repossess property if a collective mortgage defaulted. They also provide collective ownership of property which brings with it mortgage tax relief that could mean rents would be low enough for people in housing need.

HAG funding provides restraints to housing co-operatives including the need to gain permissions at every stage of development, regular monitoring of performance when in management, and inability to set their own rent levels.[18] At the same time HAG funding is becoming more difficult to obtain by being channelled away from general housing needs towards special needs and shared ownership. Several dual funded projects have thus developed combining in some cases, building society mortgage, HAG and city council land (in return for nomination rights).

Condominiums
Condominiums are rare in the UK although many Danish and Dutch Cohousing schemes are run on these lines. In condominiums the individuals own their apartments outright (or lease) but have a share in a

[18] Johnston Birchall, *Building Communities the Cooperative Way*, Routledge and Kegan Paul, London, 1988. p131

resident-owned company which owns the freehold and common areas (buildings and land) and which provides services at cost to members. Residents secure individual mortgages and govern themselves through a homeowners association.

Secondary Co-operatives
Secondary co-operatives own no properties but exist to provide development advice and other services to primaries.[19] Some housing associations also provide these services. The Housing Corporation requires that registered co-operatives have a development agreement with a secondary co-operative or housing association to steer them through the complex system of approvals for funding. Secondary Associations thus act as catalysts and provide fledgling primaries resources and skills needed for formation, registration. They may then act as development agent, procuring the site and undertaking administration to secure loans and grants from the funding authority. They will oversee construction and advise on future management. Secondary co-operatives rely on a variety of incomes for their various services including the development and management allowances paid to primaries by the Housing Corporation. The educational role of secondary associations has often been financed through fee-income from for example in house architects (non-profit organisations). Educational grants are also available from the Housing Corporation. Secondary co-operatives have either been set up from the start as 'consumer-controlled' bodies (in which each member co-operative has voting rights) or have begun with a non-elected management committee and worked towards greater primary involvement. Birchall argues that it is critical that secondary co-operatives are controlled by and accountable to primary co-operatives.[20] Such a system is consistent with Bookchins notion of confederation (see Chapter One).

8.1.4. Group Self-Build

Approximately 2000 of the 12000 self build homes completed in the UK in 1987 were built by self build groups. Again the structure is dependent on income. Low income groups will not be able to afford to build a house for outright ownership while people who already own or can afford to own their own home will not be eligible for public subsidy. The Community Self-Build Agency was set up in 1989 by the Housing Corporation, but independent of it, to promote this concept among those in housing need. Self-build groups are set up in three main ways:

• by self-build consultants obtaining an option on a site, designing a scheme, obtaining permissions and advertising for members (this is how commercial self-build schemes are initiated);
• by an institution such as a housing association or local authority sponsoring a scheme by identifying a housing need and forming a group before design by general advertising or by circulating to people on their waiting lists;
• By small groups of individuals who want to build for themselves coming together and then perhaps advertising for more people - such a group may need to justify their membership policy in terms of housing need to obtain support.

Self-build Housing Associations or Self-build Societies
A self-build housing association or society is a further form of co-operative. It is set up to undertake the actual building of the project (traditionally for owner occupation but more recently also for rent) and wound up on completion. The association may be funded through the Housing Corporation. In either case speculative gains to a property developer are cut out. This is an important factor with respect to the social ecological critique of this thesis. Ownership after completion is by personal mortgage or co-operative.

Outright Ownership
A project of this type is set up as a self-build housing association. Until recent models to make self-build affordable to people on low incomes this was the only type. It is also the favoured method of most commercial self-build consultants. It involves no public subsidy (HAG Grant) but may get a commercial development loan through the Housing Corporation (as at Zenzele). The association obtains development finance from a commercial lender (or Housing Corporation) and on completion each member takes out an individual mortgage to repay the development loan. It is a method by which low income people can build their own homes because they gain sweat equity (Zenzele). While the result is not a permanent co-op neither is it a group of alienated owners.

Shared Ownership
In this case when individual self-builders take out their mortgages on completion they do so for only part of the 'equity' or 'value' of their house as described above. The 'equity share' is their 'sweat equity' plus

[19] Helen Cope, *Housing Associations: Policy and Practice*, MacMillan, 1990. p39
[20] Johnston Birchall, *Building Communities the Cooperative Way*, Routledge and Kegan Paul, London, 1988.

a proportion of the remaining which the self-builder can afford. The option to purchase may be available at a later date. The self-builder pays rent on the remaining equity held by a local authority or housing association (or perhaps a co-operative). Such a scheme can attract a HAG which pays for a proportion of the rented part of the equity. The balance is held on a group mortgage paid for by the rents charged to the self-builders by the Housing Association. This mortgage is discharged when self-builders have purchased 100% of the equity or when the loan has been fully repaid.

To obtain HAG the self-build association must enter into agency agreement with registered housing association (or local authority) who receive HAG on its behalf and own the balance of the equity not owned by the self-builders. Shared ownership is flexible and allows the self-builder to buy what they can afford. Lewisham Self-build is an example of a shared ownership where the local authority provided money not the Housing Corporation via a HAG.

Collective Ownership for Rent
This is a new idea that applies the normal housing co-operative structure described above to self-build. The self-build group would register as a fully mutual co-operative, build their own houses, and occupy them on a co-operative basis (i.e. own collectively and pay rent to the co-operative). The scheme would be financed by a HAG and commercial loan repaid by the rent. 'Sweat equity' is obtained from co-operative when a member leaves the property. The member effectively loans this equity to the co-op and it is index linked to preserve its value. The co-op rent also covers management and maintenance. Such a scheme offers self-build opportunities to those who cannot afford shared ownership.

Self-build for Rent with Option to Acquire
This is a version of a co-ownership co-operative. It is similar to collective ownership for rent but tenants have an option to bye their house at a later date.

8.2. Benefits (advocacy) and Sustainability

In order to prioritise developments it is necessary to look at the potential benefits and problems of self-help housing. Advocates of self-help housing see benefits accruing to *occupants, architects and resource bodies*. Additional benefits discussed here refer to facilitation of environmental and green SD. These involve practical advantages of the efficiency, quality and longevity of self-help housing, increased environmental awareness of users, and the notion of self-help housing as an initiator of greater self-reliance generally. Although many of the practical benefits of self-help housing are now almost universally accepted, ideological criticisms remain that may affect development and these are discussed below (*8.3. A Critique of Self-help*).

Self-help generally refers to control over the process and resources and may or may not include self-build or design participation. Self-build may be forced due to lack of resources. Self-build and design participation have additional environmental advantages however. Birchall notes further that *'ownership' and 'control' are not necessarily interchangeable terms since ownership of property can result in not having control due to financial constraints that lead ultimately to repossession.*[21] Owners may also not have the skills to economically alter their own houses.

8.2.1. Subsidised Housing Provision

The vast majority of publications dealing with both individual self-help around developing cities and co-operative self-help in the West advocate them as solutions to the housing problem. This has environmental implications in terms of the resources used in the housing infrastructure. In order to begin to substantiate the success of self-help housing as opposed to other forms there is a need to look briefly at its development. The historical context of self-help housing is also important in discussion of another common criticism relevant to self-help in social ecological terms: the possible role of self help as a palliative for capitalism or as a progressive social movement.

Self-help is far from a new concept in housing and is considered so only because of its decline in the West with the capitalist division of labour and other processes described above. Internationally self-build

[21] ibid.

remains the major form of housing provision.[22] Ospina describes how pre-industrial (or pre-capitalist) housing practices were primarily 'participatory'.[23] Families built with their own labour and resources, using local materials. For skilled tasks, artisans might be employed and more difficult jobs might involve co-operation with the community. Each family was in control of its own resources and how they were used. Limitations were set by resources and skills available not external regulation. With the division of labour, urbanisation and industrialisation such a system became impossible. Houses became part of markets in goods and services and production of lower income housing was taken over by private landlords with returns on their investment paid by wages of the new labouring classes in rents.

In the UK state intervention in housing was eventually precipitated by the sprawling unplanned growth of the capitalist industrial city and housing condition of private tenements. Municipal authorities principally dealt with relocation necessitated by redevelopment of inner city areas although the labour movement of the 1920's attempted to use municipal powers to provide housing under public ownership. Ospina describes, how in the UK, thanks to the parliamentary nature of national and local government and the strength of organised workers, the Labour Party seized hold of municipal housing and used it to provide large numbers of subsidised dwellings.[24] It should be noted that the strength of organised labour was not part of the pre-industrial society that many postulate a return to and many see as a basis for exploitation. I noted in *Chapter One* the social ecological view that organised labour has simply served the development of material capitalism since it works within an abstract concept that separates labour from life and thus is itself exploitative. The main achievement of council housing was to take over the role of private landlord for a large proportion of the low income sector. It has provided many millions of people with adequate housing. The importance of such an approach should not be forgotten. Clearly for provision of low-income housing the private sector had the financial and technical resources but not the motivation given modest returns and thus has produced low standard housing. Housing provision in the UK thus became largely a duopoly of owner occupation funded by mortgage loans and publicly rented housing.

Provision of state rented housing has however depended on the alternative financing policies of labour and conservative governments in response to the economic fluctuations of capitalism (available finance and political will to support subsidised housing).[25] For proponents of self-help the problems of state rented housing have not only been of finance but of *management, maintenance and provision of appropriate housing. Even with adequate funding, it is argued, state provision often produced housing that was inadequate and inappropriate to peoples needs and preferences due to long range inflexible bureaucracies.* Mainly Marxist opponents of self-help however see the problems as distribution of resources in a capitalist democracy.

State Housing

Proponents of self-help such as Ospina describe how state housing authorities became distant public firms promoting housing programmes based on ideological, financial and/or technical considerations. Local councils replaced class divisions as visible agencies of social inequality when they failed to provide goods and services. While the parliamentary nature of local government ensures some accountability it allows only limited control through voting for abstract policies, targets and figures. Ospina describes a typical mechanism for state housing provision. Government planners produce housing targets based on 'scientific study of need', often tailored to political objectives. The treasury specifies a budget and architects design to fit these limits. If the budget is reduced, cost limits and standards are reduced accordingly.[26] Hamdi describes particularly the top-down mechanisms of the old GLC as a pyramidal structure.[27] At the top was the housing committee, composed largely of locally elected politicians, making policy and approving budgets. It also had final veto power over all housing schemes. Next was the Housing Department under the Housing Director who acted as the client in formulating project programs, setting the number of different dwelling types and the inclusion of facilities such as play areas. Beyond the GLC (which also included building codes control, fire authorities and building inspectors) the architect also encountered both the local planning authority (to determine appropriate densities, layouts, building scale and architectural style) and central government (in approving subsidies based on complying with standards). Last of all the anonymous tenant qualified for housing by a position on a list. The architect never met their user client. As I have noted, while small scale housing associations

[22] Richard Burnham, *Self Help Housing and Ecology*, PhD Thesis, Liverpool University, 1994.
[23] Jose Ospina, *Housing Ourselves*, Hilary Shipman, London, 1987.
[24] ibid.
[25] Rod Burgess, 'Self-Help Housing Advocacy: A curious form of Radicalism', Peter Ward (ed.), *Self-Help Housing: A Critique*, Mansell Publishing Limited, London, 1982.
[26] Jose Ospina, *Housing Ourselves*, Hilary Shipman, London, 1987.
[27] Nabeel Hamdi, 'PSSHAK: Primary Support Structures and Housing Assembly Kits', in Richard Hatch, *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984. p51

initially responded to such situations both Cope and Page argue that policies now favour bigger more distant associations that are not even electorally accountable.[28]

Popular Control
Within such a system community based housing initiatives have became increasingly popular. Reaction has shown itself in the development of participatory architecture by architects, planning policies, and spontaneous protest at local level. The recent emergence of participatory processes in architecture and planning in UK cities (both professionally and popular reaction) is largely in response to failures of comprehensive redevelopment and top-down provision of mass housing using industrialised building systems and distant management systems.[29] Such mass housing policies (and the industrial building systems they sporned) were developed as attempts to solve the 'housing problem' i.e. house low income families within budget restrictions. *Failures can be seen as a result of economic problems (fluctuations) of capitalism along with allocation policies of successive governments and technical problems of bureaucratic provision and mass systems. It is also clearly one of general distribution of resources in capitalism (where success is purely monetary) outside housing provision.* Another problem noted in Chapter Seven is the alienation created by fragmented cities.

Ospina argues that popular control *of even limited resources* can lead to production of more appropriate low income housing than state provision.[30] As noted advocates of self-help argue that the problem of mass housing goes deeper than not using enough technology or not spending enough money as traditionally stated but is largely a problem of control, of 'top down' provision itself.[31] While lack of finance does reduce standards (leading to technical problems), size and the numbers of units it does not guarantee, on its own, that provision will be adequate or appropriate for the people being housed.

For advocates of self-help a more appropriate approach to these problems is to first define appropriate housing. They argue that it is not housing for personal expression of the architect, for technical experimentation, for financial return for institutions, or political objectives. Good housing can only be defined by users themselves. Critically however they must also have the *information and power* to make this decision (professional advice and subsidised resources). Good housing is thus achieved by placing resources and process of creating housing under users control. *This involves state subsidy for self-help not state provision.*

This is a critical disagreement between left and anarchist thinkers. Self help detractors see failures of mass housing in terms of the capitalist system and accuse those who support self-help as tackling secondary 'technical' concerns. Both agree that housing is actually produced by self-help but the later question self-help as an adequate basis for housing policy for low income groups. They see it as a form of exploitation that is prolonging capitalism (by not addressing and even facilitating uneven distribution). I expand on this point below (and note Bookchins materialist definition of exploitation) after developing the argument of self-help promoters and its sustainable features.

8.2.2. Turner's Three Laws

Ward sums up the benefits of self-help by extracting three "laws of housing" attributed to Turner.[32] First "When dwellers control the major decisions and are free to make their own contribution to the design, construction or management of their housing, both the process and the environment produced stimulate individual and social well-being. When people have no control over, nor responsibility for key decisions in the housing process, on the other hand, dwelling environments may instead become a barrier to personal fulfilment [and a burden to the economy]". It should be noted that Turner is not requiring that the poor should become housebuilders but notes control of design, construction and management. He is implying that they *should be in control*. It can also be noted that his law implies but does not explain a connection between local self-management and material economy important in an environmental sense.

Turners second law of housing is that the important thing is not what it *is* but what it *does* in peoples lives. In other words, dweller satisfaction is not necessarily related to material building standards.[33] What

[28] Helen Cope, *Housing Associations, Policy and Practice*, MacMillan Education Ltd, London, 1990 and David Page, *Building for communities: A study of new housing association estates*, Joseph Rowntree Foundation, 1993.
[29] Colin Ward, *Welcome Thinner City, Urban Survival in the 1990's*, Bedford Square Press, London, 1989.
[30] Jose Ospina, *Housing Ourselves*, Hilary Shipman, 1987, London.
[31] ibid.
[32] Colin Ward, 'Preface', John F. C. *Turner, Housing by People: Towards Autonomy in Building Environments*, Marion Boyars, London, 1991.
[33] ibid.

housing does for people depends on matching of its location, building form, built form, tenure and affordability with residents' identity, security and future opportunities. Turner develops the notion of housing as both noun and verb. The value of the final project cannot be sought in terms of its physical attributes but only in the relationship between it and the user. 'Use value' and 'market value' are separate entities (again this can be compared with the green critique of the commodification).

Practically Turner uses many examples of third world housing where top down provision as it were imprisons the poor, since it is wrongly located for employment possibilities (this would be less problematic in a more productively self-reliant city) and demands high rents.[34] Squatter developments respond to these problems enabling the poor to provide themselves with housing that is dedicated to their needs. *Housing failure occurs when a tolerable match is not achieved with personal priorities.* The housing provision as it were does not 'fit'. Top down provision cannot ensure adequate fit. One important partial exception is Turners third law: that deficiencies and imperfections in housing are infinitely more tolerable if they are *your* responsibility than if they are somebody else's.

8.2.3. Requisite Variety

For many advocates of self-help Turners notion of 'fit' (thus social well being) is accompanied by that of 'requisite variety'.[35] Complex systems involving ever changing relationships between people, places and activities cannot be maintained economically by central management since large organisations must standardise their procedures and products in order to keep overhead costs within competitive or practical limits. Thus they produce housing of *high cost* but *low use value.* Autonomous systems produce low cost but high use value housing that is thus not socially alienating. Turner quotes the Law of Requisite Variety: "if stability [of a complex system] is to be attained, the variety of the controlling system must be at least as great as the variety of the system to be controlled".[36] People themselves have unique knowledge of their own situations and should have personalised and local control.

I have also noted however that control depends on personal and local access to resources land, tools, materials, skilled labour and it is governments (and the private sector) today who have access to these resources. Control also depends on professional knowledge of the wider situation. For housing to 'fit' there is thus a need for enabling by professionals and resources from government. Both the strengths and weaknesses of Turner's argument is that he treads delicately in the middle ground between total autonomy and hierarchy. As described later this reliance on government for support of 'anarchy' and the lack of a political overview of self-help within capitalism have been criticised. Many advocates of self-help housing, including Turner, have however developed this critical balance to suggest possible housing methods. Turner's and Ospina's are discussed below and SAR's in the next chapter.

8.2.4. Resources

For self-help advocates such as Ward, Turner and Ospina then failure of governments to make use of human resources has been at the root of many housing problems caused by what may be described as inadequate 'fit'. Clearly failures of housing has implications for sustainability as does the failure to utilise human resources. Once in control of appropriate resources it is argued, communities can select professional advice, designs and technologies to provide housing to their own specifications that will 'fit'. A change in power relationships (with professional back-up) makes more appropriate use of local human resources. Materials, energy and living space are wasted if peoples own personal and local resources (their experience and knowledge of their own personal and local situations and priorities; their skills and initiative, and their capacity for commitment and caring) are ignored.[37] Further the economic use of resources and stable social relations depend on each other although "neither can be achieved or maintained by residents and neighbours if they are unwilling to make responsible use of their own knowledge and local skills".[38] Capital intensive, labor saving building systems are profitable for the builders and good for the ego of architects and engineers but are inefficient as well as lacking fit. In addition self help may improve maintenance and increase longevity because residents themselves are organised and have resources to deal with it. This involves technical arguments of increased knowledge

---

[34] John F. C. Turner, *Housing by People: Towards Autonomy in Building Environments*, Marion Boyars, London, 1991.
[35] John, F. C. Turner, 'The Community Base of Sustainable development', Vithal Rajan (ed.), *Rebuilding Communities*, Green Books, Totnes, 1993.
[36] ibid.
[37] also John, F. C. Turner, in *The Scope for Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[38] John, F. C. Turner, 'The Community Base of Sustainable development', Vithal Rajan (ed.), *Rebuilding Communities*, Green Books, Totnes, 1993.

and more general notions of local responsibility but also has resource implications. Finally, in practice, Ospina notes cost reductions of 40-50% of comparable commercial costs with improved standards of design and construction where costs were not reduced. Costs are kept low by the non-profit nature of many involved advisory organisation while self-help labour and some subsidy may further reduce costs to the community.[39]

8.2.5. Alienation

I have dealt with alienation in terms of the poverty of wealth (*Chapter One*) and problems of inner city (and suburban) residents (*Chapter Seven*). In *Chapter Seven* I noted how local self-reliance could address such problems. Ospina notes from empirical observation that the experience of housing themselves strengthens communities and allows them to play an 'active' not 'passive' role in society.[40] Self-help housing has developed in many inner city areas of housing clearance, it has resulted in communities of renewed self confidence, increased knowledge of building methods and maintenance enabling the possible extension of houses by the occupants and development of other local self-help services.[41] Hatch also argues that the true significance of participation is its effects on participants allowing people to relearn environmental competence, develop the ability to question an imposed landscape, and with the support of architects allowing people to give form to their lives and cultures.[42] It thus allows the creation of cohesive communities and organisations capable of demanding and obtaining, utilities, schools housing and more. Co-operative self-help can integrate individual users into communities that can become effective instruments in meeting other social needs. Each project begins with people as they are - and moves them toward a better understanding of themselves and their environmental alternatives. It can aid creation of more self-reliant communities.

As noted home and neighbourhood building are essentially different from, for example, international communications.[43] The former are not only essential to normal life; they also provide opportunities for personnel fulfilment and cultural development through active participation. Thus while self-help in housing is clearly connected to greater self-reliance in society generally it does not have to be seen in such 'revolutionary terms'. It has environmental benefits in its own right. A predominant question for social ecologists is whether benefits of self-help are connected to commodification.

8.2.6. Profit Orientated Commercial Housing (Housing for the Market)

While the emergence of self-help is often seen as a response to the housing problem this is only one element of self-help advocacy. In discussing requisite variety Turner notes that when housing is treated bureaucratically or *commercially* as a welfare service or a *consumer product* errors are made due to the belief that houses can be mass produced like cars.[44] He thus extends his criticism beyond subsidised housing to commercial housing. The market on one hand and parliamentary democracy on the other are how users 'control' the process! Christopher Alexander also criticises modern market oriented housing in the same vain as subsidised housing.[45] Houses or housing are the single largest element of our environment and today are produced by mass means, by one form or another of semi-automatic process. Either the repetitive construction of 'tract' houses or the repetitive construction of apartments in blocks or social housing. The common assumption is that both techniques are essential to produce enough houses at low cost (or simply that people do not want to be housebuilders).

Commercial housing is usually initiated by investment capital from private sources to design and build houses that become 'consumer goods'. Decision making is in the order: financier who is after a return; developer who wants scheme to sell; architect who 'knows' how do design houses that are 'pleasing', cost effective and 'appropriate'; builder working to specification for agreed costs; and consumer who pays for the operation plus enough for the financier to start again.

---

[39] Jose Ospina, *Housing Ourselves*, Hilary Shipman, London, 1987.

[40] ibid.

[41] Colin Ward, *Welcome Thinner City*, Bedford Square Press, London, 1989.

[42] C. Richard Hatch, 'Introduction', C. Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

[43] John, F. C. Turner, 'The Community Base of Sustainable development', Vithal Rajan (ed.), *Rebuilding Communities*, Green Books, Totnes, 1993.

[44] ibid. p 234

[45] Christopher Alexander, Howard Davis, Julio Martinez, Don Corner: 'The Production of Houses', in Richard Hatch, *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

Alexander argues thus that *most* houses today lack two fundamental necessities of any human society. The first is a "recognition of the fact that every family, and every person, is unique, and must be able to express that uniqueness". The second is a "recognition of the fact that every person is part of society and requires bonds of association with other people".[46] Mass housing and suburbs are on one hand identical and stamped out of a mould and on the other they fail to give a basis of local congregation. Alexander stresses the importance of process in such arrangements - that houses in any society are given their character by the system of production used. He identifies a need to modify this system that is at present taken for granted. Unfortunately any individual departure from the accepted process is likely to lead to difficulties, delays and objections. These are however not intrinsic to the alternatives but to the fact that they are exceptions to the imposed forms.

A system argues Alexander can be recognised by the forms it produces. In tract development in USA (or developer housing here) developers buy land, develop roads, and then build houses more or less identical (in US hundreds at a time). These are private lots bought by individual families. The houses are designed as 'model homes' ahead of time on the drawing board probably based on a standard and then built many times over, by contractors working with crews of specialised labour often subcontracted. Speed is essential many workers are novice and working for 'money only'.[47] All are bound in legal bureaucratic and restrictive contracts that seem to promote confrontation and adhere to similarly restrictive building regulations. This is particularly relevant to environmental design that as I have noted is site specific and does not conform to universal norms. The system also relies on favourable mortgage arrangements that are an artificial construct (and not part of the sacred free market).

The other predominant system is publicly financed apartment housing typical of France and Sweden. Apartments are built for government by developers (private or government controlled) and later rented to people who have nothing to do with the production process. This basic process is institutionalised throughout the world and the occupants do not have the right to change their dwellings. They cannot undertake improvements, they do not have security of tenure. The apartments are identical or slight variations originating from a standard set of drawings. In Britain Housing Associations funded through the governments Housing Corporation have now taken on this role (predominantly but not exclusively for low income groups).

Alexander argues that "Of course it is true that in either one of these systems the designs of the buildings can be made *slightly* more intelligent, *slightly* more respectful of human needs, *slightly* more personal in feeling. *However, the alienated character of the buildings which are produced is, in the end, a direct consequence of the structure of their production systems - and this character cannot be substantially improved until the systems themselves are altered at the roots*".[48] For Alexander production at the local level will produce both fit and associated groups of dwellings.

Alexander compares today's housing system with typical part of the biological world. In the later there is always an immense complexity which ensures every part is adapted to its conditions. Thus although imperfect to a large extent each form is 'correct' "appropriate to its local conditions, and appropriate in the large, so that it also functions well as part of some system larger than itself".[49] A biological system is able to achieve its sensitive and complex adaptions because control over the shape of components is widely distributed at a great many levels throughout the organism. By contrast housing production is centralised and there is insufficient control at the levels which should control detail. These failures of adaption "are caused, most often, by the fact that the decisions which control the form of the houses are almost all made at a level too remote from the immediate people and sites to allow reasonable and careful adaptation to specific details of everyday life".[50] The justification is on the grounds of a need for high volume production and low cost. It takes an astonishing act of will to believe that the developer house is the crystallisation of free peoples desires as is becoming the accepted norm.

8.2.7. Expression of Self

John Habraken describes the building of peoples own homes as the 'natural relationship' again pointing out that only very recently with the division of labour have men and women as a collection of individuals

[46] ibid.
[47] ibid.
[48] ibid.
[49] ibid.
[50] ibid.

ceased the intimate and creative act of building their own personal environment.[51] Jung argues further that the house is a basic psychological extension to self.[52] In an attempt to understand our uniqueness he argues we constantly grasp for any visible and definable things to define ourselves. The house is an important part of this over which we have lost control. Modern housing process continues to completely negate individual creativity as a means of personal exploration and fulfilment. It negates a role in design and is based on the typical occupant. Further even modifying ones home environment is inhibited by the rigidity of bureaucracy, the physical structure of the building itself and a lack of skills of most occupants. For Ward "The home is an organism in direct relationship to [man]. It is [his] external environment, [his] affirmation of space."[53] Thus the home should not be the product of the state or the market.

Turner describes with reference to housing how the alienation of everyday life by organisations that reify activities and institutionalise their values deprives the majority of any but an insignificant and culturally abortive share in the satisfaction of the immediate wants of mankind. Our lives become fragmented between working stock and consumers of goods.[54] Housing is a particular example of the alienation from process that I have described in previous chapters and perhaps critical in terms of creativity.

In *Chapter Nine* I note how participatory architecture can acknowledge the fact that we are not 'typical' or 'average'. Again such an argument does not necessarily need to be extended beyond architecture into the revolutionary terms of Bookchin. Participation is criticised by populists arguing that professional leadership is a restriction of the right to environmental self-determination and by those who believe it is an abdication of the architects *raison d'être*. Architects have however essential knowledge to aid the process. In today's context they are technically qualified to facilitate creativity and can help end 'alienation' that is a product of inability to shape a responsive environment. The conflict between the role of the architect and personal expression of the user is discussed in more detail later. It is critical to the social ecological agenda. Architectural criticism of the 'vernacular' form of participative architecture in the UK today is perhaps as much a comment on the architects and regulations than on the 'conventional' desires of occupants.

8.2.8. Responsibility of Self-help

I have described how self-help housing presents an opportunity to overcome individual and community 'alienation' and that the true significance of participation is in its effects on participants. Burnham suggests further that *owner builders* in particular having primary, and in many cases sole, responsibility for the creation of their dwelling, have considerably enhanced involvement in their immediate environment compared to most in the developed world.[55] The decision to build represents a considerable responsibility. The physical input involves a continual learning process. Such a process is often long and full of unforeseen complexities.

Another relevant notion here is that this responsibility will increase environmental protection. A question remains as to whether this protection extends beyond the responsible area i.e. self-built house or neighbourhood. It is possible that through initially increasing participation and responsibility at the most immediate levels of our interaction with the environment that this may carry through to wider environmental responsibility. Wider environmental responsibility in green terms means reduced consumption not simply responsible management. Self-help is ultimately defined as green due to its potential to develop non-materialistic attitudes and thus reduce material consumption. I described how it may challenge the conventional notion of development based exclusively on growth.

8.2.9. Expression and Responsibility

Expression may also be stronger where responsibility is greater. Although 'expression of self' survives to a limited extent in mainstream housing today the sphere of responsibility is continually being narrowed both in public and private sector housing. This is due to the perceived economic need to streamline the housing process and a low capacity for environmental decision making within a system reliant society generally. In subsidised housing a lack of control prevents responsibility and personal expression. In market orientated housing responsibility and expression are controlled by regulation, the market and a lack of skills. The demand for interior design and decorating professions and purchasing of finished

[51] Richard Burnham, *The Natural Relationship: A Discussion of Participatory Architecture*, BArch Dissertation Liverpool University, 1990.
[52] Carl Jung, *Memories, Dreams and Reflections*, Collins, 1971.
[53] Colin Ward, *Housing: An anarchist approach*, Freedom Press, London, 1983. p9
[54] John F. C. Turner, *Housing By People*, Marion Boyars, London, 1991.
[55] Richard Burnham, *Self Help Housing and Ecology*, PhD Thesis, Liverpool University, 1994.

designs can be related to these factors. Personal expression, at best, has been reduced to minimal external expression and internal spatial and surface decoration. This is further dictated by imposed fashion.

Social commentators have expressed the opinion that housing built with an emphasis on the economics of repetition have proven unsuitable living environments due to a reduced sphere of control and responsibility. In the last chapter I criticised the architectural determinism of Alice Coleman. It is also questionable whether reduced capacity for expression has acted as a trigger for neglect.[56] Lack of responsibility or control over local situations may however contribute to such problems. These problems remain predominantly a problem of resource distribution, houses fitting economic conditions and a lack of control not creativity and personal expression.

8.2.10. Extendibility

There are reasons other than identification why it is desirable to be able to modify your house. Changes in life-style, new technological possibilities and the changing family structure are all important factors that affect the performance of the house. Today's housing process stifles both creativity and possibility of change with our needs. If we wish to alter our environment today (adding a room) it is often simpler to move house. If, for example, I were to develop claustrophobia could I increase the area of glass in my house. Such inability can be seen in terms of lack of skills or lack of control (usually in rented housing). Self-help process, control, and adaptable building forms are important in addressing these problems. They could have considerable resource connotations.

8.2.11. Beyond Housing

It may be argued that the failure of medium and high rise housing was, in part, due to ignoring the 'economic dimension' of domestic life and the disempowerment of the inner city poor described. Self-help housing in addressing alienation may encourage communities to develop greater economic self-reliance and thus potentially address that aspect of the housing problem. Further it may be extended to local production of essential goods and energy thus encouraging internalising systems generally within cities and the consequent *green* advantages I have discussed.

8.2.12. Investment in Housing and Neighbourhood as a Green Priority

When resources invested in home and neighbourhood building are assessed, the relative economic power that people have, apart from the state and the market, is clearly large. "Homes and neighbourhoods occupy a high proportion of built-up land; most of ones lifetime is spent there (in addition to time spent elsewhere earning money to pay for it); a significant proportion of all manufactured materials are used for building and equipping the homes and neighbourhoods, and they consume more energy than any other area of activity."[57]

Several issues are important here firstly the energy invested in built fabric is considerable as discussed. If self-help provides a more appropriate housing stock social sustainability will promote energy efficiency. If it increases knowledge of energy issues it will contribute significantly to reduced energy consumption. Secondly we spend a large proportion of time in houses that thus provide a important focus for lifestyle changes. Housing is the location for most purchased material goods. Thirdly housing is part of a market itself (materials) that could be more locally reliant. As repeatedly noted green advocates of self-help see it as a means of dematerialising society. Burgess argues however that self-help introduces people to the market and that self-help activities are part of the market.[58] They give people access to the first rung on the ownership ladder with no sign of changing their attitudes to commodification (see *8.3. A Critique of Self-help*).

8.2.13. Small Scale Intervention and Diversity

Kroll argues that if we were allowed to organise and complete our own buildings we would generate diversity at a scale that would relate positively to the urban and natural environment.[59] It is he argues

---

[56] Alice Colemam, *Utopia on Trial*, Shipman, London, 1985.
[57] John, F. C. Turner, 'The Community Base of Sustainable development', Vithal Rajan (ed.), *Rebuilding Communities*, Green Books, Totnes, 1993.
[58] Rod Burgess, 'Self-help Housing Advocacy: A Curious Form of Radicalism', in Peter M. Ward, *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.
[59] Lucien Kroll, *Architecture of Complexity*, Batsford, 1987.

many independent decisions over time that can come together to form the texture and fabric of sustainable towns. Kroll implies (as Bookchin and Kropotkin) that this diversity is stable. It is also a feature in the quality such a city could have compared to the monocultures of today. On a more practical level the diversity produced will increase the range of housing available.

8.2.14. Participation and Environmental Design

I have already described in detail how the efficiency of passive and active solar and low energy design or even whether or not they contribute to annual heating requirements depends on user knowledge of appropriate processes. Participative and self-help architecture clearly have the potential to increase resident knowledge of processes and possibilities. I have also described how solar and low energy design need to be targeted to the particular lifestyles of residents and how participation is important in this respect. With group self-help or participation initial group and neighbourhood consideration and negotiation can increase efficiency due to appropriate climatic location of various houses and communal facilities. These factors should be added to the increase in environmental awareness generally.

8.2.15. Participation and a Common Language

Self-help housing more often than not involves participation of the user client in design. Such participation necessitates a dialogue between architect and user that is of mutual advantage in terms of education and help to develop a 'common language' between architects and user likely to increase the relevance of architectural debate. In participative architecture users attempt to define their wishes while designers are groping toward forms which can speak intelligibly about new relationships and needs. Increased participation may break down the architects self image as 'experts', and their intolerance of 'non-experts.

8.2.16. Some Conclusions

Harms describes how advocates of self-help (those most clearly associated with John F. C. Turner) see the 'principle' as an *a priori* positive "because housing is actually produced and insofar as they assume that it leads to greater autonomy of housing users independent of the political, economic and historical context in which self-help arises."[60] They believe that centrally administered systems cannot match individual priorities for appropriate location, dwelling and neighbourhood type and tenure. This mismatch also reduces investment and care of the user. The solution is to place the resources for housing: land, materials, energy, tools and skills in the hands of ideally small scale groups. This is the basis of the solution to the housing problem and other social problems. For the user it reduces costs of housing and enhances self-confidence.

Participative processes are I argue a vital element in the success (social sustainability) and economy of schemes whether or not greening is the predominant aim. Involvement in the process (organisation, development, post-development) can also bring about a better understanding of how the building and its servicing works. It can increase peoples knowledge of their environment generally. The result may be an ability to 'use', maintain and adapt the building that is particularly important in ensuring buildings are run efficiently. Participation may also form a vital role in the development of what has been referred to as a 'common language' between professionals and users and users and their environment. This is important in ensuring correct operation and maintenance of green building systems and developing a climate of negotiation. In moving towards green cities participation is a means of communication of technologies and methods helping to ensure schemes are run efficiently over their life span and can be modified when necessary. It is also a means of aiding regeneration of inner cities by moving toward social and economic self-reliance. Self-build schemes notably those of Walter Segal have further developed confidence and building skills with the ability to extend houses without specialist help when demanded.[61] Participative design and self-build are however secondary to control over the process and the choice of whether to participate or not.

Such advocacy does not however mean total de-specialisation of society. While it is true that most architects would like everybody to take an interest in building it is also true that in this sphere effective communication between professionals and users, users and their environment and thus professionals and their environment is particularly important in green terms.

---

[60] Hans Harms, 'Historical Perspectives on the Practice and Purpose of Self-Help Housing', in Peter M. Ward, *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.
[61] Special issue, 'Walter Segal', *The Architects' Journal*, 4 May 1988.

8.3. A Critique of Self-help

8.3.1. An Outline

History

I have described how, with the growth of capitalist modes of production, self-help housing declined in the West. It is in fact, only relatively recently, and in only a few areas of the world, that people have not *had* to build their own houses. Prior to this the direct producers of housing did not receive a wage for this labour. Instead of the wage relationship housing was produced for its immediate 'use value'. With capitalist modes of production the motivation for production of housing was changed into commodity production for the market. 'Market-value' replaced 'use-value' and the wages paid became the basis of consumption in the market. With increasing division of labour and social and technological organisation the building process also became increasingly complex.

Benefits

I have described potential benefits of subsidised self-help: to participating individuals in providing themselves with more appropriate housing, in increasing confidence and skills and allowing increased scope for individual expression; and to resource bodies in economically providing additional housing units that exist alongside mainstream housing (and are well maintained). Neither are the benefits restricted to subsidised housing. I have discussed the significance of self-help more generally in terms of increased 'fit', responsibility and environmental control. Self-help housing can cut down costs to the participant or gear the housing process specifically to the finance available at a particular time. Many of these advantages are universally accepted amongst housing experts and planners even if self-help remains a fringe activity in Western cities. Actions of self-help proponents have attempted to develop methods by which self-helpers can effectively control the process within economic constraints. These are discussed later.

Critique

The need to democratise the housing process is widely accepted. Harms in his criticism of self-help argues that democratisation and decentralisation of management and direct participation or control by the housing users not only in procedures of management and allocation, but also planning, design and maintenance are essential if state housing is not to be used to control and discipline people.[62] There is however, he argues, a need to clarify its significance in the overall structure of capitalism; its potential positive relation to social movements against its integrative role in the system and its relation to repression of social movements. While many proponents see self-help as an *a priori* positive that can be generally applied to solve the housing problem, criticism has been directed at the benefits of self-help to resource bodies (governments) and thus its palliative role in capitalism that is seen as the cause of the housing problem. Such a critique is clearly important in terms of the environmental movement and its search for alternatives to capitalism and growth. Criticism has also been directed at whether economic benefits to people are genuine and whether self-helpers really see obtaining a place to live as 'non-alienating labour'. This is especially the case if self-help is the only way of obtaining housing. The ideological slogan 'Freedom to Build' it can be argued confuses freedom to act with the necessity to survive.

Harms summarises his criticisms by pointing out that self-help housing:

1 - provides possibilities to;
• lower the level of circulation of capital in housing,
• increase the amount of unpaid labour in society,
• to devalorize labour power and lower pressure for wage increases by excluding housing costs from wages;
2 - reduces the need for public subsidies to housing, since the reproduction of labour is done by the efforts and costs of labour itself;
3 - is economically expansory in terms of consumption demands;
4 - ideologically incorporates people into the mentality of the petty bourgeoisie to own and speculate with housing;

[62] Hans Harms, 'Historical Perspectives on the Practice and Purpose of Self-Help Housing', in Peter M. Ward, *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.

5 - isolates people from each other; it can individualise discontent and pre-empt collective actions and solidarity.[63]

8.3.2. A Capitalist Process

In looking at self-help housing in terms of an overall socio-political context it has been criticised by the left as a means of entrenching capitalist modes of production and consumption.[64] Burgess argues that housing as a commodity is critical to an understanding of the limitations of self-help. Self-help does produce a commodity and consumes commercially supplied products and labour input. In short it is a potential commodity constructed primarily for the producer and thus cannot be looked at in terms of 'use-values' alone. It fits the expansionist sphere of commodity production for capitalist exchange. Turner himself describes how self-help achieves a "level of capitalisation which would be impossible to achieve through the market or the state". Self-build housing groups become incorporated as consumers into a market (of building materials etc.), through loans they become interest payers, and in the end some of them will become *property owners with an asset to speculate on the market.* This process argues Harms individualises potential gains (break up of co-operatives), separates people from each other and impedes collective action.

For Harms workers collective self-help in political terms, ideally, can mean attempts to reorganise, collectively and co-operatively, the general production process outside of commodity production, in the hands of workers or the direct producers for their own and their fellow class members individual needs. The revolutionary impetus of such schemes is however practically transformed into creation of 'mixed enterprises'. Precedents of 'alternatives' that operate within the capitalist mode of production are incorporated into capitalism.

In supporting self-help Turner distinguishes between home and neighbourhood creation as a third arm and not private sector.[65] Turner argues that both corporate and community-based non-governmental sectors have been lumped together. The 'third sector' is treated as an adjunct to the 'private sector' in 'free-market' economics. It is however social and economic and this combination is crucial. As noted Bookchin refers to this distinction in revolutionary terms (holism). He sees the break up of the factory as a revolutionary process. In response to Harms' criticism forms of co-operative self-help ownership that do not allow break down for commodity gains may be particularly appropriate (common ownership). It should also be noted that if such collaborative communities were based around the notion of local builders yards and material exchanges as described below they would more effectively deny the market.

8.3.3. Take-over by the State

Harms also notes how the history of self-help activity has increased at times of economic crises. Its top down encouragement is a means of reducing subsidy. He describes how historically since the emergence of the capitalist mode of production self-help has been a function of how far capitalist division of labour has been directed to satisfaction of the housing need. Its emergence has coincided with 'crisis times in capitalism' with regard to the crucial relationship between income and wages. Burgess agrees that State assisted self-help has been a means of *reducing public subsidy expenditure.*[66] 'Crisis times in capitalism' may produce individual or collective self-help, or collective demands for state help. The later means demands for allocation and redistribution of the socially produced surplus for the benefit of dependent groups. State-help can however mean different forms of publicly assisted or provided housing.

Harms distinguishes between self-help initiated and controlled by participants and that controlled by the state. "While the former, under specific political circumstances and especially as *collective self-help* can be a tool in the class struggle from below with considerable potential for increasing workers self-determination, ...the second a tool in the class struggle from above that attempts to increase integration into the existing social order and perpetuate capitalist accumulation and domination."[67]

---

[63] Rod Burgess, 'Self-help Housing Advocacy: A Curious Form of Radicalism', in Peter M. Ward, *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.
[64] Hans Harms, 'Historical Perspectives on the Practice and Purpose of Self-Help Housing', in Peter M. Ward, *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.
[65] John, F. C. Turner, 'The Community Base of Sustainable development', Vithal Rajan (ed.), *Rebuilding Communities*, Green Books, Totnes, 1993. p233
[66] Rod Burgess, 'Self-help Housing Advocacy: A Curious Form of Radicalism', in Peter M. Ward, *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.
[67] Hans Harms, 'Historical Perspectives on the Practice and Purpose of Self-Help Housing', in Peter M. Ward, *Self-Help Housing*: A Critique, Mansell Publishing Limited, 1982.

Burgess argues that only by identifying the interests and involvement of the various fractions tied up in the process of self-help housing can we become aware of the way in which they are responding to the inherent contradictions in international capitalism. "Planning policies may be more easily directed towards use-values and may propose mechanisms that will enhance them - reduced bureaucracy, greater control over decision-making; but rarely, if ever, seriously threaten the actual process of production."[68] It should also be noted that Turners idea of increasing access to resources for the poor goes *against all capitalist state interests* and thus requires that interests of industrial, financial, landed and property capital are going to legislate against themselves. Turner's recommendations will only be implemented *alongside* not *instead of* and this is counter productive.

8.3.4. The Housing Problem - *Not a Solution*

Critics of self-reliant housing also argue that it is *not* a radical solution to the housing problem. It fails to provide a real alternative exactly because it fails to break the shackles of housing as a commodity status and thus remains part of the real reason for the 'housing problem' - the capitalist mode of production. It demands commercial materials that have a market value and labour. The only distinction is that self-help is built primarily for its 'use-value' but when sold gains 'market value'.

While critics such as Burgess and Harms believe self help can provide additional housing units that will exist alongside mainstream housing for them this is part of the problem of encouraging self-help. They see housing failure in terms of the overall economic and political systems within which all housing is produced (capitalist) not a result of particular technological or bureaucratic organisational systems as advocates such as Turner and Ospina emphasise. The basis of critiques is that self-help is part of capitalist commodification and thus destined to maintain class divisions in a growth society and extend the 'housing problem'. Burgess describes proponents such as Turner as apolitical. They are, he argues guilty of generalising from individual cases and not looking at the global context. Such a criticism cannot however be made of Bookchin whose critique of Marxism, as I have noted, is that it falls into serving capitalism due to its 'material' nature.

Detractors also see self-help as a curious form of radicalism or freedom from alienation especially if it is not a question of choice to build but practically the only way to get a place to live or to get a house of the standard they want. Self-help can thus be seen as exploitative. In addition self-builders may find certain tasks cheaper if they employ specialists compared to their own labor time. As I have described however Turners notion is one of user control over the process (control over resources) not necessarily involving housebuilding. Systems such as the Segal method discussed in *Chapter Nine* reduce labour time and increase value of the self-helpers labour by simplifying the building process.

8.3.5. Co-operative Self-help

As Birchall notes self-help can be seen as a market individualist concept.[69] He notes that advocates for co-operatives can however be taken from, individualist, liberal pluralist, collectivist and communitarian socialist schools and that each will attempt to shape them differently. If communitarian socialists, they would be promoting co-operatives, not as one form of tenure amongst others, but (alongside worker and consumer co-operatives) as the cell structure of an ultimately stateless society. If they were liberal pluralists they would be promoting co-operatives and housing associations as intermediate institutions. If they were collectivists, they would be defending council housing, and trying to organise its tenants to beat the capitalist state and if they were individualists they would see the eventual break up of co-operatives as a way into owner occupation and a way of steering funds away from public housing.[70] Meanwhile the co-operative members are likely to be people who want a decent home and are prepared to put a minimum level of participation to maintain it. They may not want to explore co-operative principles?

[68] Rod Burgess, 'Self-help Housing Advocacy: A Curious Form of Radicalism', in Peter M. Ward, *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.
[69] Johnston Birchall, *Building Communities the Cooperative Way*, Routledge and Kegan Paul, London, 1988. p76
[70] ibid. p86

8.3.6. Defending Tenant Control

Colin Ward answers some objections to tenant control of existing public housing that I note here since they add to the debate on the benefits (or not) of self-help.[71]

• Tenant take-over would permanently withdraw houses from the housing stock.
Tenant co-ownership of housing with council retaining nomination rights would address this problem although it reduces the notion of control of tenant co-operatives. Ward argues alternatively that houses are built and better maintained and thus in fact tenant take-over would actually result in net housing gain.
• There is no public control over what will happen to the estate when the loan is finally paid off.
The property can be owned by a co-operative or association and the association is owned by the tenant shareholders.
• It is wrong for people to make private profit from housing in which public money is invested i.e. co-ownership can be used by members as means of capital accumulation.
This can be avoided by the type of ownership but such a question also seems hypocritical when owner occupiers see their houses increase in value. Ownership by community enables increase in property value to the benefit of the community not individual.
• A mobile population do not want a house to cherish but want to rent decent accommodation and be able to move on quickly.
Ward accepts this point but argues diversity is increased not reduced by tenant build and take-over. Clearly in addition not all housing would be tenant controlled.
• Tenant allocation would tend to discriminate.
Clearly this assumes councils and private landlords do not.
• That a stake in equity will destroy financial viability or restrict entry to the better off.
This has been a serious problem in some co-operative housing. It can be solved by giving control not equity although this may be seen as manipulation.
• That tenant take-over exalts the virtues of private ownership while in a communal anarchist utopia private ownership would not exist.
Ward argues *co-operative ownership* is a better form of social ownership than *state ownership.*

8.3.7. Conclusions

In conclusion, despite these polemic differences, there remains a potential for self-help housing to promote small scale environmental responsibility and control and increase the efficiency of implemented green technologies. Often notions of creativity and responsibility are subsumed by the sweeping ideological arguments discussed. The positive benefit to participants controlling housing becomes secondary to the problems of creating a petty bourgeoisie. In developing a green critique that questions consumption such arguments cannot be ignored and are essential to the social ecological critique. It is worth noting however that:

• participation is beneficial in *environmental* terms despite ideological arguments (but must be part of a broader framework that ensures control to delegate);
• green technologies particularly benefit from participation;
• areas of agreement exist on democratisation of state housing that should be built on;
• co-operative forms should be developed enabling control over the process but not equity gain to the individual.

Perhaps the task of self-help housing advocates is to recognise its limitations while increasing decision making capacity and control of users. My concerns are the environmental implications of self-help housing and how the principle of self-help housing can be structured into frameworks where environmental responsibility is more effectively produced. Meanwhile I have described how some green city technologies can decrease reliance on the market and aid more complete self-reliance.

An alternative Revolution

As noted social ecologists such as Bookchin see the lefts critique of self-help as a product of the inherent materialism of socialism - that measures everything in 'capitalist' terms. A more environmentally literate and politically participating people developed through encouraging self-help or at least participation in design decisions provides a basis for eventually questioning materialist accumulation. *Both socialist and anarchist World views criticise the other for being part of the capitalist agenda.*

---

[71] Colin Ward, 'Participation or Control', in Colin Ward, *Housing: an anarchist approach*, Freedom Press, London, 1993.

Clearly the promotion of self-help is associated with the idea that people should do more for themselves and thus forms part of the anarchist concept of a society consisting of an aggregate of multi-skilled individuals not of a collectively of specialised individuals. The question remains does self-help in housing promote such aims or simply help maintain the status-quo and general conditions for capitalist development. Co-operative elements of group self-help will be important in developing a coherent approach

Much of the theoretical discussion of self-help concerns the 'housing problem' in cities of the developing world. I have attempted to broaden this argument since I am dealing with implementation of environmental and social ecological concepts in the developed world and a more generally applicable owner build and rented alternative on which to base green initiatives. It is clear that the quantitative effect on the environment is greater amongst owner occupiers and thus that the discussion must attempt to address such groups through encouragement of group self-help, co-operative ownership and physical supports structures (discussed in Chapter Nine) as well as greening the individual self-help construction process.

In criticising Turner, Burgess argues "The future, so we are told lies in decentralised organisation and administration with low-energy technologies and locally-produced materials. Although we may all be in sympathy with protestations about the harmful effects of large-scale technology on the environment, and the economic irrationality of what it produces, there is nowhere in these analyses any attempt to explain why decentralised systems have disappeared or are disappearing, or even how they articulate with more 'centralised' systems. Nor can there be, for in these analyses the evil is seen to be technological or rather technologically-determined forms of social and economic organisation."[72] Since such criticisms however Turner has elaborated on the notion of support and centralised systems.[73] *Bookchin however while advocating decentralisation clearly stands at odds to the notion that problems are technologically determined. He sees the origins of centralisation in capitalist relationships of hierarchy not technology. In fact it is likely he would criticise Burgess as technologically or materially orientated in his materially based view of alienation.*

8.4. General Principles for Co-operative Self-help

Here I outline some general principles for effective development of community self-help and then note potential developments in co-operative forms. Generally effective development depends on the appropriate 'requisite variety' suggested by Turner and noted above.[74] Ospina argues that squatting initiatives are limited by lack of organisation, technical knowledge and capital. Effective forms of popular control demand financial and professional resources. Community organisation is essential however in ensuring these resources are not used to dictate.

8.4.1. Assisted Self-help

Turner argues that examples of how people can work out their own unique projects and programs to fit their own needs and priorities when they have the support of their governments are numerous. He argues as Ospina that governments should participate in actions of people not the other way around. CBO's (Community based Organisations) and NGO's (Non-Governmental Organisations) should act as mediators and community developers. They combine in a 'third sector' that, he argues, is neither commercial nor governmental.[75] For Turner we need to achieve a new balance of complementary powers, not the hegemony of any one. The search is not for "standardised projects and programmes that centralised agencies replicate. Instead, the realistic search has to be for the ways and means by which governments, non-government organisations, and the building industry can enable people to do well what

[72] Rod Burgess, 'Self-help Housing Advocacy: A Curious Form of Radicalism', in Peter M. Ward, *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.
[73] John F. C Turner, 'Barriers, channels and community control 1', in David Cadman and Geoffrey Payne (eds.), *The Living City*, Routledge, 1990.
[74] John F. C. Turner, 'The Community Base of Sustainable Development', in Vithal Rajan (ed.), *Rebuilding Communities*, Green Books, 1993.
[75] John F. C Turner, 'Barriers, channels and community control 1', in David Cadman and Geoffrey Payne (eds.), *The Living City*, Routledge, 1990.

so many do in any case: the planning, building and management of their own homes and neighbourhoods at costs both they and society can afford."[76]

From an examination of precedents Turner concludes that governments attempting to compensate for failures of capitalist market to provide for low to mid incomes must change their priorities from provision of centrally supplied housing projects, by subsidising commercial developers, to enabling owner builders, self-managing community based organisations, and the local governments and enterprises that deserve them. The most important supports are those that increase access to affordable and well located land, to secure tenure, basic services, appropriate technologies, to affordable standards and procedures and credit. Thus the development of supportive and enabling policies involve a change of relationship between people and government. NGO's as third parties are essential mediators as well as community developers, innovators and motivators. CBO's are essential for targeting funds. Turner notes that the most simple definition of an appropriate technology is Paul Osborne's: "a technology that people can appropriate".[77] That is that people can take hold of and use. A technology that people cannot use, that makes them dependent on a large organisation, is not appropriate for housing and local government. Heavy, capital-intensive technologies may be highly appropriate for some large buildings, but not for homes and neighbourhoods.

Points of Delivery
Turner points out that there are certain tasks that are common to all schemes but there are different ways and means of doing each. The tasks that must be carried out in implementation of a housing scheme are:

• Organisation - by those on whom the implementation of the program depends and in ways that ensure the required degree of co-operation;
• Finance - to obtain necessary services and material resources;
• Land - acquisition or obtaining the appropriate form of tenure to provide the necessary control;
• Planning and specification - of the development;
• Techniques and tools - acquiring those necessary for the works;
• Building - by contracted and/or voluntary management and/or labour;
• Maintenance - post development.

These Turner defines as 'barriers' to be overcome.[78] Although they are broad sub-dividable categories that ignore possible sub-tasks they serve to illustrate that each task can be accomplished in different ways. The number of possible permutations in a completed housing scheme is thus huge. Looked at as 'barriers' the development process allows options for locally self managed programmes some of which should provide access for low income households dependent on government enabling. Turner argues that it is impossible for corporate organisations to meet such permutations as their economics depend on large-scale, standardised forms and procedures.

The necessity of local knowledge
Turner notes that "however simple a dwelling environment may be technically, it is an immensely variable and complex system socially, economically and spatially."[79] As I have noted he argues that success depends on local knowledge and sufficient options that the user is aware of and can make use of. Conversely centralised systems, ignoring local knowledge will fail or require heavy expenditure to overcome the mismatching of supply and demand. Two kinds of authority and power based on two complementary types of knowledge can be defined "It is clear that competent decisions on locally appropriate programs depend on those who have to implement, use, manage and maintain the works to be carried out. It is also obvious that personal and local freedom to carry out decisions depends on the appropriate ways and means of carrying out the tasks, a knowledge that professional consultants should have." The greatest available resource for new home and neighbourhood building is the people who need them and for improvements and maintenance those who are already housed. Architects make technical decisions from knowledge of the wider environment.

NGO's and professionals should ideally act as:

• consultants to central authorities;
• consultants to locals, ensuring they are aware of options and have access to knowledge and skills required to combine them into a practical programme, controlled or implemented by themselves;

---
[76] ibid.
[77] ibid.
[78] ibid.
[79] ibid.

• mediators in negotiating agreements.

Green Decisions
It should be possible to overlay Turner's 'barriers' with preferable green options that can then be evaluated for their 'fit', for example:

• organisation - preferably co-housing;
• finance - some form of undissolvable (non-equity) common ownership;
• site choice - within city and including renovation;
• planning - in respect of microclimate, communal areas, communal buildings, site layout for appropriate heating requirements and lifestyles;
• techniques and tools - low impact construction methods and materials as defined in *Chapter Five*, transparent methods, adaptable constructions;
• building - some element of self-build or participation;
• maintenance - design for adaptability by local people.

8.4.2. Co-operative Self-help and Support

Turner's is a generalised account of process. I have already noted benefits of co-operative ownership forms. Here I note Ospina's description of the various participants and the process through which a community co-operative may go to produce housing.

Community, Professionals and Resource Bodies
There are usually three main participants in any community housing project. Ospina notes that the successful completion of a project depends on the resolution of these various interests:

• *The community* may be self-organised but is more likely to be brought together by local authorities, housing associations or by secondary co-operatives.
• *Professionals* provide necessary administrative, financial or technical support to communities. This *enabling* expertise is problematic in that it can be used to control the project but such professionals are critical intermediaries between the community and resource bodies.
• *Resource bodies* determine the framework and provide resources accordingly. The framework determines the form that the community and project can take and the support or obstacles that will be given or put in it; way. Resources such as land and finance are usually provided within a series of regulations. Ospina defines *enabling* resources as those that operate with flexible limits that are broad enough to give the community a range of options. These resource bodies can be public or private.[80]

Subsidy, professional services, modern technologies, integration into official housing policies can all *enable* popular control but the potential appropriation of self-help by 'experts' or resource bodies is a critical problem. Ospina argues as Turner that community architecture should be what people design themselves, with the benefit of professional advice; appropriate technology is what people choose to develop for themselves after access to wide range of possibilities; the only ideal organisation and finance are what people voluntarily choose, on the basis of having control of the resources and the necessary information and freedom to use those resources in the most appropriate way.[81]

Resources
The resources necessary to carry out a housing project can be divided into those that are internal (provided by the community) and external. The main resources are land, infrastructure and services, finance and human resources.

• *Land* is usually an external resource provided by local authority at subsidised cost or purchased on the open market. Purchase on the open market increases cost but may broaden choice to the community - i.e. less restrictions in terms of allocation.
• *Infrastructure and services* (roads, drainage, electricity, gas and water) are usually external resources provided by public boards. Provision must be co-ordinated with the construction to be enabling. It should be noted that decentralising green technologies could 'internalise' more of these resources (district heating and CHP, low energy and solar building, rain water collection) reducing ultimate demand but not usually negating installation. Such internalisation would depend on appropriate professional advice.
• *Finance* is usually external (loan funding and/or subsidy of numerous types). Critically however, subsidised or not, control must rest ultimately with community to determine how it is used.

---

[80] Jose Ospina, *Housing Ourselves*, Hilary Shipman, London, 1987.
[81] ibid.

• *Human Resources* include labour and professional skills. As described some communities will provide their own labour ('sweat' equity) and some will provide professional skills administration or accounting (enterprise equity). Often these skill will be purchased. Professional skills may be given as a subsidy by government but more often they will be brought from secondary housing organisations. *Again there is not a problem of whether they are internal or external but how accountable they are to the community.*

Participants and resources come together in housing process to produce housing through proposal, organisation, development. Post-development actions are also important.[82]

Proposal
The proposal involves the determination of project size and scope and user group. Initially a group will come together to form the nucleus of a co-operative of some type (or self-build association). The proposal maybe initiated by the community, professionals, local government or other sponsor. Ospina argues that the former is preferable since the others are likely to reflect interests of external groups rather than the community. Locally initiated projects are generally smaller and more locally appropriate. In the UK groups have tended to come together and then seek out a secondary co-operative to see through organisation and development work. In Scandinavia people tend to join a secondary co-op first and are then allocated a place in a new primary co-op.

Common ownership co-operatives must first register as a friendly society and then attempt to register with the Housing Corporation as a housing association. This depends on there being grant and loan finance available and on the co-operatives willingness to use a secondary co-operative, housing association or local authority as development agent. It is far from automatic. They then must work within the complexities of the Housing Corporations funding system and loan approvals.[83]

Organisation
A distinction has already be drawn between community initiated and professional or government initiated schemes. If community initiated they will need to seek accountable professionals to guide development. The services of a secondary housing associations will be important here. If professional or government initiated these bodies will need to 'find' a community to use and manage the development. 'Ready made' communities may be found in existing groups, like residents of a clearance area or formed from waiting lists. Ospina notes "If the social engineering involved in forming a community is to be successful, the promoters must ensure that the people brought together have more in common than just needing a place to live. This may involve 'integration activities' where people have a chance to meet, work with and get to know each other prior to occupation".[84] One of the strengths of self building is that it provides this opportunity. The self-building of a temporary materials shelter or permanent communal house may precede contracted or self-building of the units.

Very few communities are entirely self organised and most are brought together by local authorities or secondary housing co-operatives. The degree of control over the process may however depend on their organisation and internal cohesion. Ideally users should eventually develop a separate, autonomous, democratic organisation which enables them to decide the shape of their housing and to manage it after completion. If the group is divided or not formally constituted control may end with professionals. Clearly attempts to encouraging 'green self-help' will rest on a 'pro-active' support but will also involve developing finance arrangements and other resources to generate community initiatives.

Development
Once the group has purchased land or unimproved buildings planning permissions are then sought and the financing of the scheme is agreed with whatever agencies lend or grant money based on preliminary design and costing. The development period is from land acquisition to occupation and involves two main phases design and construction (by tender or self-build). Professional involvement includes both development managers and architectural/technical consultants involved in design and construction. Although communities can carry out their own development it is usually left to the local authority or specialised secondary organisation which in turn employ the consultants and contractors. These organisations need to be accountable to the community. If the community is to control development through its secondary organisation appropriate training is required for the community to make the decisions required.

---

[82] Peter Stead, *Self-Build Housing Groups and Practices*, Anglo-German Federation, London, 1979. p38
[83] ibid. p37
[84] Jose Ospina, *Housing Ourselves*, Hilary Shipman, London, 1987.

The secondary co-operative will either appoint, or aid the community to appoint, an architect. The architect will help the community to develop designs, and decide on construction types and the appropriateness of, for example, self-build. Participation methods in design such as 3-D models, overhead projection, site visits etc. have been developed to aid this process. These are discussed below in more detail (see *9.3. Participative Design Methods in Co-operatives*).

The architects will manage the construction of both self-build and contracted work. If the project is contracted they will aid in choosing an appropriate builder, produce drawings for construction and supervise builders. In self-build the architects will organise the process including training in the technologies to be used etc. One choice, for example, will be between using 'work teams' or having 'individuals' constructing their unit. The Segal system allows for predominantly family or individual building with the group assisting at certain stages but more traditional building technologies will usually require skilled contractors or organisation of residents into work groups. Self-build allows for savings but employing contractors allows people not to worry about their skill levels for building and thus enables them to concentrate on design and the desired results. The later requires more income or higher subsidy.

Post Development
As noted a co-operative can begin or end at this point. The main difference between a house-building co-op and a 'full' or 'continuing' co-op is that the former do not enter the management stage. The house building co-op is simply a group of people who come together to provide housing for owner occupation at a cheaper cost than they would incur on their own. It may be used simply to buy land for parcelling out as individual plots or it may develop the site, hire a builder and complete the development stage. Although such co-operatives are not genuine they may contribute to the building of 'community' and buildings that are associated.

Control of management and maintenance after completion and the secondary allocation of housing are perhaps the definitive measure of community control. A co-operative may contract out these responsibilities or carry them out directly. Allocation of vacant dwellings is only in the hands of the community if ownership or tenure is collective. Because common ownership's are in receipt of grants they must allocate according to need. In owner occupied or co-ownership arrangements the re-allocation is in hands of individuals although the later will require consent of a co-owner.

An important point here is whether group policies are more or less discriminating than those of an official housing body.[85] As noted above critics argue that housing groups will be parochial in allocation. On the other hand advocates point out that different community housing groups will have a variety of criteria, corresponding to a variety of needs, which, if universalised, would provide for many more individual requirements than centralised allocation priorities could.[86] In addition it should be noted that central allocation has been far from non-discriminatory.

Responsibility for management and maintenance also depends on tenure:

• if owner occupied the owners are responsible for their own home although some collective responsibilities may occur in communal areas (that are communally owned);
• if shared ownership the responsibility is maintained by the share owning body (local authority or housing association) and funded from rental payments paid to this body;
• if either owned or held collectively by the community the co-op or association are primarily responsible and payment is from rent paid by each user to their collective body - they may choose to employ a management agent (e.g. a secondary association) to carry out this function.

Principles
Ospina draws several general principles from his observations of self-help housing in the UK.[87] They are:

• *A need to form communities.* Public control over resources (i.e. communities of users vested with collective management of those resources) depends on the formation of genuine, self-managing communities.
• *A need for a nurturing framework.* For a community housing organisation to form and develop it needs access to resources and professional skills and to forms of organisation that will allow it continued

[85] Johnston Birchall, *Building Communities the Cooperative Way*, Routledge and Kegan Paul, London, 1988. p129
[86] Colin Ward, 'Participation or Control', in Colin Ward, *Housing: an anarchist approach*, Freedom Press, London, 1993.
[87] Jose Ospina, *Housing Ourselves*, Hilary Shipman, London, 1987.

control of its environment. Official frameworks are valuable if they are not manipulating. The idea of a completely enabling framework however is utopian.
• *Community control of resources.* Control must be with the community but this demands enabling professional services.
• *Enabling professional services.* Enabling means securing community participation in administrative, financial and technical decisions.
• *Design technologies and forms of organisation should be selected by communities.* This clearly follows from the above. A successful framework will encourage more appropriate decisions.
• *The aim of professional enabling and a supportive framework is to maximise choice.* Architectural services are important in broadening choice beyond peoples immediate scope.

Conclusions - Towards Mutual Aid - Co-operative Self-help

Co-operative housing has become accepted by all sides of the political spectrum from those who believe in the right to buy in the free market to those who believe in the right to rent social housing and the right to a home. Birchall notes that such acceptance has put housing co-operatives on the agenda but has done little to develop a coherent structure for co-operative living.[88] *What co-operative housing has done is explode the myth that owner occupation is the only way people can gain control over housing and that council housing is the only way of securing housing for the disadvantaged.* As noted owner occupation does not necessarily mean control over housing but can mean homes controlling people. There are people who cannot afford to keep up the repairs on housing or modify them for their changing needs. There are those caught by property price raises who's income is dedicated almost solely to housing. There are also those who through redundancy or ill health become mortgage debtors. Such situations have been made clear with 'negative equity' and the recent council house sale repossessions due to non payment of mortgages.[89] *Co-operative forms are then not simply a rental alternative but also an owner-occupation alternative for many groups.*[90]

It is also clear that owner occupation encourages housing as a 'market good' (not a usable adaptable home) and increases inequalities in society. For example tax relief is made available to encourage higher income groups to invest in housing for its exchange-value not use-value. This equity is handed down within families.[91] Birchall argues alternatively that co-operative housing is inherently equalising, since it is allocated strictly on the basis of need but unlike local authority housing it is controlled by dwellers who use the rent income to maintain the property. In common ownership co-operatives there is no equity gain by individuals and so house price inflation is checked (there are increased costs due to land value and building costs).[92]

Common ownership co-operatives however do not offer a realistic alternative to owner occupation generally since state subsidised common ownership co-operatives only admit those in housing need while those who could afford to invest in private dwellings will lose potential equity if they do not do so. *Birchall argues that one answer is a more equitable system of housing subsidy that does not bribe people to become individual owners and penalise those who do not.* It means developing shared ownership and co-ownership co-operatives, through which dwellers can make individual investments in their housing without losing the advantages of collective control and a more co-operative lifestyle. Shared ownership co-operatives are however usually designed to lead to owner-occupation with the dissolution of the co-op (unless there is a residual freehold held in common as in a condominium). In addition co-ownership co-operatives have been sold off to their members. A critical question is can individual equity be encouraged, without it destroying the very existence of the co-operative? A variety of ways exist:

• Common ownership co-operatives could issue loan stock to members at fixed rates of interest.
• Shared ownership co-operatives could, in return for state subsidy, be constituted so that a fixed part of the equity is always held in common as at Glenkerry House.[93]
• Co-ownership co-operatives could be set up with members taking up a minimum share holding, then receiving bonus shares as the value of the property rises and surpluses are made on rents. These could be sold to a new member on leaving or transferred to another co-op. This would entail two safeguards; a law

88 Johnston Birchall, *Building Communities the Co-operative Way*, Routledge and Kegan Paul, London, 1988.
89 other examples in Johnston Birchall, *Building Communities the Co-operative Way*, Routledge and Kegan Paul, London, 1988. p190 (compare to Turners third world examples of limited inner city renting)
90 Johnston Birchall, *Building Communities the Co-operative Way*, Routledge and Kegan Paul, London, 1988. p191
91 ibid. p192
92 ibid. p192
93 ibid.

(such as in France and Italy) against the break up of a co-op for capital gains, and a procedure for valuing the members shares which discourages speculative gains.
• Co-operative control of the process by which owner occupied housing is produced and improved. This has occurred in self-build groups enabling low income groups to build their own homes. The result is neither a permanent co-operative nor an estate of restless, alienated owners, but a group of people who have just built their own houses and at the same time built their community.[94]

Such initiatives, I argue should form the basis of what could genuinely be described as '*green* housing and city design' policy.

Application - 'Proactive Green Community Housing Policy'
In concluding this chapter I argue that group self-help is potentially our greenest form of city development and should be encouraged within any sustainable framework. There is a need to build on the intrinsic green aspects discussed and this would be a priority in a green city policy. Developing co-operativess that link work and home should be a priority. The development of federations of these co-operatives would also be important to avoid parochialism by encouraging interchange of ideas.[95] In summary attention should be focused on:

• a reversal of current financial incentives to owner occupation
• enabling financial frameworks for self-help and a pro-active environmental self-help policy;
• development of confederation of co-operatives and self-help organisation with 'green centres' in cities acting as demonstrations and information centres;
• encouragement of communal self-help as opposed to individual with genuine communal tenure options for subsidised and private co-operatives;
• providing for building materials, services, and support services for housing production locally;
• means of extending housing provision to local production of services thus expanding and making more revolutionary the self-help project - federation of food, housing and workers co-operatives;
• encouragement for green technologies that enable greater self-reliance within the co-operative housing framework;
• green design literature for individual and group self-help, the later involving the concept of negotiation based on, for example, beneficial locations for passive solar design within a group of various users;
• development of transparent design methods that will inform and thus increase control;
• development of simple design procedures that enable control but do not force people to 'build'.

Both the self-help/self-reliance movement and green technology movement offer something to each other. Participation forms a basis for inner city renewal while green technologies discussed maintain self-reliance beyond construction into production of energy and food etc. A pro-active green 'support' could be created that enables introduction of green technologies within a self-help or participative framework. This should promote ideally small scale federated non-equity co-operatives as opposed to existing policy of larger scale housing associations. I now go on to look at the role of the architect in the development stage that as I have noted is of particular importance in the development of sustainable housing.

[94] ibid. p193
[95] Murray Bookchin, *Urbanisation without Cities*, Black Rose Books, 1992. p296.

Chapter Nine:

Self-help Housing: Architectural Support Strategies

Introduction

I have described the potential of greater self-help in housing provision in moving towards more sustainable cities. I have therefore suggested the development of a pro-active self-help policy. This should enable a variety of ownership patterns but particularly expand the various co-operative options. Such a policy should also be directed at a number of levels, not simply, for example, at new build housing or rented housing. I now go on to look at the role the designer can play within this framework in:

- enabling effective participation in design and construction,
- introducing green forms and techniques while maximising user options.

I do this by looking at various projects that have involved participation within their larger political, financial and regulatory context. I also note some programmatic features in these projects that can be described as environmentally beneficial. Participative design methodologies are clearly not independent of consideration of the context described. Successful participative process must optimise resource use. Each of the projects discussed responds to a specific set of parameters.

- At Byker the architect collaborated with a large and informally constituted community body of tenants where resources were in the control of the local authority sponsor client. No *control* was given to tenants individually or communally.
- Physical support structures built at Adelaide Road (London) and Papendrecht (the Netherlands) were developed for tenant participation in individual house *layouts*. This occurs within a physical structure designed by the architect for the social sphere knowing the site but not the future tenants. The individual layouts were determined with the tenant but their ownership remained in the social sphere. The sponsoring body owns the support designed by the architect and the infill (a kit) designed to participative specifications but built by manufacturers as a system.
- Hertzberger has designed *speculative supports* in Delft (the Netherlands). These demonstrate the possibilities for owner occupation of the architect designing unfinished buildings that the owner completes within building regulations.
- In most housing co-operative designs the resources (fixed centrally), are controlled by the community who thus employ the architect (usually based on advice from a secondary organisation). A co-operative will usually want to have an influence over the design of their living environment in terms of individual house designs and the site layout. A variety of methods are used in relation to the community and individual users who have a degree of control over design limited by regulations, *the fixed budget* and the effectiveness of design communication. Consultation procedures are aided by *design tools* of various types.
- The Segal Method has been used for owner occupation, rented and co-operatively owned self-build. Self-build reduces costs for all of these forms but can restrict architectural possibilities because of possibly limited skills of the self-builders. The Segal Method further reduces costs but gives a large degree of freedom in floor planning and to some extent form.
- The SkillBuilding *assistance package* was developed to allow for a wide variety of sponsors and ownership patterns for lower income housing. The system facilitates house production by making the entire process more transparent (not simply design). Design occurs within a system. Contractors are used but the process defined is designed for on-site training of users and eventual take-over of construction towards completion. The method has modifications for self-build.
- Alexander's self-build methodologies envisage a complete change in the housing process. Principally co-operative members would build their houses with the architect on site. Questions are raised concerning cost control of such alternatives.
- Cohousing schemes have combined various forms of common ownership and management forms with physical provision of shared facilities that provides potentially our greenest form of housing. Many have been designed (for economy) around fixed community core structures that enable variation within economic limits.

9.1. Byker - Some Problems of Participation

Participation or Control

Ann Richardson notes that efforts to involve tenants cannot be judged simply by technical criteria but must be seen as political decisions that are often contradictory "tenant participation may be introduced as a means of increasing tenant control (power) over policy decisions affecting them. Or it may be introduced because it is thought that established policy goals may be achieved more efficiently if tenants are given a regular voice in the implementation process (making things work better). Or it may be introduced to give tenants an increased sense of involvement without necessarily affecting policy decisions very drastically (keeping people happy). Finally it may be introduced to ensure the representation of tenant views in council decision-making with an emphasis on due process rather than policy outcomes (democratic rights)."[1] Participation can be a means of manipulating tenants in the interests of housing management. It can be seen as a training ground for genuine tenant control or as a means of manipulation.

The Byker redevelopment in Newcastle has become a symbol of successful urban redevelopment and design. In 1968 the City of Newcastle produced an outline plan for clearance and rebuilding to rehouse the existing community of local authority tenants with associated shops and community facilities. Between 1968 and 1981 over 2000 dwellings were built on a 200 acres site cleared of the existing tightly packed council owned terraced houses in stages. As a pioneering experiment in participation it has provoked debate as to whether it is predominantly the product of architectural techniques, political requirements or people's design. Here I briefly explore the effectiveness of participation at Byker. The animated debate in the architectural press has perhaps helped to disguise what has actually happened. It is however important as an experiment in participation where the architect is designing for a user client but employed by the sponsor (in this case the local authority).

In looking at the extent to which participation shaped the Byker redevelopment four inputs must be balanced:

• tenant demands (as they were made known through the participatory process);
• the architects interpretation of the future for Byker;
• the local authorities objectives for the greater area;
• regulatory powers and financial resources (in particular of the local authority owner client).

The extent to which each of these determined physical and programmatic aspects of the scheme varies. Below I discuss three areas of the development separately. In conclusion I attempt to isolate reasons for the varying degrees of participation achieved. First I look at the forms of participation proposed.

Forms of Participation Proposed

Byker represents an early attempt by a local authority to acknowledge the presence of, and conserve, an existing community in an inner city area scheduled for comprehensive redevelopment. The policy developed was in line with the recommendations of the Skeffington Report *People and Planning*, published in 1969. This report acknowledged limited participation as a means of:

• informing people about (the official view of) progress,
• improving the officials' level of understanding of local needs and preferences in order to improve the basis of decision making.

It maintained however that responsibility for preparing the plan should remain with the local authority in order to deal with inner city objectives at it saw them.

Ralph Erskine's office was initially employed to re-appraise the local authorities proposals and develop the project to implementation. This was due, in large measure, to previous experience working within a participatory framework in housing. Erskine philosophy was that the true clients should be the residents not the sponsors.[2] His report to the city council expressed a desire to work in "intimate contact and collaboration" with the residents and to consider "the wishes of the people of all ages and many tastes".[3]

---

[1] Ann Richardson quoted in Colin Ward, 'Participation or Control', in Colin Ward, *Housing: an anarchist approach*, Freedom Press, London, 1993.
[2] Ralph Erskine, 'Designing between Clients and Users', in Richard Hatch (ed.) *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[3] Peter Malpass, 'The other side of the Wall', *Architects Journal*, 9 May 1979.

The intent was to involve local residents in the formulation of goals and let their needs and preferences determine priorities of the scheme. Another clearly connected aim was local rehousing of the community.

In implementing participation Erskine with the support of the local authority:

• began initial general consultation and research into residents wishes;
• converted a building, centrally located in the development area, into an office with a flat above for two members of the office to live on site;
• proposed a pilot scheme (to test participation and the forms of houses) in which prospective tenants would be directly involved with the architects in the design of their future houses.

The on-site office was to perform 3 main functions:

• a focus for design meetings during the pilot project;
• a form of 'architects surgery' developing a two way flow of information;
• a location for participants meetings with council officials and housing allocation sessions that would normally taken place in the civic centre.

Vernon Gracie, one of the architects to live on site argues that it allowed the possibility of chance meetings of great value in the design process, giving an insight into user requirements and providing for answerability.[4]

The Pilot Project (Janet Square)
The first practical result of participation consisted of 46 timber framed houses of two and three stories for residents from a cleared area at Gordon Road. The project was developed in response to requests for early action (public relations) on land already cleared prior to Erskines appointment. The project was to provide a test bed for participation and for the types of units planned for whole area. Meetings with the future residents were held in the site office and continued through design, construction and after completion. During construction residents were able to monitor progress of their own houses. Amery notes how communication of 3-dimensional designs proved difficult within the meetings and formed an obstacle to participation.[5] He describes the form of participation that took place as middle-way participation. The designer learns more of the clients needs and the tenants are better informed but in the end the architect gives users the design he or she feels will suit them best with certain limited choices. The physical form of the pilot project was thus not the result of the architect and client sitting down together and designing individual house plans.

It should also be noted that the architect was employed by the local authority client within a constraining framework that meant architects and tenants were not free to make decisions together. The final designs were predominantly Erskine's, working within a rule bound system for producing council houses. These included nationally imposed cost ceilings, minimum standards and local official requirements. The later were represented through the Housing Departments presence at design meetings. The pilot project drew attention to problems for the architect in working to meet demands of one set of clients while the key resources were controlled by another.

Perhaps the more important feature of the pilot project was that tenants were considered to constituted a *'representative group'* whose comments would be fed into the design process. Feedback from the pilot scheme affected future stages in various ways:

• a proposed contemporary version of the back-lane principle was disliked as was the use of smooth dark brickwork;
• single aspect houses caused feelings of greater intrusion of privacy, given the same amount of both private and public space in front of them, than did double aspect houses;
• sound insulation values were generally inadequate despite meeting the local by-laws;
• archways under housing units provided gathering spaces for the young that many found a nuisance;
• the courtyard/square principle was popular and further developed in later phases by enclosing the courtyards as semi-private space.

While then, the pilot project established clear communication and working relationships with primary clients participation was limited in scope. Generally it was subsequent phases that benefited from

[4] Vernon Gracie, 'Pitfalls in Participation: A Cautionary Tale (of Success)', in Richard Hatch (ed.) *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[5] Colin Amery, 'Housing, Byker: Criticism', *Architectural Review*, December 1974.

feedback (that was vocal) from the pilot households as typical residents! The pilot project also showed that participation had a low priority for residents compared to the desire to be housed. Emphasis for future developments thus concentrated on collecting feedback (generalising the communities demands) and campaigning for forward allocation of houses.

The Wall
In its initial brief the Local Authority specified a requirement to deal with sound from a proposed motorway along the northern edge of the site. The long perimeter block known as 'the wall' developed as an acoustic response to this motorway. This solution was outlined from the start by the City Architects and the resulting form was developed by Erskine's office. Erskine accepted that the wall like the motorway was outside the scope of participation.[6]

In one of his reports to the council Erskine stated "As a rule, the block will be no higher than its primary function as a noise shield determines. It will however by virtue of its position, length and height, make a major statement in the urban landscape."[7] The wall varies from two to twelve, but more generally between three and eight storeys. It consists primarily of sheltered housing for the elderly with some family housing with ground floor access. One reason given for this is that groups of elderly stated preferences to live together as neighbours and friends with families located nearby. Gracie describes that while the extended family network was important at Byker the elderly preferred to live in groups with a lower density of children.[8] He also notes that "comments made by quite a number of elderly people in Byker" stated a preference for living off the ground for security and the view.[9]

This *unconstituted* preference can alternatively be seen as a convenient excuse for an interesting piece of urban design that solved the problem of motorway noise. The institutional isolation of this concept bears little resemblance to the 'community' as it used to exist on Byker with relatives, neighbours, visitors, life in the street and around doorsteps. Again the power of the real client lay elsewhere. In detailed design the DoE's sheltered housing concept with its limited floor areas, alarms, wardens and cost limits was the most powerful determinant of the end result. The physical amenities in the new units were clearly an improvement that very few elderly people would turn down. The offer was however not made while after 'consultation' it could not be turned down anyway since, it seems, it had been requested!

Low Rise Mixed Development
Most of the Byker development is low-rise. The architects initial plans for Byker involved renovation of the existing buildings based on a stated aim not to impose but to maintain existing patterns of life, traditions and characteristics of the area and the existing structure of the community with its close-knit sub-groups. In addition renovation would reduce disturbance and thus ease the process of renewal. Research illustrated however that a large majority of tenants wanted new housing while studies of the architect showed that old houses were difficult to rehabilitate with no obvious economic advantage in so doing. Residents, generally also rejected the idea of maintaining and reworking the existing street pattern - the front roads, back alleys, and house groupings of old Byker.[10] They pointing out deficiencies in orientation (all the original streets ran up and down steep hills; half the living rooms faced north) and the nature of use patterns and social exchange in old Byker. Observations from the pilot project confirmed the desire for completely new forms of housing.

With this in mind and the relatively high density frame of the perimeter block to the North Erskines concept for the majority of the housing became one of exploiting the south facing slope. This involved mostly two storey row housing built around the contours with shallow pitched roofs to enhance views. Some semi-detached and even detached houses are also provided along with some three storey blocks and single storey disabled flats. Initial plans by the city envisaged a greater amount of flats that were limited to the perimeter block after consultation (residents expressed the desire for private outdoor space and low rise building). Feedback particularly from the pilot project meant that many developments were based around semi-private courts and private gardens with low fences. Erskine argues that tenants accepted his preference for limiting internal streets to pedestrians.[11] Row houses were used principally for economy.

[6] Ralph Erskine, 'Designing between Clients and Users', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[7] Peter Malpass, 'The other side of the Wall', *Architects Journal*, 9 May 1979.
[8] Vernon Gracie, 'Pitfalls in Participation: A Cautionary Tale (of Success)', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[9] Vernon Gracie, 'Architect's account', *Architects Journal*, 16 May 1979.
[10] Ralph Erskine, 'Designing between Clients and Users', in Richard Hatch (ed.) *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[11] ibid.

Byker residents did express a desire to retaining neighbours, friends and associations, and to retain local landmarks and community facilities corner shops, pubs, churches and laundries all of which had been scheduled for demolition. The architect attempted to meet these demands and give a specific local individuality to each group of houses. Specific locations of shops were decided after consultation with shop keepers. Erskines initially stated desire to build a complete and integrated environment involving creating positive conditions for dwelling, shopping, recreation, studying - and as far as possible working in near contact with home thus consisted of a combination of existing landmark buildings with new-build houses. An area for light industry was also included.

Through consultation the architects also discovered that uphill areas were considered more 'prestigious'. These were typically away from the docks but closer to Shields Road shopping street. Problems arose initially with people cleared from the hill top and relocated near the river. Consultation allowed this to be accepted or compensations inserted such as new shops and community services at the bottom of the hill.

It is clear that the architect took a firm design line in responding to the city brief, the two dominant physical characteristic of the site and residents wishes. The appearance and construction of Byker is idiosyncratic to Erskine but some decisions in developing the brief were determined by the architects desire to know about the area and find out from the people. Such consultation (rather than participation) increased the architects knowledge of the large diverse community (unfortunately this was based on theoretical consensus). Erskine acknowledges that the views were many and only a few could be accommodated.[12] Tenants acted as clients only to the extent that some of their wishes were listened to, others were not expressed, others not listened to, and others impossible to accomplish due to demands of the sponsor client.

Some Programmatic Concerns

• At least one meeting was offered with all users before occupation and pamphlets were distributed on the houses. At these meetings facts about the new buildings were explained, such as location, layout, cupboard spaces, size of windows and alternatives could be demanded.[13]

• Flexibility was gained by initial "under-renting", by use of convertible house types (e.g. two 2 person flats that could be converted into a 5 person house), and hobby rooms connected to houses for possible extension of occupancy.

• When fundamental disagreements with residents occurred Erskine describes how they tried to "convince them by fair methods".[14] Erskine planned a children's sand and water play areas that many parents did not want for various reasons. The architects thus planned reduced play provision leaving space for further provision later. They then built a playground outside the office and eventually were asked to re-equip existing areas!

• Management, maintenance and cleaning were initially centralised. Many of the technical problems that have arisen at Byker are due to the architects design often as a result of the tight housing and maintenance budget. Central management and the scale of project have however added to many of these problems.

• The office site set up a service for landscape advice and for the sale of plants at wholesale prices. Lectures and printed information on garden screening and indoor plant care were also provided. If they dug their own garden tenants were offered the equivalent of the cost of external works in plants. Beech hedges were planted just outside each garden fence on public land and were thus paid for from the budget but trimmed by tenants to suit there privacy needs. In addition school children planted the trees on public areas. The community has responded to landscape almost without exception with well kept and luxuriant gardens despite the fact that old Byker had little vegetation and its residents lacked gardening experience. Buchanan argues this has much to do with process.[15]

Outward Movement

Initial research suggested 80% of existing tenants wished to stay in the area. To provide more opportunities for local rehousing the architects reduced clearance areas from between 1000 and 1500 dwellings to about 250 dwellings and set up a process of build - rehouse - clear - build. This was an attempt to avoid problems associated with demolition and clearance including; uncertainty over the future, disintegration of the social fabric, demolition noise, smoke and debris, increased in vandalism and theft. A Code of Practice for controlling demolition was drawn up with the involvement of residents and an attempt was made to allocate houses in advance, reducing uncertainty and allowing families to at least follow developments in their houses.

---

12 ibid.

13 Mats Egelius, 'Housing and Human Needs: the work of Ralph Erskine', in Byron Mikellides (ed.), *Architecture for People*, Cassell Ltd, 1980.

14 Ralph Erskine, 'Designing between Clients and Users', in Richard Hatch, *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

As a proportion of those people living in the redevelopment area in 1960 those who now live in the area are a small group. Many left shortly after development plans were discussed in the early 60's. Erskine proposed to rehouse three-quarters of those still in the area in 1968 (around 9000 people). Several factors mitigated against this including:

• old houses must be cleared to build new ones and so some people would have to leave to free building sites despite the Code of Practice;
• numerous delays in building occurred due to political factors outside the architects control. Gracie describes how most people moved out of the area between 1971 and 1974 when major delays in building occurred;
• the phased building option proposed by Erskine was subverted by the council who demolished far more houses than were built in response;
• despite attempts to reduce its impact in this case redevelopment clearly creates stressful environmental conditions that encourage people to leave rather than wait.

Malpass argues that more importantly failure to keep people in the area was due to the failure to more effectively involve residents due to the weakness of the architects in relation to the local authority.[16] Malpass points out that the local authority had political priorities to regenerate the area at reduced density (and putting a motorway through) before retaining the community was accepted policy and that in actuality retaining the community remained a low priority. From this point of view, participation, for the local authority, was a means of carrying along the residents - not giving away power that would weaken its ability to carry out it 'responsibilities'. The restricted form of participation is important here i.e. via the architects office, pilot scheme and public meetings not through an organised body of residents operating through political channels to achieve control over policy in the neighbourhood. The council could thus structure contacts to deny an effective voice and prevent emergence of more challenging alternatives.[17]

Conclusions

Byker is then as much a product of architectural techniques and political requirements as 'people's design'. It was a pioneering but in many ways flawed experiment in participation limited in scope:

• Limited individual tenant choice was a feature of the pilot project only and this was minimised by requirements of the sponsor client, regulations, and difficulties in communicating 3-dimensional designs in informally arranged meetings. Neither however was this a priority for tenants.
• The main function of the pilot project was providing feedback for future stages that were for different residents.
• After the pilot project participation in individual plans formed no part of the brief and emphasis was placed on collecting feedback that was inevitably generalised and forward allocation to ease regeneration.
• The overall brief and site concept involved a strong architectural design input but was also shaped by increased knowledge of tenant wishes. These were not formerly constituted and thus could be loosely applied depending on specific circumstances.
• Cost restraint by the client sponsor had a considerable influence on the architect's design and use of feedback as more importantly did regulations for council houses.
• The local authority had certain priorities outside the scope of participation that it implemented using the informal forms of participative contact to carry along residents.

Keeping people informed and improving the officials level of understanding of local needs and preferences in order to improve the level of decision making form an adequate basis for participation only if consensus exists and urban redevelopment is not like that. The form of participation by not giving any political control to residents allowed the local authority to carry out its objectives based on the notion that there was a consensus of views at Byker. By constantly telling people within a participatory framework that it was doing its best and putting problems down to technicalities beyond reasonable control those who might disagree, instead, let them get on with it. Consensus stands in direct opposition to participation that should be about uncovering conflict and then working out how the benefits will be distributed.

There are perhaps no doubts about the intentions of the architects but Byker demonstrates a need to grapple with political complexities to fulfil participation. A need to be alive to politics of policy making and implementation in local government. Effective participation must be developed around community groups that are constituted to have control over resources. The type of participation proposed by architect Ralph Erskine and the local authority, although it has undoubtedly contributed to the success of the re-

---

[15] Peter Buchanan, 'Byker: The Spaces Between', *Architectural Review*, December 1981.
[16] Peter Malpass, 'The other side of the Wall', *Architects Journal*, 9 May 1979.
[17] Peter Malpass, 'The politics of participation', *Architects Journal*, 16 May 1979.

development, can be criticised as not giving any real control to tenants. For critics such as Malpass Byker became an exercise in urban management with power remaining strictly in councils hands rather than giving people a decisive choice in the area.[18]

Limited management co-operatives have been set up after completion but alternative forms of tenure that could have given a controlling role in decision making were not explored. Ownership, resources and thus control remained with the local authority. Neither was any tenants body formally recognised politically. Participation now centres around a liaison committee chaired by residents in rotation. The architects would have preferred a properly constituted association to maintain initiatives beyond design.[19]

Against these criticisms it should be noted that the Byker redevelopment took place against a daunting tangle of constraints which defined public housing in Britain in the late 60's before the co-operative movement in Liverpool. The project is generally seen as a successful regeneration within its own terms. Ravetz has described a neighbourhood rebuilt around its people and social life "quietly absorbing the churches, schools, and other community buildings".[20] She also notes that many residents are personalising their houses and even taking over some of the smaller public open spaces with the tacit sanction of the authority. The success of semi-public space and mature vegetation have been described by Buchanan. Although the results at Byker can not be considered in isolation of the design and many other factors it is clear that the architects local involvement and the consultations with tenants were undoubtedly important.

Predominantly the pedagogic side of participation, communicating the process has been important at Byker. The process of public meetings and hearing private queries has activated the community as they passed through demolition and re-housing. They have become more informed of the planning process and as a whole and thus less willing to accept, becoming more environmentally critical. Tenant involvement was a means of easing the community through the distress and anxiety caused by the upheaval of redevelopment as much as influencing physical design and to this extent has been successful. Despite some outward movement most commentators agree that the 'community' has shifted from the old housing areas to the new and seems even to have gathered strength from the process. Collaborative design argues Erskine increases the "understanding of what the buildings and streets can do when built, and what is not possible and why".[21] It can develop the realisation that users can contribute, not simply accept. Further architects can enquire about preferences not guess in the isolation of their office.

As noted Byker also suggest areas to be explored in moving towards greening that I have argued are as important as traditional 'low energy' building. These include landscaping as a continuum with architecture, mixed uses, utilisation of knowledge of architect and residents in development, flexible and transparent design. The liberal supply of corner shops, craft workshops and light industries envisaged was to form a complete neighbourhood not a dormitory suburb. Some industrial units planned to encourage light industry, "the back street workshop" are being exploited by the residents (management) co-operative.

Participatory Design Methods and Local Control

The criticisms of Byker do not mean that architecturally informal participation cannot be effective but that political control or control over the financial resources to employ the architects should precede such methods. Broadbent describes Erskine's notion of participation generally as one of *Conjectures and Refutations* after Karl Popper.[22] Like other participatory methods such as graph theory it attempts to address the problem that residents lack skills to design and build their own houses. The architect acts as catalyst in the realisation of designs. He puts forward a range of samples, based on users telling the architect what they want. The users then look at these to see what most nearly meets their personal requirements and suggested such modifications that would bring them about. Once they had seen alternatives participants can judge if, and at what cost, their dwellings could be adapted to their needs, "aesthetic appreciation is linked to one's experience of life".[23]

---

[18] ibid.
[19] Alison Ravetz, 'Commentary on Byker', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[20] ibid.
[21] Ralph Erskine, 'Designing between Clients and Users', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[22] Geoffrey Broadbent, 'Commentary on Lycee David', in Richard Hatch, *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[23] Ralph Erskine, 'Designing between Clients and Users', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

Broadbent argues that while it is criticised as architect dominated the method is essentially no different from control gained by teaching people graph theory (or designing a physical support as described next). Limited as drawings and models obviously are in showing the architects three dimensional concept of what he or she thinks users want Broadbent argues they are a good deal more honest than teaching people graph theory and making them think they are designing for themselves. The potential of all these methods are however secondary to resources. Effective participation requires some form of constituted control of resources allowing the occupier to make decisions and control the process. Clearly however there will always be financial and regulatory limitations.

9.2. Supports: an alternative to mass housing

9.2.1. SAR

SAR (Strichting Architecten Research) was set up at the Technical University of Eindhoven in 1964 by John Habraken. Its aim was to develop *architectural and institutional* means of returning control of *mass housing* to its users. The development of what is known as the supports concept was based on the idea that dwelling is an act not a product. Each person needs a unique environment in which to develop and grow and this demands user participation in the act of producing a dwelling. In postulating a return to user control SAR noted however that dwelling is an act that takes place in two spheres of responsibility and decision making - the individual and the social. These two levels of decision making *can always be recognised.* Even those with the resources to own their own houses have to comply with an infrastructure, regulations and local building codes when building or structurally altering their dwelling. By developing the notion of social and personal spheres SAR attempted to balance personal decision making and creativity with societal demands (cost limits, space and planning standards, regulations). Further while participation of the user in design of dwellings would produce *greater* fit, since dwelling is not an artefact but an interaction between people and their environment it, *must be adaptable to changing needs and occupants providing flexibility and extendibility.*

Critical to discussing the relevance of this division of control today is SAR's point of departure. Habrakens criticism was of Dutch mass housing systems: a perceived alienation created by the parental mass provision of housing and the impossible nature of abstract design decisions given to architects by top down housing provision.[24] The Dutch context is unusual in that 85% of housing is subsidised and thus subject to the regulations and mechanisms of bureaucratic control. In addition 60% is rented thus extending the condition of mass housing (the absence of a user) beyond the design stage and into habitation. As I have discussed above however similar abstract decisions apply to developer housing for sale in the UK. The debate carried out by SAR thus has wider significance.

Supports and Infill

The terms *support* and *infill* were used to define SAR's *division of control.* Neither argued Habraken should this distinction between social and individual control be set.[25] The precise line of division of control should be a product of definition and negotiation given particular contexts (limits negotiated on the basis of mutual needs, abilities and resources). *The distinction between support and infill, for example will be different in different cultural situations.* Habraken refers particularly to the housing conditions of different countries and different densities. In addition while technological possibilities play a role in distinguishing support and infill, *they are secondary to political and economic control.*

Having stressed these distinctions between cultures and between physical limitations and decision making powers *Variations* is a manual for design of supports and thus concentrates on the technical design problems of achieving maximum variations within the economic constraints of a highly industrialised and densely inhabited country.[26] As an architectural research group SAR looked at the architectural consequences and thus structural form of support over the notion of political control and negotiation. The PSSHAK and Molenvliet schemes below concentrate on participation not extending beyond the initial design or into the area of how control is formally constituted.

24 N. J. Habraken, *Supports: an alternative to mass housing*, Architectural Press, 1985.
25 N. J. Habraken, et. al., *Variations; The Systematic Design of Supports*, MIT, 1976.
26 ibid.

As noted the supports concept is one in which the dwelling is not a product that can be designed and produced like a commodity, but is the result of a process in which the user can make decisions within a larger framework. A 'support' becomes a physical entity if the philosophy is applied to *mass housing in the urban, high density environment*. Here it is no longer possible to think in terms, for example, of separate lots and individual houses. Larger structures, either high rise or low rise, must contain a number of dwellings. SAR thus attempted to provide opportunity for individual action in this kind of situation.

A physical support is any building intended to contain a number of dwelling units, which can be individually adapted to the ever changing needs and desires of the users over time. Again the Dutch context is notable in that the Netherlands is an extremely densely populated country and thus restrictions on the idea of doing your own thing were a generally accepted part of urban development. The support is typically an urban problem. Architecturally Frans van der Werf notes further that the support/infill concept *does not originate only from a desire to encourage participation but offers cohesion and merges individual buildings into a clear urban structure*. A main theme in which variations are encouraged.

It should be noted again however that a *support* is not necessarily a *structural frame* and *detachable units* or *infill* are not necessarily *infill components*.[27] Support and infill distinguish two spheres of control or decision making power. Support embodies the social decisions about housing, and detachable units or infill embody the individual decisions. This division should not be a technical or functional distinction *only*. A structural framework and infill components may both be under the control of the resource body and thus both will be supports. By definition the resident is able to decide when and where a detachable unit should be located and thus it will not normally be a structural element. If the occupant wants to remove the element, the structure should not collapse. An internal partition is not infill if people have no control on its movement irrespective of its construction. Logically infill will be non-load bearing elements built into the support and the support will be a complete structure in itself.

Physical Supports and Infill

The concept of levels of support and infills a generalised principle. According to Habraken's definition an element is of a higher level if:

• a change in the underlying level effects no alteration on the higher level;
• a change on the higher level effects an alteration on the lower level.[28]

The support design (space, materials, utilities) places limits on what can be realised within it. A support allows for a number of different layout options for a house unit and a change in floor area of a unit either by adding construction or by changing the unit boundaries within the support. The number of dwellings in a support can be changed. Inter-levels are set up to acknowledge these variations of house types within a support not simply rooms within part of a support.[29] The selection of variant of house types can happen after the support design while a change in infill level has no effect on the inter-level (infill location).

A support is a product bound to site and weather designed by an architect. It has a public sphere because it determines public space. A support for apartments also has to fulfil a few collective functions: entrances, stair wells, main supply and return ducts (for row houses - supply and return ducts). For all these reasons a support is subject to public and political decision making and also has to answer many regulations. The clients for a support may be housing corporations or property developers who will influence the quality of the support. The support is designed for variation but must be capable of achieving dwellings of the standards of normally accepted housing with the problems of limited resources, money and space still present. SAR attempted to give greater control to occupants while working within an standardised 'economic' mass housing system. If rationalisation production was required for quantity could it also enhance quality? The support deals with the notion of limited resources that was the stated reason for system building. Another spark to SAR however was growing doubts over economic benefit of mass housing systems - compared to traditional methods. A support can either be of industrial or traditional construction.[30]

Infill is defined as "a product that is completely subject to the choice of the individual consumer".[31] Infills have been orientated to the consumer market. Infill includes the spatial layout of the house and its

---

27 ibid.

28 N. J. Habraken, *Transformations of the Site*, Awater Press, Cambridge Ma USA, 1983.

29 Dr.ir A. van Randen, 'Consumer oriented building: in full control of and behind one's front door', in *entangled building...?*, Werkgroep OBOM, 1992.

30 N. J. Habraken, et. al. *Variations; The Systematic Design of Supports*, MIT, 1976.

31 Dr.ir A. van Randen, 'Consumer oriented building: in full control of and behind one's front door', in *entangled building...?*, Werkgroep OBOM, 1992.

necessary elements such as inner partition walls, frames, doors etc. It also includes kitchen and bathroom fittings. For Habraken infill units were to be adaptable and capable of being used in different combinations, fitting into different supports (that were therefore to be co-ordinated but site specific). For SAR the concept of infill was developed for mass production (pre-fabricated infill components). The distinction between support and detachable unit distinguished two types of production processes that had to fit. SAR has worked in close collaboration with builders material suppliers, developers, planners and engineers to develop a modular dimensionally co-ordinated system of industrial components to fit between supports.

Support and infill are thus two separate products - each having their own marketing and production requirements; the support controlled by public and collective aspects and the infill oriented to the occupant. Ducts have been seen as part of infill and the support depending on hierarchy and specifics of the project. The notion of industrialised infill builds on the concept of systems building for economy but has been criticised as consumerism rather than participation (choosing off the shelf components dictated by industry) and recognised as not inherent to the supports idea (at Molenvliet and PSSHAK infill was designed especially). I expand on this point later.

An Evaluation Method
The design of a support is then the "design of housing when the desire of the larger community for a particular urban structure is known but the specific needs of the future users are not".[32] This statement assumes effective democracy at a larger scale (discussed later). Such decisions are usually in the hands of specialists and 'representative' politicians. The architects role is the design of a support for the sponsor client (resource body) and participate in designing infills with the user client. He or she is restricted by regulation and developer standards as well as the need to enable variations. A critical problem is how these can be analysed and thus the support evaluated.

Clearly a support design cannot be evaluated by looking simply at one or two variations in house plans. A method was drawn up to demonstrate how a support could be subdivided. The method is an analytical tool that can be used to determine all the fundamental variations of infill possible and thus the value of the support (its variability). The method allows evaluation of what layout alternatives, *which satisfy certain criteria*, can be accommodated by the support. These are the basic criteria of the architect designing for the developer client and must be formulated explicitly. Following evaluation alterations may be made to the location of structure and services in the support. In the method these criteria are described by a specific zone/margin system and rules for the location of functions within these zones.[33] The method or zoning analysis is described in detail in *Variations*.[34]

The design of the support puts limitations on the layout possibilities because of the positions and dimensions of walls, floors, columns, ducts and staircases. By looking at a support design through a zoning analysis these limitations can be studied and their acceptability determined. The use of such a method helps in the design of a support that will accommodate infills that meet previously determined standards or characteristics set by the designer. The analysis does not involve technical or architectural quality just capacity to accommodate functions. It allows the architect to evaluate *technical* (space regulations) or *architectural* starting points for their functional quality.

The SAR method has received considerable criticism for rationalising the design process.[35] Rationalisation is essential to some extent due to design of supports before users are known and the aim to design for flexibility. The criticism is that rationalisation ultimately restricts design freedom more than is gained by participation. Proponents insist that the method is an evaluation method only. Its output is never more than an input.[36] Further it only deals with one aspect of design - the physical planning aspect. This aspect concerns the utility value of spaces. This value is expressed in the capacity of a space to accommodate spaces and elements of a lower order. This capacity and nothing else can be analysed by the method.

---

[32] Frans van der Werf, 'A Vital Balance', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[33] N. J. Habraken, et. al., *Variations; The Systematic Design of Supports*, MIT, 1976. p 50
[34] ibid.
[35] John Carp, 'Twenty Years of SAR', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, 1984.
[36] ibid.

Some Problems
Problems of the supports concept itself include restricting choice to *industrial* consumer infill systems and the development of universal (co-ordinated) infill systems. Such systems demand rationalisation to co-ordinate infills and supports. This emphasis has also been criticised with increased evidence that system building does not lead to economy. The technical distinction between support and infill without genuine user control over the infill has also been criticised. There is perhaps a need for institutional change (in ownership) to accompany physical provision and negotiation of limits in each specific instance. Turner has ultimately criticised supports because there development generally would mean people being obliged to choose a particular support. Such a support may not fit their circumstances anymore than traditional housing forms.

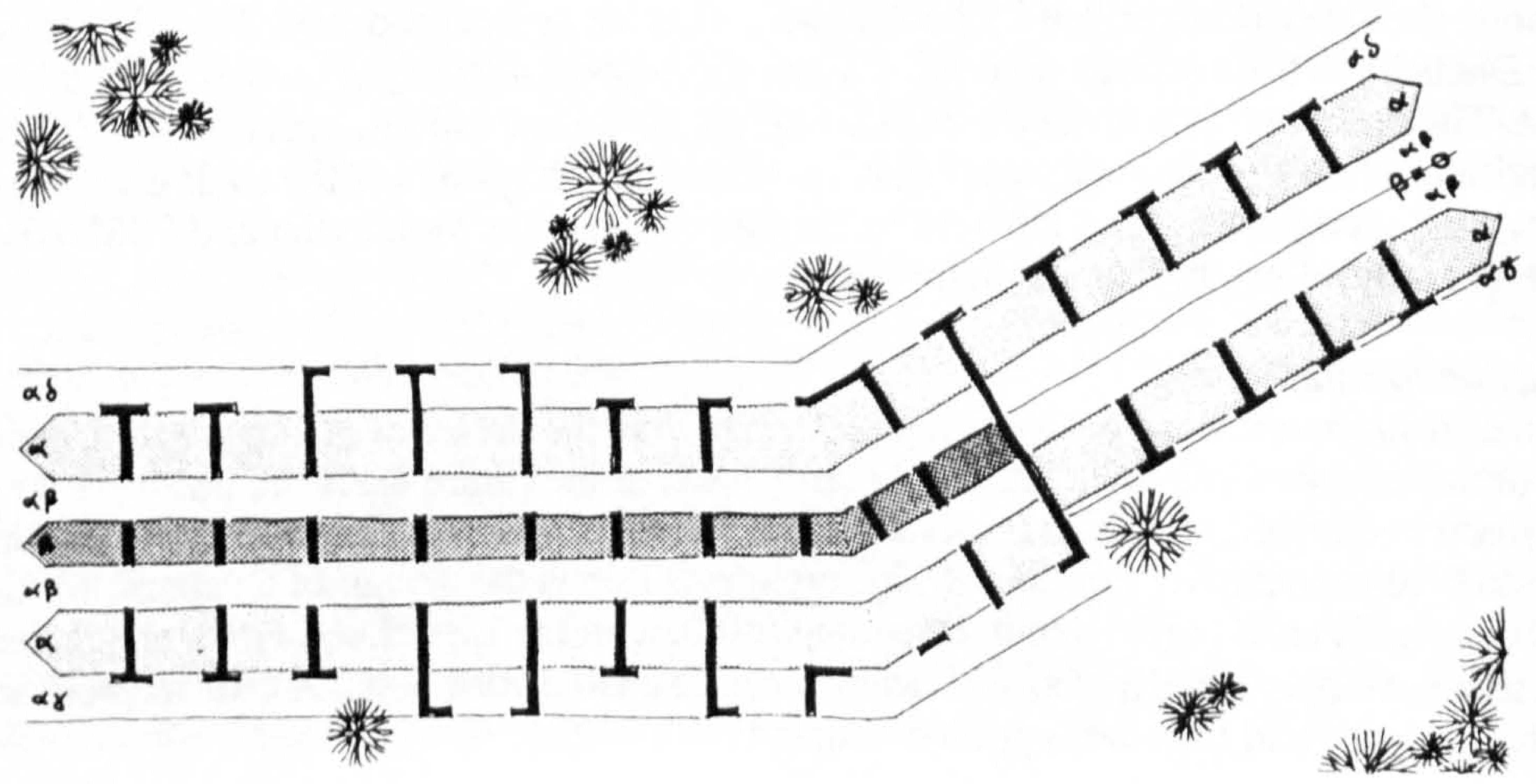


Fig. 9.1. A Zone Distribution[37]

From Dwelling to City
Given the criticism that user control over internal layout, equipment and finishes would only be a marginal expansion of control and that it could be argued that it was the larger environment that was at fault (monocultural and monotonous environments) SAR expanded its brief to urban design. SAR 73 introduced the notion of tissue level. As the dwelling plan gives form to rooms and the support plan gives form to groups of dwellings, the tissue plan gives form to the housing site and city district. The SAR tissue level is both physical (roads, pipes, etc.) and spatial dealing with thematic open spaces (streets, squares, parks).

The method distinguishes between spatial and built elements, and between common elements that follow a theme and special elements that do not. Such an idea is largely based on historic Dutch cities such as Amsterdam with the continuity of the built elements (elongated building blocks) and elements of space (streets and garden courts) forming the thematic elements and the occasional squares and public buildings as special elements. The general understanding provided a clear context and the freedom for elaboration at the lower levels. It should be noted that these towns demonstrated no strict separation of functions such as CIAM and the contemporary city.

The tissue is a chosen theme in urban design. The adding of 'non-thematic' elements such as major shopping street or school enrich and vary the tissue. Within each theme an architect would develop a certain support. The idea was developed in opposition to currently perceived chaotic townscapes with freedom to elaborate site plans in any conceivable shape. The proposal can be seen to be analogous to planning levels in the UK today and forms a basis for levels of participation. SAR went on to define such relationships. Simply the argument is that within a framework diversity is increased not reduced.

Levels of Control
A distinction can be made between participation and control. An individual can (should be able to) control their own room and participate in the house layout, a family can (should be able to) control the layout of their house and participate in the support design, a 'community' can (should be able to) control the support and participate in the tissue - etc. This idea could be extended based on the need for more direct democracy generally. At present participation is achieved by election and a system of putting plans on the table for public comment.[38]

---

37 N. J. Habraken, et. al., *Variations; The Systematic Design of Supports*, MIT, 1976. p55
38 see Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.

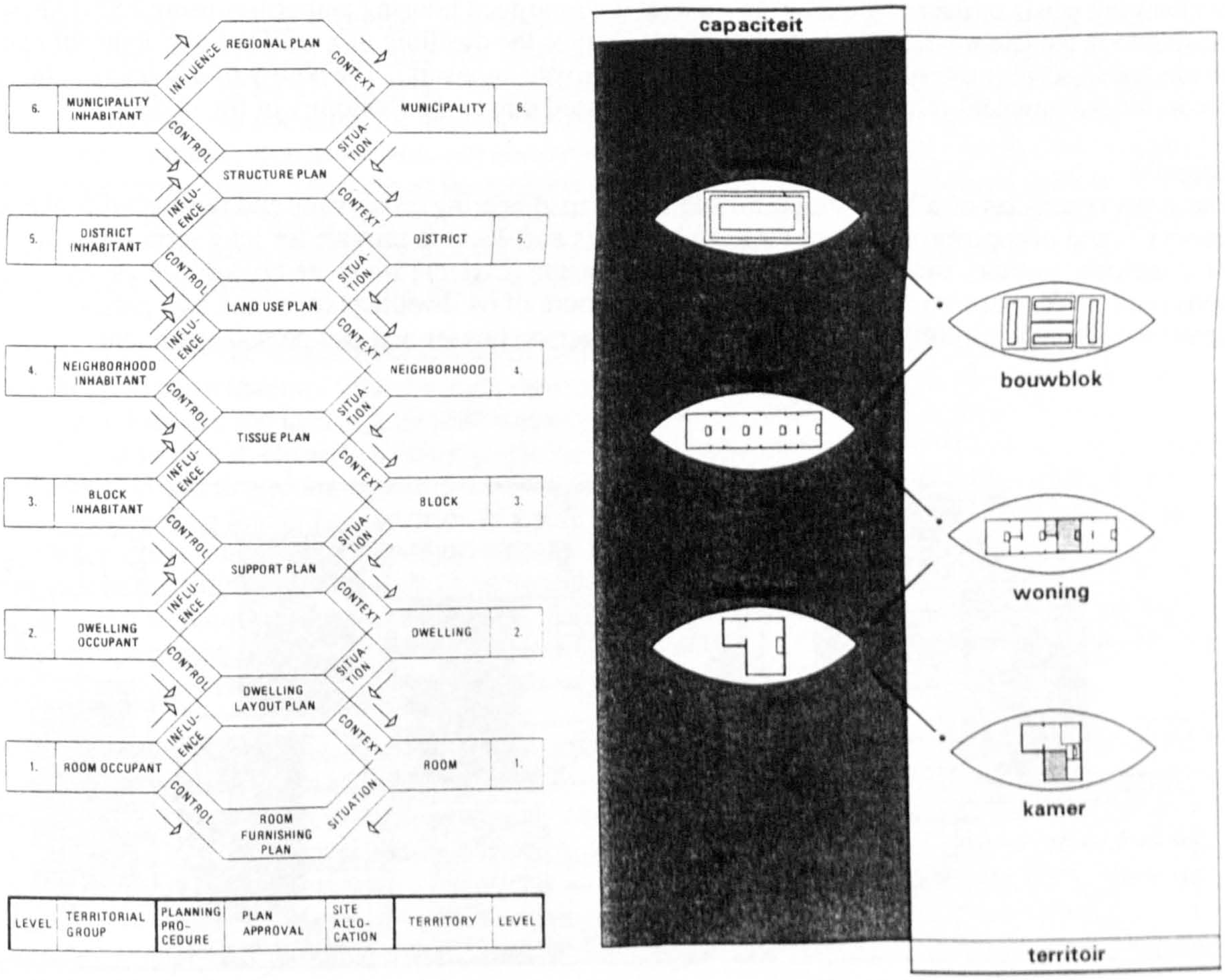


Fig. 9.2. SAR chain of decision making and physical support levels[39]

9.2.2. PSSHAK

Hamdi states that the objective of his PSSHAK (Primary Support Structures and Housing Assembly Kits) project, developed for the GLC at Adelaide Road, Camden in London, was to explore SAR concepts within the framework of a large housing agency.[40] Specific aims were:

• to develop a support designed to meet standards for space planning and finishes but enabling users to interpret these according their needs and desires;
• to develop a standard structure that could accommodate a wide variety of dwelling types (from 1 to 8 persons) adaptable to changing demand;
• the design of dwellings that could be simply adapted and upgraded, piecemeal, to meet changing space and equipment standards;
• to capitalise on benefits of standardisation without producing uniform functionality.

The basis of PSSHAK is the separation of building structure from *internal* space dividing elements. This enables:

• dwelling sizes and mix to be varied independently of the structure (referred to by Van Randen as inter-level),
• the number and size of rooms within an apartment to be modified with the use of an adjustable system of internal fittings

[39] N. J. Habraken, J. T. Boekholt, A. P. Thijssen, P. J. M. Dinjens, *Variations: The Systematic Design of Supports*, MIT Cambridge Massachusetts, 1976. P77 and E. Vreedenburgh (ed.), *entangled building...?*, Werkgroep OBOM, 1992. p78
[40] Nabeel Hamdi, 'PSSHAK: Primary Support Structures and Housing Assembly Kits', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, 1984.

Such a division was an attempt to facilitate both, initial user participation in the design and modernisation to changing needs or users with time. In general it was argued housing authorities using PSSHAK would be able to make late modifications and need not finalise the dwelling mix until the development reached an advanced stage (this would also be the case for private sponsors). The ability of a housing authority to accommodate atypical families would also be increased due to the flexibility of the system.

Support
The support consists of a basic structural shell, with load bearing cross walls and reinforced concrete floors pierced in appropriate places for possible stairs and ducts to provide for long-term flexibility. The shell includes primary mechanical and electrical systems. External walls are brick/block cavity construction The support can accommodate a maximum of 64 dwellings (one- and two-person apartments) and a minimum of 32 dwellings (eight person houses and two person apartments).

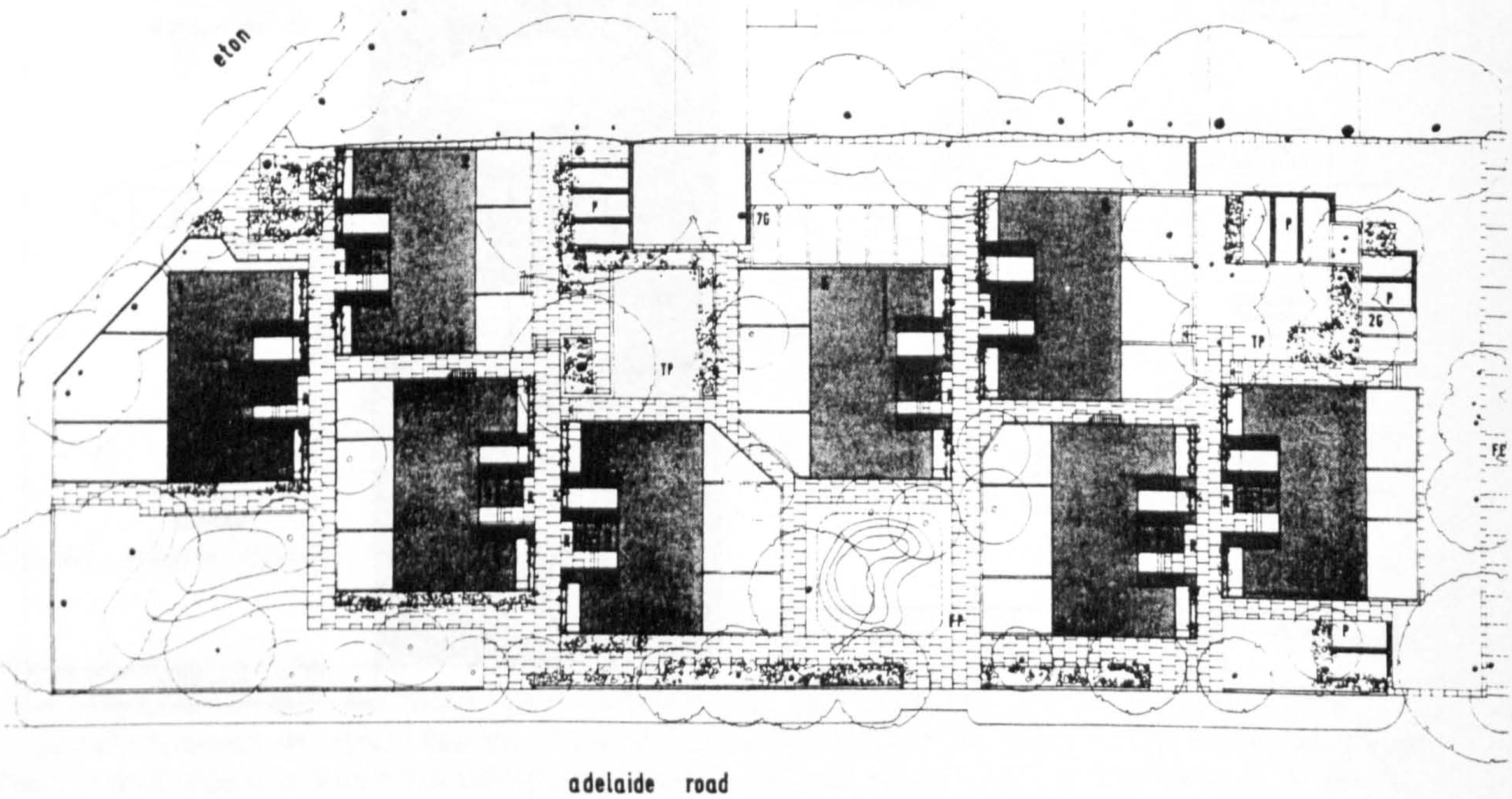


Fig. 9.3. Adelaide Road: site plan[41]

Assembly Kits (Infill)
The infill kit is completely independent of the structure and consists of factory produced components which form the internal layout and finishes once the dwellings are rented and detailed requirements determined. Layout of flats on each floor are independent of other floors. The assembly kit was provided by a Dutch company and consisted of vertical service ducts, partitions, doors cupboards, kitchen units, bathrooms and stairs. Partitions were softwood frames with particle board panels and waterproofing for appropriate areas.

Participation
Initial meetings were held at which a design manual was issued and procedures for working out plans were discussed. After two weeks the manual was to be completed and returned by prospective tenants. Tenants plans were then checked by the architects against practical criteria. Site workshops were then conducted over about a month involving the architect, kit manufacturer and the housing department of the GLC. Families visited the unfinished space they were to occupy. Additional information such as furniture etc. was turned into quick model form to ensure fit. Tenant plans were set up in model form, and the ensuing discussions covered layout, location of doors, furniture, arrangement of kitchen units, position of socket outlets, light switches and lights. For a period of about a month after workshop meetings tenants were able to call back with adjustments and changes of mind after which final plans were drawn and kits calculated and ordered. Costs were a constant constraint, judged against a standard plan drawn up by the architect, although trade-offs were possible. Final plans were drawn up by the kit supplier and on the basis of which kits were calculated and ordered.

[41] ibid. p52

Conclusions
Hamdi argues that Adelaide Road has been a success within limits set by legislation and bureaucracy. A reusable housing shell has been created and users were involved in determining their floor plans to an unprecedented level for public housing. The decision making hierarchy of the GLC and UK housing legislation however did not allow for negotiation of decision making powers 'based on mutual needs, abilities and resources'. Residents were not involved in decisions on site layout, car-parking, and public versus private open space. The support became everything outside and the infill (some aspects of which tenants could influence) inside. Both the support and infill were owned by the GLC and thus although present layouts have been largely determined by residents (within the confines of the system), any future changes must be approved (i.e. tenant action needs official approbation).

The range of user choice was limited to a kit of parts. The consumerist approach here Hamdi describes as the antithesis to participation - with the status quo ruthlessly safeguarded. Hamdi also points out the contradiction between the idea of a flexible support and a single 'perfect' set of infill components to subdivide and service it. He argues that a single kit of parts is important to those who would encourage industrialisation and to housing agencies bent on streamlining production, but it is not central to the supports concept I no longer believe that the sort of Assembly Kit used at Adelaide Road is necessary as far as participation is concerned - perhaps not even desirable. As a next step we should explore the practicality of providing unfinished shells to be finished as tenants see fit, using a combination of 'off-the-shelf' and craft techniques."[42] In addition to ideological problems many problems of the 'kit of parts' concept demonstrated at Adelaide Road were technical difficulties of work[man]sip, complexity of site operations and 'fit'. These increase costs of industrialised systems.

Although an active management co-operative is now operating at Adelaide Road Hamdi argues from the experience that less emphasis should be placed on industrialised components and more emphasis on co-operative control and management from an early stage. In developing more appropriate solutions public authorities need to structure appropriate economic and political frameworks for user initiative making available resources. Architects have a future role as skilled understanders enabling people to work out their problems. Architects cannot decide in advance what each party should do - it is a role for negotiation. It depends on context - place, people and resources available, and the cultural and regulatory rules that apply.

9.2.3. Molenvliet

Habraken has described the Molenvliet project as the most complete single example of SAR principles. It was developed by Frans van der Werf at Papendrecht near Rotterdam (the Netherlands) and finished in 1977. The project developed as an experiment in response to the basic Dutch house building system of non-profit housing societies subsidised by the government producing high density row houses and apartments. According to Frans van der Werf this system had produced housing quantity but only a few unit types reflecting 'national standards' for 'categories' of people. At Molenvliet the aim was to provide low cost, rented housing that would increase individual 'fit' and adaptability.

In accordance with complete SAR practice four levels or scales of design were defined. Each had its own specific decision making process and list of concerned participants - from government to housing society officials, neighbours and inhabitants:[43]

• Level 1: Overall plan of the district which locates the building sites, the major circulation system and the green areas.
• Level 2: Tissue plan (i.e. above individual architect) in the form of open spaces and building zones.
• Level 3: The plan of the supports themselves that will accommodate the Infill.
• Level 4: The Infill - partitions, mechanical equipment and facade elements of the dwellings, shops and offices.

Tissue
Elements of the tissue plan or 'theme' (open spaces and building zones that form them) were; traffic streets, entry courtyards, garden courtyards, connecting alleys. The theme was defined as high density, low rise, gallery access apartments structured by alternating entry and garden courtyards in a checkerboard grid. Alleys connect the courtyards to one another and the street. At Molenvliet however

---

[42] ibid. p58
[43] see N. J. Habraken, J. T. Boekholt, A. P. Thijssen, P. J. M. Dinjens, *Variations: The Systematic Design of Supports*, MIT Cambridge Massachusetts, 1976. p26

only a small proportion of the tissue was eventually built.[44] If the full scheme had been completed this theme would have provided a cohesive framework for various architects to work within. Other variations would be provided by 'cadenzas' - sports hall, schools and shops.

Fig. 9.4. Molenvliet: Plan of completed courtyards with two entry courts (A) and two garden courts (B); and one subdivision of the support into dwelling units (dark areas are circulation and storage)[45]

Support
The support concept was:

• duplex apartments stacked to give a four-storey height;
• small gardens for ground floor units and large terraces for those above;
• gallery access for the upper level units reached by stairs from the courtyards;
• pitched roofs.

The structure of the support was based on a 0.1 by 0.2m tartan planning grid and included:

• 0.2m concrete floor slabs with regular openings for staircases and mechanical chases;
• concrete piers (1.4 by 0.2m) in 4.8m bays;
• 45° timber roof elements 2 bays wide providing possible attic space;
• precast concrete lintels and a fixed timber member at doorhead height act as a framework for facade and Infill elements;
• in-situ concrete stairs and access galleries.

Infill
Prefabricated infill assembly kits were delivered to site as complete packages. Each kit contained: gas heater, kitchen group including fixtures and cabinets, bathroom group(s) including fixtures and cabinets, wiring components, facade elements (windows, doors, frames), interior partitions as required, closet and storage units. The specific kit would be designed to the floor plans determined between resident and architect thus eventual infill would reflect the varied sizes, cultural differences, stages in lifestyle and special needs (including handicapped) of eventual occupants. Van der Werf made plans for the support showing economically optimal organisation of dwelling units which the support could accommodate. Costs were computed and code approval was given on this basis.

---

44 SAR, *REISGIDS: travellers guide*, SAR, Eindhoven, 1984.
45 Frans van der Werf, 'A Vital Balance', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984. p31

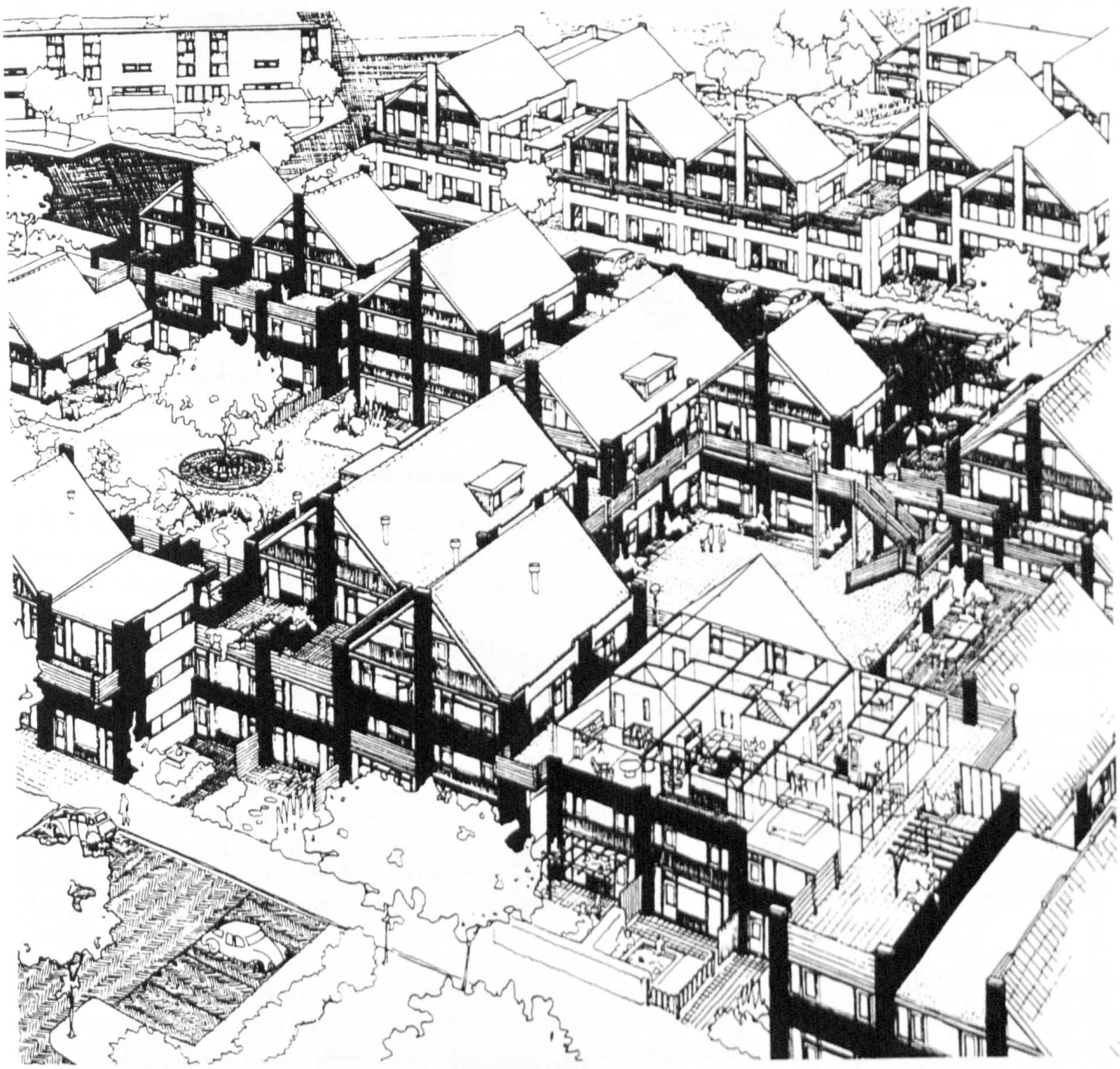


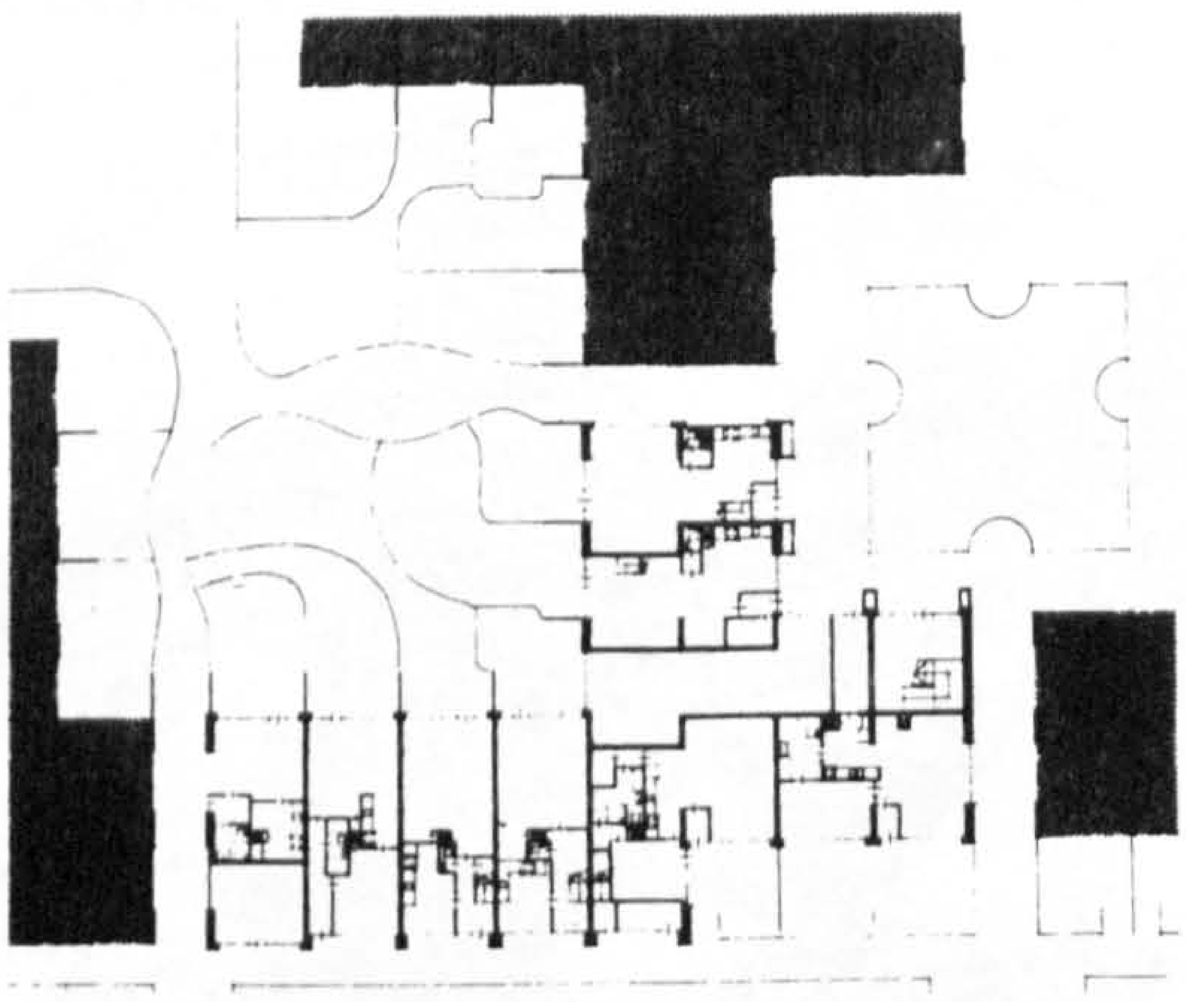
Fig. 9.5. Molenvliet: axonometric[46]

Participation in Design
Prospective tenants were selected by the housing society on the basis of need and their position on the waiting list *as the support took shape*. At initial meetings each household was given general information on the scheme and the size and location of their intended unit (inter-level decided for people who had been chosen to be housed). The support concept meant swaps could then be made. Eventually more small units were needed than expected so 16 larger apartments were split into 32 smaller ones each with its own front door and outside space. The SAR concept allows this without redesign of the support.

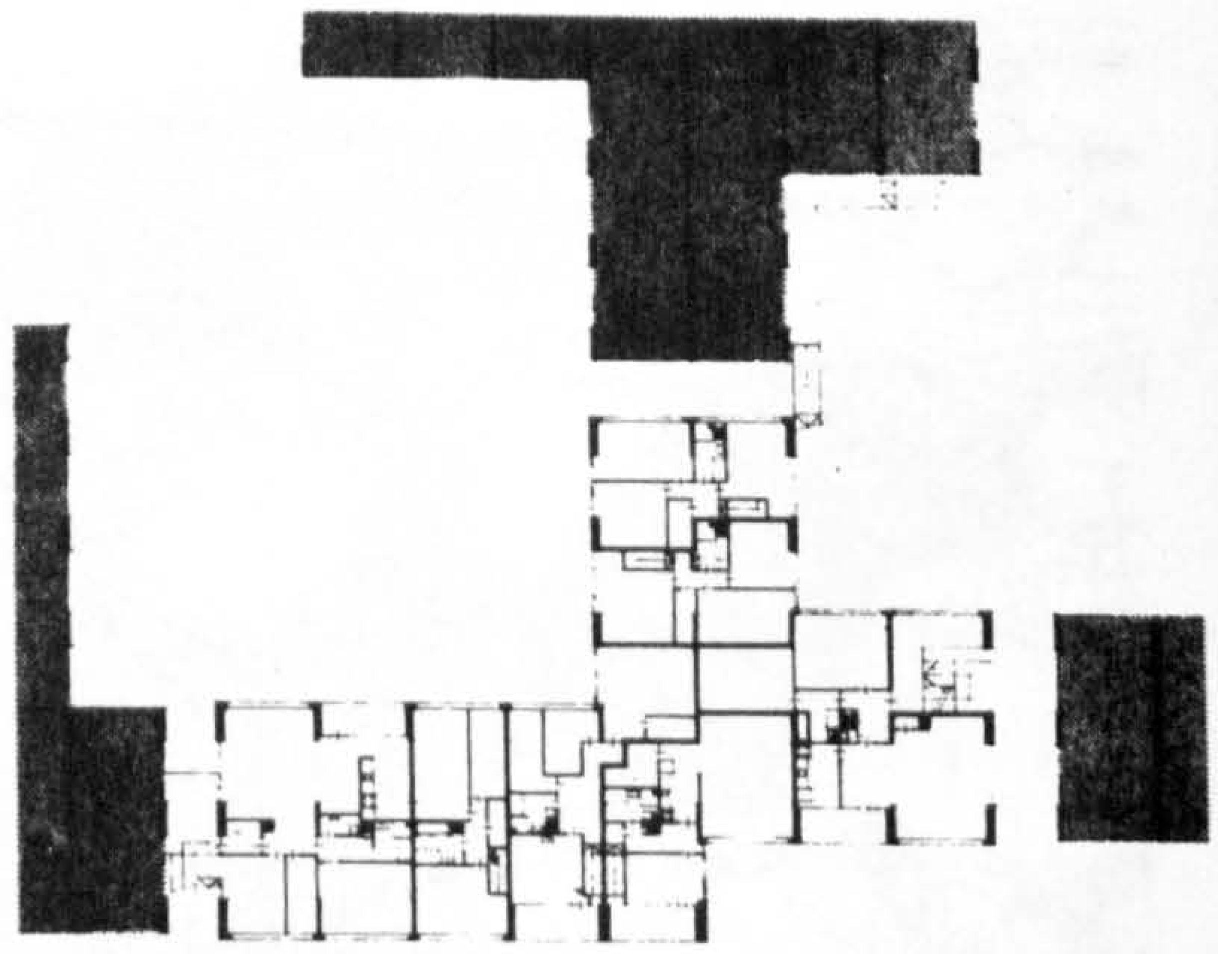
Frans van der Werf worked personally with each prospective tenant family on the interior planning. Blank floor plans were distributed and two 45 minute meetings arranged with the architect and housing society representative initially discussing lifestyles, habits and customs of eating, sleeping and bringing up children sitting around a table. A rough floor plan emerged that tenants were left with to develop on a

[46] ibid. p28

Tartan grid. The second meeting was used to refine these plans, and locate equipment. Colours for the exterior were chosen from a limited palette.



Ground floor plan



Second floor plan.

Fig. 9.6. Molenvliet: support plans[47]

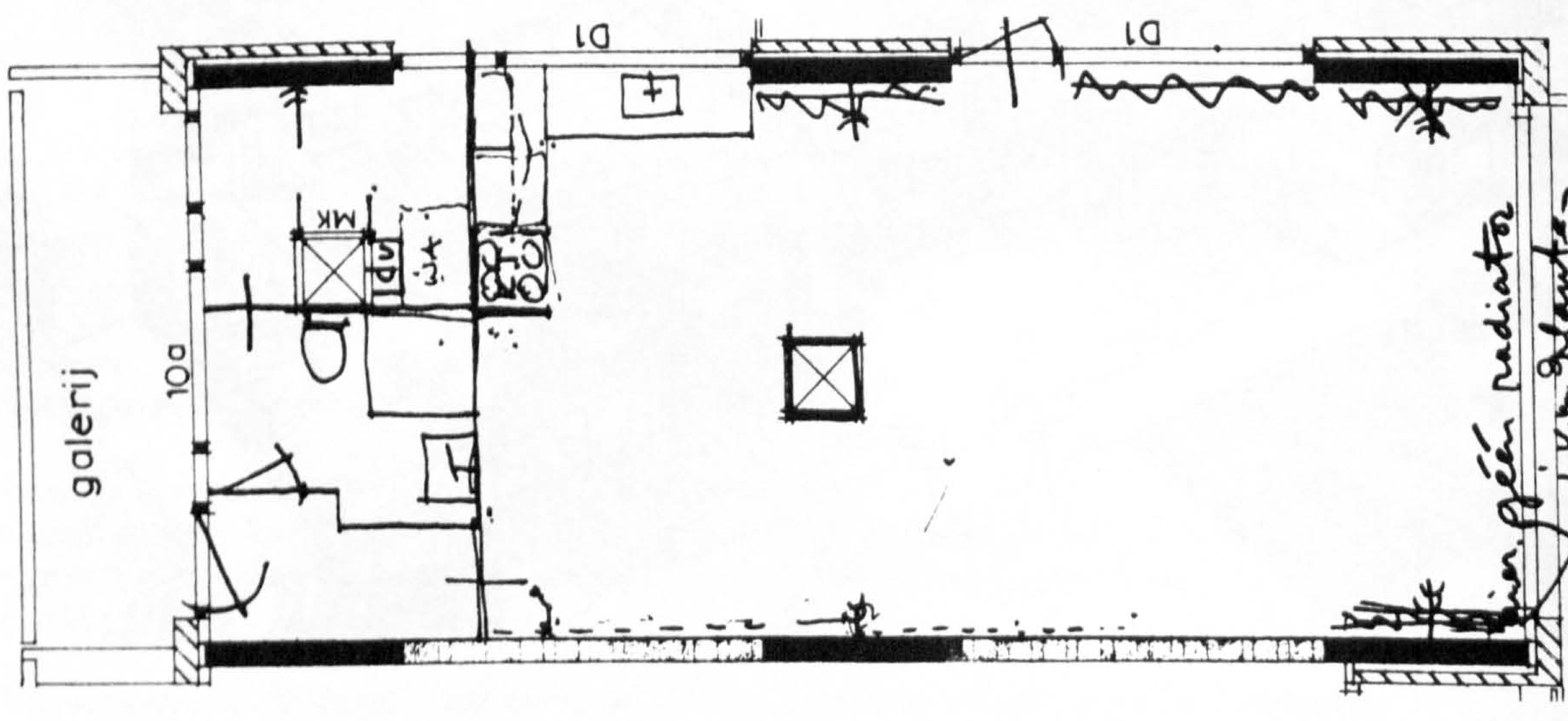


Fig. 9.7. Molenvliet: sketch during design meetings[48]

Conclusions

Participation at Molenvliet involved establishing floor plans, deciding on the amount of glazing and some choice of colours and finishing. Clearly many limits to choice existed. These included, for example, the shape and overall size of the dwelling, the location of internal stairs, the entrance and main vertical duct that were part of the support and inter-level. In addition there were restrictive rules of the government housing authority, fire authority, housing society and to some extent the architect when developing the infill. *In one-third of the cases resident designed plans could not be used without alterations due to the need for various approvals.* Only 60% of the initial units involved participation since 40% of tenants were selected for the project too late and were given finished dwellings. These units were not left uncompleted until allocated as the support concept allows for. In addition, for most participants, agreeing to get involved was a way of getting a dwelling and thus no real choice existed (they could not choose another system more suited to their needs). At Molenvliet unlike Adelaide road some external features were part of the infill but not 'extensions' such as balconies, sunspaces etc. The support controls the section of the dwelling and stairs cannot be moved or floors inserted.

---

[47] ibid. p34
[48] ibid. p34

Frans van der Werf notes the problems of decision making in two 45 minute meetings. The support concept at Molenvliet however enabled alterations and modifications based on actual experience of the spaces. Such alterations have involved internal partitions, facade elements and mechanical services. They required the approval of the housing authority but only the later required any skilled labour. *The kits were however installed using contracted labour not self-build.* Their was no equity incentive for self-build. The flexibility of the system means that each apartment is different. Some are so specific as to be not applicable to new tenants but they can make their own dwellings.

As an experiment in dwelling as an act in which tenants appropriate space and give it value Molenvliet must be considered a success within accepted limitations. Frans van der Werf argues that the success of Molenvliet is seen in the painting and carpentry the tenants have added, how much of themselves they have added to the units which have become their homes.[49] Despite reservations Ans Gotink notes from interviews that generally most participants gave a positive account of the experience.[50] Again it should be noted that meetings usually overran and free professional time was given. In addition the project attracted subsidy for both its experimental nature and the low income of occupants. At both Molenvliet and Adelaide road residents were chosen from waiting lists and could have had a say in support, as SAR's concept of levels indicates, but did not. At Molenvliet they were chosen as the support took place (they did not choose but agreed).

9.2.4. Open building and Adaptable Houses

Since up to date literature on supports proved difficult to find in 1993 I visited the Netherlands to establish whether the work of SAR was continuing and collect literature on recent developments. I also wished to visit some built projects, particularly given the very different nature of Dutch and UK cities, housing and urban growth. Projects visited included Frans Van der Werf's; Molenvliet housing in Papendrecht, Keyenburg project in Rotterdam, and Lunetten project in Utrecht. I visited SAR inspired projects such as Herman Hertzberger's Diagoon houses in Delft (see *9.2.6. Diagoon*) in which Hertzberger built incomplete but separate row houses for completion and extension by (owner) residents (not a support structure but individual extendible houses). I also visited Kroll's social housing in Haarlem and University accommodation in Brussels. Dr.ir. Boekholt at Eindhoven referred to Kroll's architecture as all infill and no support.[51] Habraken notes however that while known as an 'anarchist' architect Kroll is also one of the most systematic architects and that this is essential to variation.[52] Along with Dutch Co-housing also discussed below these projects cover the spectrum of participative architecture in the Netherlands and offer an interesting comparison with the co-operative and self-build movement in this country.

In meeting Dr.ir. J. T. Boekholt at Eindhoven I discovered that SAR was wound up in 1992 but research work in supports or open building is continuing at OBOM (Open Bouwen Ontwikkelings Model) in Delft set up in 1984. Dr.ir. J. T. Boekholt described how the Supports concept had now been accepted into the mainstream in the Netherlands and that the situation of the research groups had changed from 'preaching' to 'teaching'. Supports had genuine cost benefits allowing people to choose initially cheap infills, select builders or self-build, and carry out future alterations when needed without major structural alterations. Boekholt referred to 'editing' of buildings and agreed that the concept was applicable to sustainable architecture. Clearly however such concepts must extend the nature of ownership. OBOM continues to advance the idea of open building. Recent work of particular interest included an analysis of three terraced houses over their life-span, for example from young couple to family to separate flats for teenagers to separate flats for people in old age. A design can then be developed to allow for these alterations saving money and resources in modifications.[53] Perhaps this should be referred to as a typical process rather than a typical house. An international magazine on open building *Open House International* is edited in Newcastle by Nick Wilkinson. This magazine discusses open building particularly in a third world context.

OBOM are now developing an unapologetically technical and consumer orientated approach. Clients include housing corporations, investors and property developers. Recently OBOM have developed several methods to enable ducting within the dwelling to be part of the infill taken from one inlet. The support only carries the main supply and return ducts. This enables bathrooms and kitchens to be moved

---

49 SAR, *REISGIDS: travellers guide*, SAR, Eindhoven, 1984.
50 Ans Gotnic, 'Commentary on Molenvliet', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
51 Dr.ir. J.T. Boekholt, interview, August, 1992.
52 E. Vreedenburgh (ed.), *entangled building...?*, Werkgroep OBOM, 1992.
53 Dr.ir F. E. Bakker et. al., *3E Wonen*, Afdeling Bouwkunde Tu Eindhoven, 1993.

more freely. Such methods have included duct-carrying systems with channels for ducts in concrete floors, raised hollow floors and special wall units acting as ducts, lowered ceilings or a combination of all of these.[54]

9.2.5. Supports: A Critique

In evaluating the supports concept described it is pertinent to ask:

• what are the existing benefits;
• what are the problems;
• whether, or to what extent, existing projects and potential universal applications actually increase the scope for personal decision making;
• whether improvements may be made;
• what is the correct *green* balance between individual and social control and how may the supports concept better achieve this balance.

Potential Benefits

• Choice of individual plan forms, materials and some facade elements. This choice is limited by regulation and cost and critically the need to fit a pre-conceived support design that restricts plan form and section, and must be capable of accepting other dwelling combinations.
• Creation of adaptable shells (to varying degrees) able to be more economically modified to meet constantly changing needs. The changing nature of the family and increasing multi-cultural nature of societies provide a powerful arguments for residential architecture that permits spatial adjustments. For this the size of dwellings must be allowed to vary.
• Benefits to users of participation that have been discussed in terms of environmental awareness generally and knowledge of the particular project.
• Possible applications of a solar support or low energy support are evident to the simple extent of appropriate location of functions based on shadow projections.
• Communication of 3-dimensional design is aided because users can potentially see the space within which their house will take shape. Infill can potentially be planned on site using full scale mock-ups to allocate sectors.
• The limited forms of participation are of benefit in a specialised society for those with heavy time commitments. The division of labour is a reality and there appears to be little future for a mass of semi-skilled home builders except in maintaining their houses. While this view ignores the other economic and personal benefits associated with building or designing your own home and critically controlling developments it highlights the need for a more accessible or optional participatory systems. Despite the undoubted benefits of participatory housing it remains a minority activity in Western cities. The supports concept is important in overcoming this problem in practice.
• Typical plans in a support can be used to fix average building cost and rent levels (rent levels can also be varied depending on the exact nature of Infill and finishes etc.). At St. Quentin a typical rent was based on 97.5 % of the maximum and could thus be varied by up to 2.5%.[55]
• A modified concept of *unfinished buildings* is potentially of use in both private and subsidised dwellings.
• Supports deal with density and negotiation between individuals, their neighbours and the community in general that have been described as a beneficial feature of greening cities.
• In the UK context a physical support is no more a restriction than housing association flat (if the rent is the same). It will limit freedom as with a housing association flat by not being *everywhere* and by having a minimum resource input.

Problems

• Both Molenvliet and PSSHAK benefited from additional funds due to their experimental nature in the form of public subsidy. They also benefited from extra uncharged architects time (as at Byker and in many co-operative housing schemes). It is not clear how much these inputs are a product of their experimental nature, are intrinsic to the methods, or how much they contribute to the undoubted success of these projects.
• The supports concept involves no participation of the neighbourhood group because it is not known. Unlike Byker the community body has little say in the overall development policy - who they live next to, what communal facilities they need. The support remained abstracted, designed for a site but typical residents. At Adelaide Road and Molenvliet however the 'community' could have participated in the

---

54 E. Vreedenburgh (ed.), *entangled building...?*, Werkgroep OBOM, 1992.
55 Open Building Projects, *Habitat sur Mesure*, Strichting Open Bouwen, Delft.

support design if chosen earlier from waiting lists (beyond being able to swap at the inter-level) as in the ladder of decision making outlined.
• The support is designed by the architect to cost restraints and space standards of the sponsor (which will depend on a type of housing). Given a change of circumstances people will still tend to change support to 'a better model' rather than adapting their infill in stages.
• Allowing for variations without group participation demands a rationalisation of the design process that limits the support design and potential infill.
• Both Molenvliet and PSSHAK were developed as rental schemes. Ownership and thus real control of support and infill remained with the sponsor. Infill design is still controlled by government standards and regulation set up in the support as rental property.
• In practice variation was limited to layout of a type of infill designed by manufacturers for the project. All the infills were of the same system. Choice of materials was not available let alone heating preferences etc.
• Universal industrialised infill choices were proposed initially by Habraken. This clearly depends on a wholesale change in housing production still proposed by OBOM. A consumer choice of infill and supports is then available that implies commodification.
• The infill kits were industrialised components and thus difficult for the users to adapt with available tools even if they had the control to do so. There is also difficulty in combining them with other systems. The tendency would be to skilled jointing of industrialised supports rather than self-build.

Turner argues that technological application that is not complemented by institutional innovations is counterproductive and actually decrease the scope for personal responsibility.[56] The purely formal and technical distinction strengthens the separation of local and central powers while the added use of industrially supplied components co-ordinated to match the centrally determined modular design of support structures increases the division of labour and separates production and use.

If a universal policy the possibility of manipulating dwelling components to rearrange internal space would be a trivial advantage for which essential freedoms would be sacrificed. Turner argues that people who want to make their own housing decisions want to live where they need to for social, economic and environmental reasons. Central imposition of a support infrastructure would either tie users down to the specific sites prepared or society would have to carry the costs of under used infrastructures. Broadbent and Turner both pose the question: if we do not like your framework, shall we be allowed to not build into it.[57] If you cannot turn down the offer freedom is restricted. If people are not free to choose where they live from an adequate range of alternatives - they cannot choose their neighbours. The system imposed to implement supports would also perhaps standardise forms of tenure and financing. Users are locked into specific forms of construction that are highly industrialised and they become passive consumers of subsystems that they can only assemble. As these tend to be complex industrial systems they are difficult to modify or combine with other materials using hand tools. This *increased* separation between production and use "extends the rarefied domain of consumerism, the ultimate form of alienation."[58]

Further while many highly industrialised commercial materials and components may be cheaper initially when they are tied into co-ordinated systems, their design and production, storage and delivery, and assembly and maintenance tend to be complicated and expensive. Technical mistakes likely in design are difficult to rectify on site. These costs are added to by administrative costs of component allocation and matching variable plans with individual households (or at least , different sets of components and the supervision of their assembly) demand high proportions of professional time. Turner notes that such systems limit the scope for personal responsibility and thus inhibit personal growth and actually increases dependence on mechanical and administrative substitutes. The organisations required by industrialised production and central planning and supply increase the distance between users and producers. The greater the physical and managerial distance the less understanding and knowledge the planners and organisers have of both needs and resources at the workbench or in the field. People are unable to make full use of local materials and become consumers of off the shelf items not genuine participants in housing.

Turner notes that financially universal application is limiting. This is because people compelled to live in a support may not have or want to commit financial resources to housing of that quality. The support

---

[56] John F. C. Turner, 'Commentary on SAR', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[57] in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[58] John F. C. Turner, 'Commentary on SAR', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

allows no opportunity to contribute sweat equity since it is a highly specialised system. It allows no realistic opportunity to live in one room until resources are available. Standards remain. Turner criticises the support notion since the standard floor plan that must form a basis may be to expensive for a persons particular economic circumstances and supports may reduce the ability to not accept a place. For Turner supports have little advance on mass housing (simply room arrangement). Turner is clearly referring more to third world housing context and the very poor in the west. A welfare state can provide subsidised supports but they may still not be appropriately located or may take up a large proportion of income. Much of Turner's critique is based on the industrial nature of infill that is not essential to the concept.

Turner' s concept of freedom is clearly of a different form to OBOM. Hamdi refers to the problem of ends and means.[59] He questions whether the tools are appropriate but not the support concept itself. Institutional and ownership reforms must accompany such technical distinctions. In particular community organisation and ownership are important and the division of control (physical framework) should be negotiated. It will vary depending on resources of the group who should be known. Variations will depend, for example on whether they can contribute labour, whether they are families or single people or a mixture and how they will be separated. Two supports may be developed in one scheme.

Modifications

• The transition between the two spheres cannot be static but must be totally negotiable and the position of the divide should be able to shift depending on the people involved and external and cultural factors.
• Institutional changes could be made in the form of co-operative supports and non centralised development of supports (co-operative owned supports or infills, tenant owned infills). In developing the support concept Hamdi stresses the importance of community as opposed to individual as the effective power in decision making. The clearest institutional support for this idea is the co-operative in the many forms this can take. The support as a physical manifestation of who does what must be determined through negotiation and not static theory. It is the reflection of the shared values off community and not standards prescribed by public agencies. Public agencies must provide institutional frameworks.
• More flexibility in infill, such as not using components would, be an improvement. The idea of a self build infill based on the Segal system described later offers several advantages in the potential ability of residents to alter the infill. The technical distinction is however overshadowed by the need to give control via ownership.

In summary supports offer and have provided adjustable housing forms. They would however be improved by ensuring institutional means of local control and the development of site and people specific supports and non-industrialised infill. A superior method is perhaps, as described by Hamdi, not an industrialised modular system but a structural support with both off-the-shelf and craft infill.

Clearly the basis of the SAR critique is essentially different from that of co-operative housing. It is based on local government or centralised mass housing rental alternatives where initially the resources available are known but the client body is not. Two levels are distinguished as opposed to three in co-operative schemes - society (resources), group (community to be housed), individual (as part of co-operative). In addition the SAR critique is more concerned with potential rapid turnover of users and adaptable architecture.

The Larger Community

Ideally participation would begin at a higher level. The tissue could be developed by a larger 'residential committee' (a formally constructed Byker). Main common spaces could be designed at this level as well the pattern of open space and size of different clusters.[60] The neighbourhood level (possibly co-operative) support could then be developed with participation by established co-operatives determining:

• the sizes and number of flats according to the real household structures at the time of design,
• the functions and arrangement of the common space and entrance stairs etc.

Each co-operative cluster would be different within the given pattern from the upper level. The interior spaces remain to be filled.

[59] Nabeel Hamdi, 'Response to Turner', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[60] Jia Beisi, 'A Planning Process Involving Local People in Urban Renewal', *Open House International*, Vol.19 No.3, 1994.

9.2.6. Diagoon

The Diagoon project in Delft consists of eight prototypes of Hertzberger's 'carcase houses'. The houses are intended as prototypes to demonstrate what should be possible today in answer to the sort of housing demands Hertzberger suspects many people have - *not to design or build their own houses but be able to modify, add to, and personalise them.* Hertzberger defines a carcase house as a half-product that everyone can complete according to their own needs.[61] The eight row houses form a stepped terrace with each house designed and built as an incomplete framework that allowed occupants to decide how to divide the space and live in it: where to sleep, eat and relax. Due to their incomplete nature the houses can more easily accommodate changes in the composition of the household and to some degree be enlarged. They are, unlike supports, separate houses.

The House Core

The houses consist of two fixed cores, with floors at each half storey height forming the living space that can take on functions such as - living, sleeping, study, play, sitting or dining. One core incorporates vertical access and space for storage or a toilet, the other incorporates 'wet' or service functions i.e. bathroom or kitchen. On each open level a part can be divided off to make a room, the remaining area forming an indoor balcony looking onto the living hall 'void' which runs the full height of the house. These balconies together form the living area for the family. There is no strict division between living area and sleeping area "with its forced going up stairs". Each member of the family has their own part of the house as part of the large communal living space. The carport-like lower level is provided within the body of the houses that can also be used for an extra room, office etc.

Fig. 9.8. Diagoon: plans and section[62]

Negotiation

Inside the carcase houses deal with negotiation between members of the household. Households can discuss where for example the sun enters in the morning and evening and thus where relevant functions will be located. Outside relationships with other members of the 'community' are involved. Externally the houses are designed for everyone to define their own territory if they wish. Since the houses are designed as a framework that can be filled in freely with solid or glass panels they can suggest colonisation of external space or not. A household can also extend the interior at cost of its own external space. Due to the terraced form of the houses, with every intervention outside interaction with neighbours must take place. A wall foundation between dwellings was designed by the architect to allow the building of a divide if desired. Consultation is then forced as to what type of divide and the mutual decision may be for none or a space for joint use. A low line of perforated blocks makes the foundation for a low or high brick wall, fence posts, vegetation or non.

[61] Herman Hertzberger, 'Shaping the Environment', in Byron Mikellides (ed.), *Architecture for People*, Cassell Ltd, 1980.

[62] Herman Hertzberger, 'The Interaction of Form and Users', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

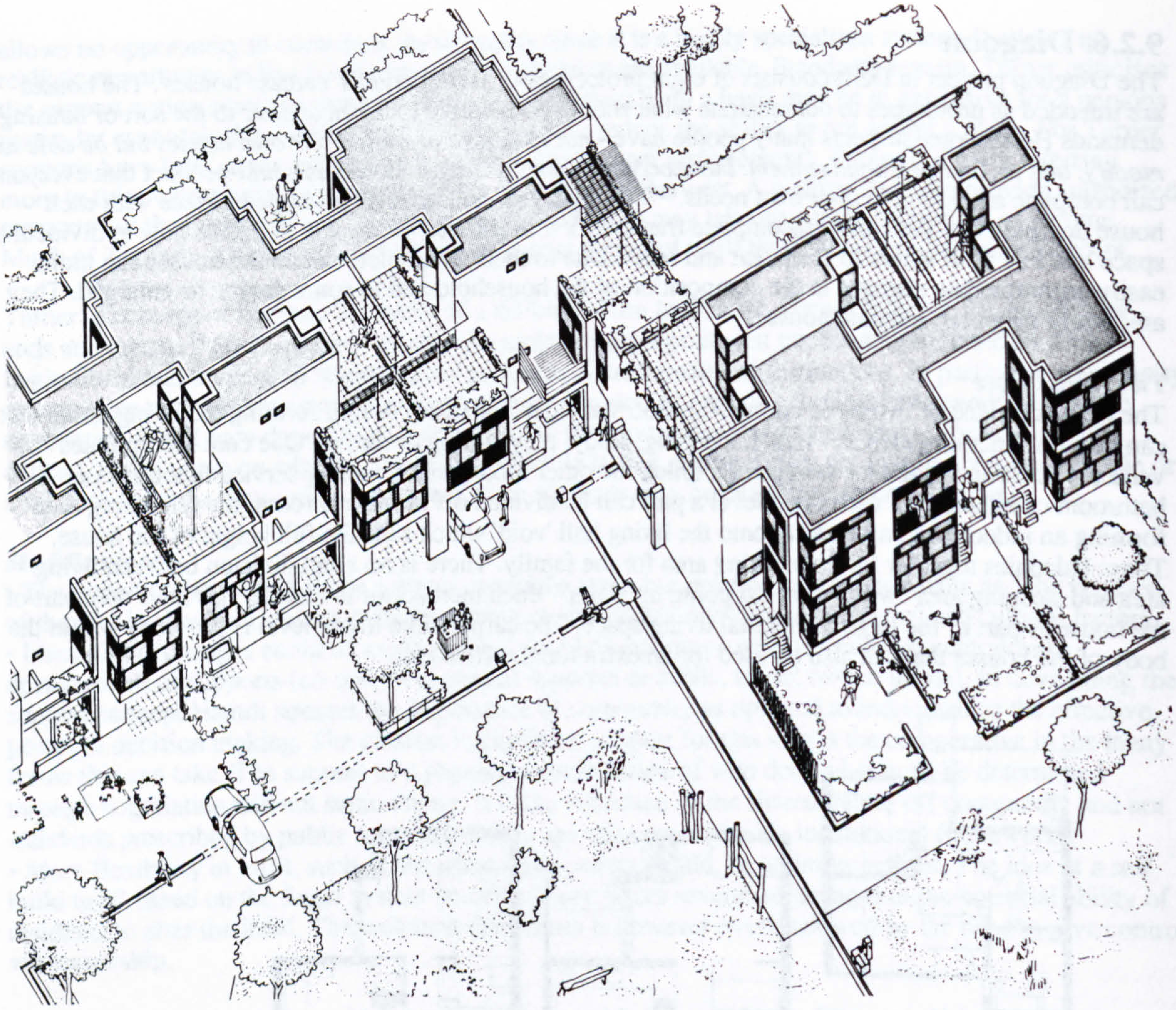


Fig. 9.9. Diagoon: external axonometric

Roof Terraces, Entrance's and the Street

All the houses were provided with roof terraces giving unshaded external space. Frames were constructed between roof gardens to encourage habitation allowing easy fixing of cheap materials: cloth, matting, sheet metal, timber or wire trellis work for planting or simply to hang washing. One inhabitant used this space to build a complete greenhouse that was dismantled after a few years to make way for an extra room.[63] Concave spaces were formed by recesses in the front and rear walls to invite inhabitants to enlarge the interior of their home. At the front of the house a concrete beams spans across the recess suggesting a 'yard'. The space can be closed off to form a shed, used as an extension to the entrance hall or left open. From above the concrete beam defines a realm that could be turned into an outdoor living space. Access can be provided by appropriate choice of infill of the adjacent wall. The ground in front of the houses that belongs to them was not laid out as a garden but was paved as a sidewalk and hence part of the public road. The idea was that each resident would use this area according to their wishes taking as much of the area as required leaving the rest communal. This was to avoid a strict built in division between public and private to encourage public and private to intermingle and encourage consultation.

Conclusions

Research suggests that residents are positive about the overall design.[64] Some occupants are constantly changing and renewing their houses, some have 'completed' them. The Diagoon houses however do not deal with problems of ownership and control. Building costs were high and the buildings are occupied by a select group in terms of income and motivation. Hertzberger acknowledges these problems in generalising the Diagoon experiment.

---

63 Herman Hertzberger, *Buildings and Projects*, 1986

64 Strichting Experimentele Woningbouw, 'Commentary on Diagoon Houses: Resident Interviews', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

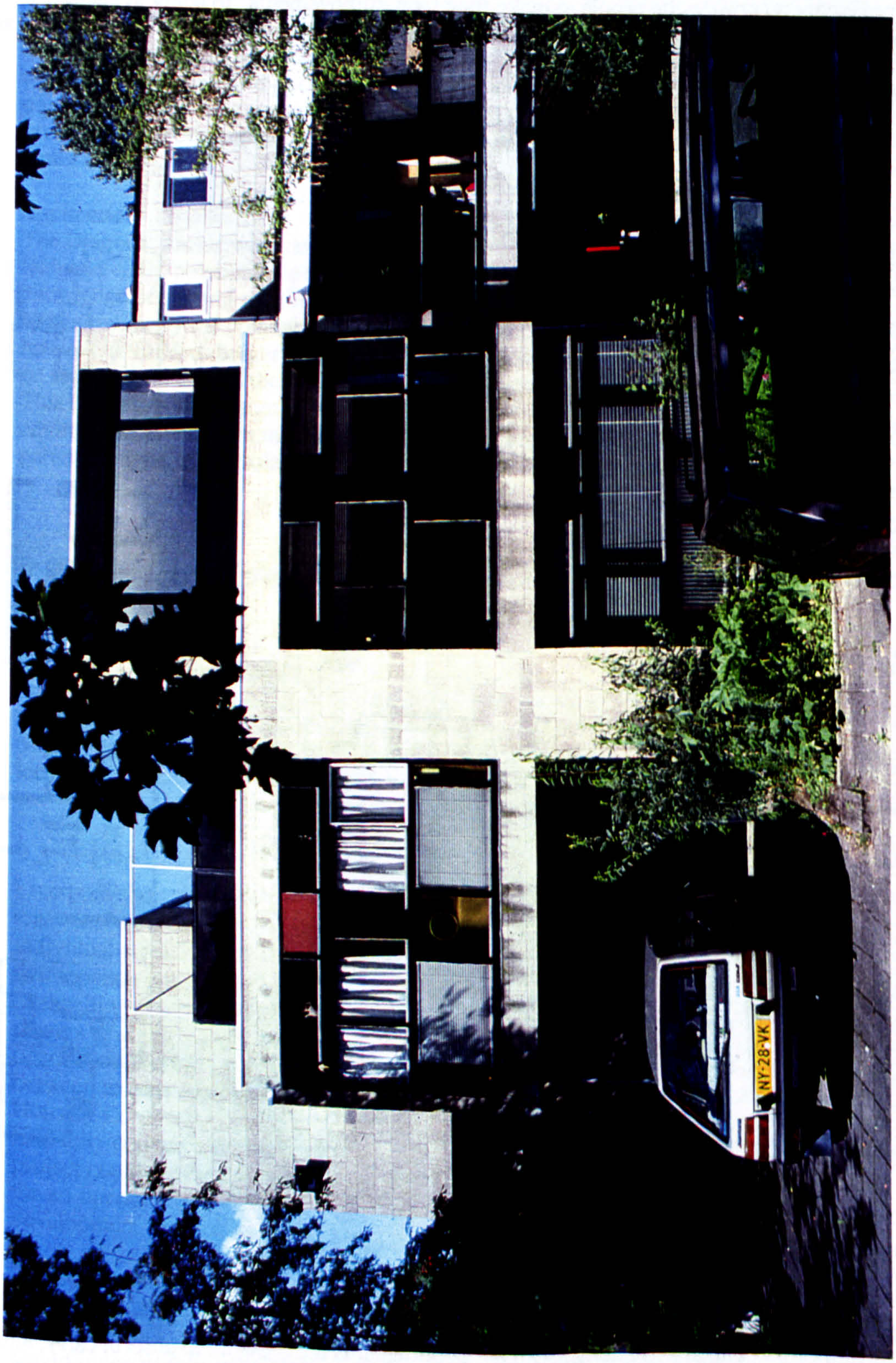


Fig. 9.10. Diagoon Today

Hertzberger postulates a central role for the architect in creating form. The Diagoon houses were not the result of design participation at group or individual levels but of an architectural concept of space and living. Residents then 'interact' and 'take possession' of the concept themselves. While enabling variation the Diagoon framework does impose many notions (including a level of finance), if not the traditional ones such as "going up stairs". Its design challenges certain stereotypes about living. For Hertzberger architects as experts in a specialist society in which people no longer build their own houses have a major role to play in the struggle against alienation. The concept allows the architect to explore various housing forms. Form for Hertzberger can incite people to make their own improvements "to adapt to changes is difficult - for the repressed as well as the repressors - since established certainties must be traded in for an appeal to the imagination. Changes cannot be imposed. Only when they are generated by the people themselves can they awaken awareness and be assimilated as such".[65]

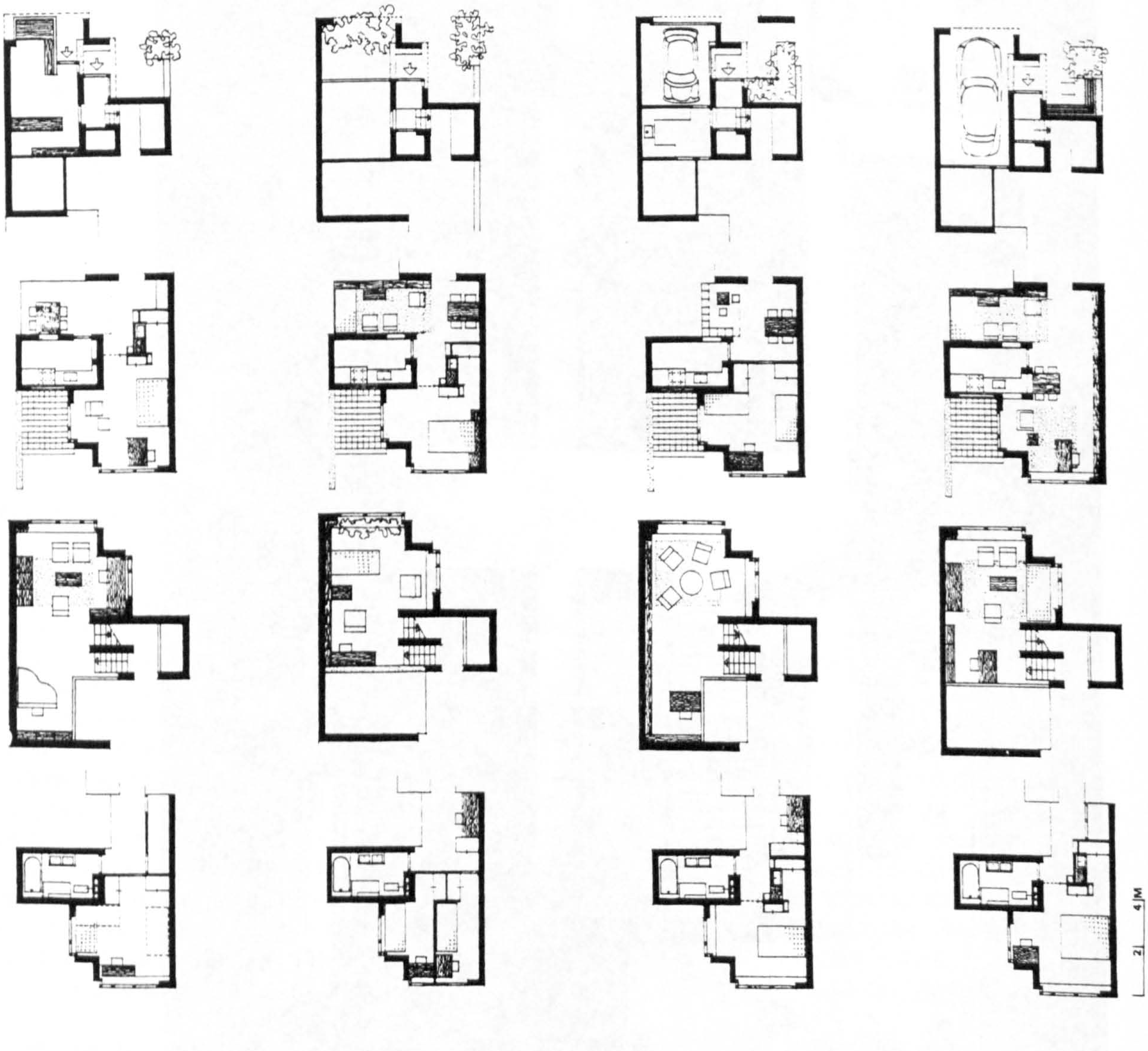


Fig. 9.11. Diagoon Plan Variations[66]

Hertzberger also argues that it is important not to build 'open shells' since this limits 'suggestions' and makes it more difficult for occupants to interact with the building "it is the capacity to absorb, carry, and convey significance that defines what form can bring about in users, and conversely what the users can

[65] Herman Hertzberger, 'The Interaction of Form and Users', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[66] Herman Hertzberger, 'The Interaction of Form and Users', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

bring about in the form. What matters is the interaction of form and users what they convey to each other and bring about in each other, and how they mutually take possession of each other".[67] At Diagoon for example the dark space of niche has different emphasis for each individual relevant to their needs and wishes. The function of these spaces is not predetermined thus it could become a secluded corner to sit in, a study base, a bed niche, a darkroom, a storage place for food or other. The richer variety the house offers in this respect the greater its capacity it has to suit the varied reference world of its occupants. Evoking associations can thus increase freedom. Hertzberger notion thus differs from the supports concept.

The Diagoon houses are clearly urban in conception in forcing negotiations between neighbours. A mutual decision to avoid pursuing your freedom at their expense (solar gain). This obviously may be a point of conflict but it ensures that "people no longer sit safely within the walls of their own little castle, protected from one another by the authorities, but are dependent on one another, and this is what society really means".[68]

Application
The Diagoon houses were designed before the occupants were known with a clear division of roles. The architect could potentially sit down with a community and design such half completed houses with a knowledge of general requirements of that community. The concept could also be extended to appropriation by the community (communal arrangement of houses and who lives where) as well as the household. In Hertzberger's terms a communal room could be colonised for various functions depending on the requirements of the community. The concept can clearly be extended in an environmental context. This might involve design of a group of site specific houses developed around a solar core of environmentally benign materials allowing for appropriation depending on lifestyle to, maximise in each particular case, use of solar energy.

9.3. Participative Design Methods in Co-operatives

I have described the emergence of housing co-ops in cities such as Glasgow, Liverpool and London in response to 'clearance' and a desire of inner city residents to remain in their existing communities and as a means by which lower income groups can achieve control over their housing without individual ownership. I have noted different forms and potentials that expand application to different groups. I now look at some issues relating to design of co-operative housing developments on Merseyside.

9.3.1. Hesketh

Liverpool's second new-build housing co-operative, a Par Value Co-operative, was formed in 1979 by tenants of a condemned terrace. The housing is collectively owned by the co-op. It cannot be sold to individual members and they do not hold shares in individual properties. The co-operative was formed by two separate groups that approached CDS, a housing association (non-governmental organisation for channelling central government funds into low and moderate income housing for rent) that has used its powers to act as a secondary co-operative (sponsor and enabler of independent housing co-ops). CDS operated in this case as development agent. The project received HAG funding to make up the difference between tenants combined *fair rents* and the project mortgage. Loan advances were also provided by the Housing Corporation to the co-operative. The role of the various government bodies included providing land (city council), providing funding, monitoring use and providing a legal framework in which the project could develop and standards and cost limits applied. The result is centrally funded housing with the co-operative given control of capital and revenue finance (ownership) and thus able to control development but with no individual equity or right to buy.

The co-op selected a local architectural practice (Innes Wilkin, Ainsley, and Gommon) from a shortlist of architects with the help of CDS following visits to examples of the architects work and interviews. Design was not progressed until members had been informed as to some of the possibilities open to them. David Innes Wilkin refers to attempts to develop a 'common language'.[69] This involved:

• coach trips and guided tours to about ten other projects in the area;

[67] ibid.
[68] ibid.
[69] David Innes Wilkin, 'Architects' account', *Architects' Journal*, 18 July, 1984.

• slides shown of these and other houses around the country;
• circulation of books and magazines showing selected housing layouts and detail;
• overheads of plans ready for alteration in discussion;
• circulation of A4 plans with kits of small drawings and notes for discussion and amendments at meetings;
• A2 site plans were also distributed;
• video film of the site;
• making sample materials available at the practice office;
• construction of site models;
• a 'participation in housing planning model' which formed rooms at 1:20 scale with card walls that can be moved around and which include furniture, walls and windows.[70]

In addition it was necessary for architects to stress that:

• use of space was limited to standards (Parker Morris) set by the social sphere;
• design was limited by normal cost yardsticks for public housing set by the social sphere;
• planning restrictions applied - the planning authority wrote a brief for study by the co-operative while neighbours and local firms were asked to voice their suggestions and objections at a meeting with the co-operative;
• with respect to regulations regarding minimum parking requirements a planning agreement was drawn up to reduce the normal requirement since few co-op members had cars and it was agreed that garden space should be earmarked for extra parking space should it be required in the future.[71]

The architects decided that generally families would be able to design variations on a theme given a shell for the appropriate house size. Individual designs were developed for a seven person family and for flats for the elderly.

Organisation
Out of 40 co-operative members a design committee of ten volunteers was formed to meet with the architect *each week* (along with any other members who wanted to be present). A representative of CDS was also present. The meetings were held either in someone's flat or a local meeting room (potential for *self-build site office*). These meetings recommended decisions to *monthly general meetings*. Individual *surgery meetings* to check individual house plans were held with each family at the beginning and end of the detailed design stage.[72] These surgeries included a member of the tenants design committee as mediator.

Sketch proposals for the whole project began with density exercises (*potential solar version*) to check yardstick costs with the quantity surveyor, and to check the mix of household sizes with the housing department. Next a detailed survey of members preferences was carried out. Members of the design committee helped individual members to answer questionnaires. Architects sketch proposals were used to help members make detailed choices. Typical design meeting topics included:

• internal or external storage - the co-operative decided against external stores;
• kitchen at front or rear - the co-operative decided with one exception for kitchens at the rear of houses;
• dining room separate, in the kitchen, or in the living room - their was great variation in combination of dining, kitchen, living in contrast to upper rooms;
• open or closed stairs - most people omitted a hall for the stairs so as to increase the size of the living room;
• windows size, material and method of opening;
• choice of materials - bricks and roof tiles chosen by the co-operative after seeing samples;
• differences in garden requirements could be accommodated due to the shape of the plot;
• communal open space was generally disliked because of feelings that it encouraged vandalism and maintenance problems.

This process generated house types located on the site plan by the architects to make 'best advantage on the site' (*a low energy or solar version might be possible*). Families of the same size then chose their individual house. The co-operative consists of 40 households divided into 16 flats (one of which is

[70] José Ospina, *Housing Ourselves*, Hilary Shipman, London, 1987.
[71] David Innes Wilkin, 'Architects' account', *Architects' Journal*, 18 July, 1984.
[72] ibid.

specially designed for a disabled person) and 24 houses: 4 two-person flats, 12 three-person flats, 9 four-person houses, 9 five-person houses, 5 six-person houses and 1 seven-person house.[73]

Construction

Layout planning, building design, and construction were limited by public funding. Tenders exceeded the yardstick and voting was used to decide on cut-backs. The essence of the decision was to maintain quality and leave out secondary items that *could be added later* (especially if planned for in the initial designs). Official site instructions were made through the architect although co-operative members attended site meetings. Ospina notes the 'architectural paternalism' of the exteriors compared to the variety of the interiors where he argues the real individuality is evident.[74] The principle of '*fixed shell and changeable scenery*' was applied, allowing first time occupants to organise the inside of each house, while preserving that option for future residents (appropriate to ownership). The shell characteristics were common width frontage, avoidance of internal load bearing walls and 'judicious positioning of wet services' allowing interiors to be organised in different ways. All arrangements complied to Parker Morris. Alan Hoyle, first chair(man) of the co-op notes that Parker Morris Standards were an obstacle to full participatory design, since they were made to protect standards that members would have protected in more appropriate ways.[75]

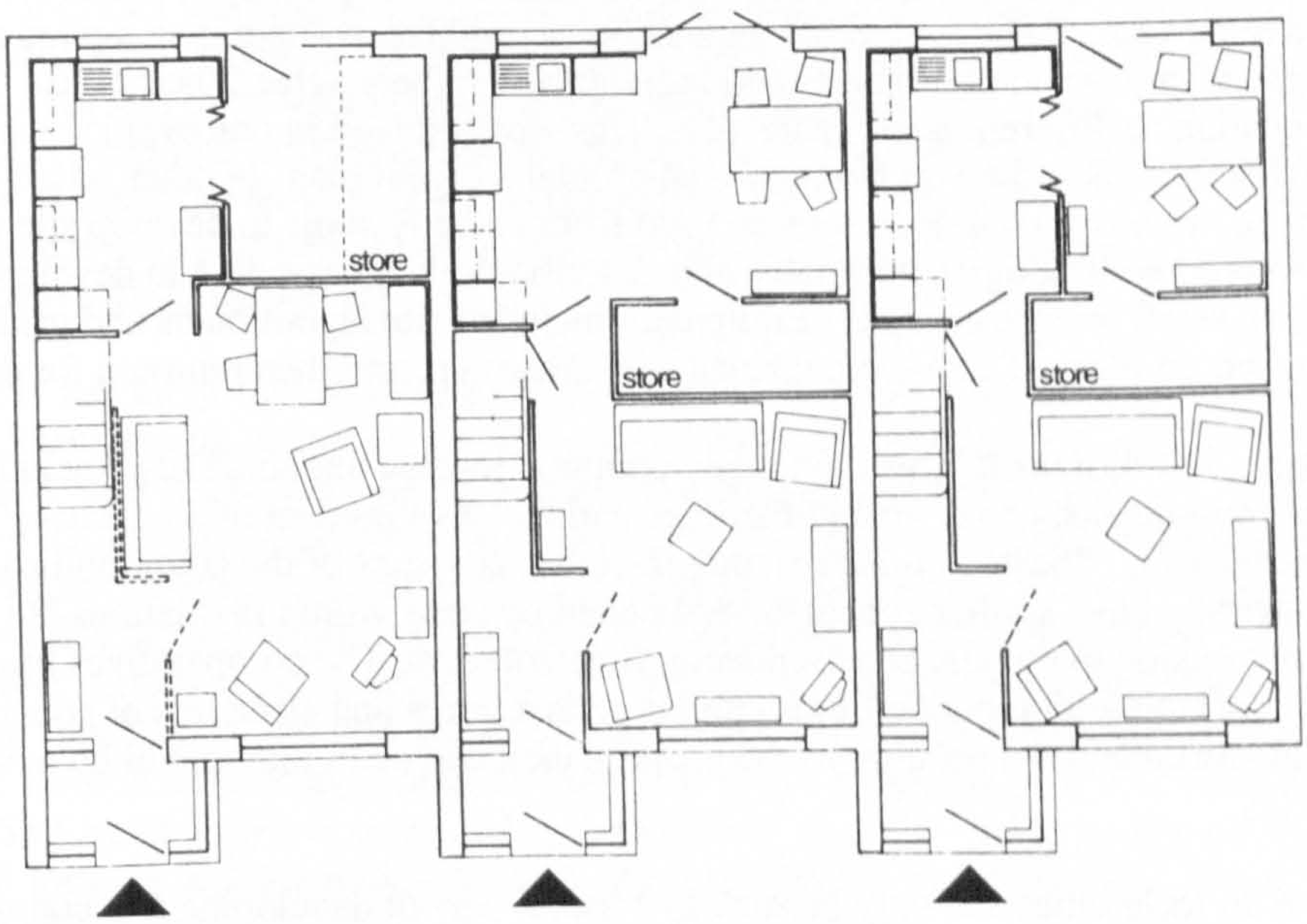


Fig. 9.12. Variations on a theme - three house plans[76]

Conclusions

Hugh Anderson argues that Hesketh blends awkwardly with it's city surroundings.[77] It exhibits many 'vernacular themes' and is similar to housing in Warrington new town and other co-operatives. Greater fit was certainly achieved, for example, those who liked gardening eventually got big gardens, those who had children or were quite glad of some noise were located near the playground. While the next generation of occupants will not get this advantage the choice will be no worse than any other housing and greater in variety. The 'fixed shell and changeable scenery' principle means adaptions can be made. I have noted how direct gain solar systems can be produced on cost and can reduce running costs. Such a debate could be introduced to co-operatives with some take up expected.

While conventional in appearance small variations in external form are evident on close inspection (some introduced by the architects) but most variations are evident in subtleties internally. Pacaud and Anderson note a two way process of changing attitudes. The architects affected the co-operative in certain choices and the co-operative members affected the architects 'general policy' in different areas. Some plan forms can be considered 'unconventional' but caught the imagination of occupants.[78] Pacaud notes that extra costs to the office were 15% and other jobs subsidise their co-operative work.[79] Delay in payment was

---

73 José Ospina, *Housing Ourselves*, Hilary Shipman, London, 1987.
74 ibid.
75 Members Views, *Architects' Journal*, 18 July 1984.
76 Hugh Anderson, 'Appraisal', *Architects' Journal*, 18 July, 1984. p41
77 ibid.
78 ibid.
79 Danielle Pacaud, 'Summing Up', *Architects' Journal*, 18 July, 1984.

another major problem. There is perhaps to offset costs with social advantages. As far as 'creativity' is concerned the limited outlook of the architects in the examples the group visited may have as much to do with appearance as the supposed conservatism of those seeking to be co-operatively housed.

9.3.2. Co-operatives on Merseyside

Bill Halsall describes how a wide variety of techniques have evolved in conjunction with various co-operatives.[80] These have included:

- questionnaires to sound out members preferences;
- bus trips to various schemes;
- comparisons of various house plans and house type models to develop new types for members;
- site visits during construction to review progress.

The techniques used depend on the site and co-op. At Portland Gardens, for example, the restricted nature of the site largely determined the layout of small terraced housing. Variety in external appearance was achieved by using overlays to demonstrate various facade possibilities for the plans to residents. Group and individual preferences were used. At Southern Crescent a major priority was a community scheme that encouraged relationships but was secure against break-ins. The co-operative agreed a crescent form with some communal areas and play spaces and individual members agreed their house type. Problems remained in allocation to different areas of the plot. This was resolved in one evening using colour cards representing each house and occupant being moved around a layout plan. In other schemes (Leta/Claudia Housing Co-operative) block models have been used from an early stage to develop site plans. At Weller Street, Halsall worked with design committees and describes how he was able to develop the design in a more direct way in small intense groups.[81] Equipment included site layout plans and gridded paper to design a range of house plans. These were taken away, drawn up, and then returned for discussion.

While a wide variety of designs has resulted many common themes remain. These include the incorporation of communal space or shared facilities and the development of an enclosed site form for security (most schemes are located on the existing the inner city sites of the communities). The Liverpool co-operatives generally have similar appearances dictated by costs within regulations but also perhaps the restricted ideal of housing in the UK and architectural paternalism. The co-operatives have produced tailored housing working within public funds similar to cost limits and standards of council housing. Unmet and un-quantifiable costs peculiar to the projects included extra time put in by members, architects and CDS.

Halsall notes that all techniques can only be seen as a useful way of developing and communicating design ideas in the context of a much wider discussion and debate at many different levels.[82] In addition all designs and details have had to be democratically voted on by members. The objective is to enable the co-operative members to be in control of the design procedures so that they can effectively determine their own living environment. Such control demands actions such as those outlined by Ospina that I discussed in *Chapter Eight*.[83] Co-operative training aims to equip co-operatives with the skills, information and confidence to achieve their self-help goals. These include for example:

- organisational training for all the group to ensure democracy but some specific training for different roles in the co-operative;
- development training to enable the group to make its own independent and informed choice of and, as the client, to instruct, its architect;
- training in management policy such as allocation rules and tenancy agreements etc. and systems to maintain efficient management and maintenance.

The later can enable an informed choice of which services the co-operative can offer itself. Co-operative education is an ongoing project often carried out by groups such as CDS through programmes and events annually. Significantly co-ops are now turning to each other (federation). There are clear advantages to having users as clients who are in control in terms of ownership extended by education given during the process and design methods. Consideration must however be given to adaptability, finance restrictions and regulations.

---

[80] Bill Halsall, 'Participatory Design and Housing Co-operatives', *Building Democracy: housing co-operatives on Merseyside*, CDS, 1987.
[81] ibid.
[82] ibid.
[83] José Ospina, *Housing Ourselves*, Hilary Shipman, London, 1987.

9.4. Self-build and the Segal System

In 1986 it is estimated that 11200 new homes were completed by self-builders compared to an estimated 10000, 9600 and 8000 respectively by the top three commercial house builders.[84] While relatively 'middle class' sections of society (building individually outside the city) have tended to dominate such self-build in the UK recent projects have been developed by groups of lower income families, the young, unemployed and homeless in the inner city. These projects have been facilitated by and utilised various forms of tenure and financing arrangements (discussed in *Chapter Eight*) and construction forms. They have included self-build for rent. Group projects have included Lewisham Self-build, the Giroscope Workers Co-operative in Hull, Zenzele Self-build in Bristol, Rosehaugh Self-build in Tower Hamlets, Sea Saw Self-build in Brighton and Greenwich Self-build.

Graham argues that there is no shortage of people who would jump at the chance of building a home for themselves and that following the screening of a BBC programme on the first Lewisham scheme he received 1500 letters of enquiry. The present and future difficulty for self-build is however access to land "land comes at prices that few people can afford".[85] The most effective way ahead is thus likely to be through local authorities working in conjunction with housing associations and housing co-operatives. Further with traditional constructional techniques people with little and no skills cannot be expected to build for themselves and even with the help of professionals completion is likely to take years. Development of appropriate technology for the construction of the houses using semi-skilled or entirely unskilled labour is therefore another important feature of facilitation (an alternative is to reduce regulation). There is also a need to develop methods that can reduce production time to avoid stresses caused by excessive building periods.

Self-build clearly has the potential to increase the scope of both co-operative and individual responsibility. Sweat equity gained by contributing labour will reduced costs even if professional design assistance is used. This enables people who could otherwise not afford to do so, to own, part own or co-operatively own their house. In the later case I have noted they get the inflation linked costs of that sweat equity on leaving the co-operative. Self-build extends participation further into skill development, more complete knowledge of the building process and actual building and technical work on site. It thus potentially further increases user control. The problems of self-build construction however introduces technical controlling factors that may be limiting in design terms. For this reason complete self-build is rare with some form of specialised labour usually employed (potential of partial self-build and conversions). Self-build is clearly more demanding than participative design and suited to particular groups but will form an important element in developing the city I have outlined. It may be particularly appropriate for the young.

Construction
Generally speaking self-builders have been limited to the choice of two forms of construction:

• 'traditional' construction otherwise known as 'wet-and-heavy' consisting of load bearing brick or masonry with concrete strip foundations and possibly concrete ground floors (used in group self-build projects at Zenzele and Netherspring);
• lightweight timber frame construction, with separate pad foundations (the Segal Method) or stud-framed wall-panel construction on strip foundations (the SkillBuilding system).[86]

Various combinations have also been used particularly brick cladding of timber frames. Traditional construction involves 'wet trades' of bricklaying, strip foundations and plastering that need skill and experience. Many self-builders thus contract out this work reducing their 'sweat equity'. Problems may also arise in moving heavy materials around, carrying out extensive groundwork's and because the operations are relatively slow. On the other hand traditional construction is regarded as a sound investment by valuers. Further group self-build may enable a sharing of existing building skills within the group.

9.4.1. The Segal Method

For Segal the social effects of process, the formation of community and self-realisation of the builder-inhabitant are more important than the houses themselves "*Our platform (as architects) is small, but it*

---

[84] Danny Levine, *Building young lives*, NFHA, 1989.
[85] Graham Vickers, 'Segal's Legacy', *Architects Journal*, 4 May 1988.
[86] Jon Broome and Brian Richardson, *the self-build book*, Green Books 1991. p143

has become so because we give too much priority to design....There is more to architecture than behaving like gladiators, fighting ourselves, trying to out do each other with eye-catching designs which become so quickly ephemeral".[87]

The Segal method simplifies the building process so that occupants can both entirely construct their own house and have a controlling influence on its design (within limitations of the method). Design, documentation and construction are simplified to make the whole process transparent. Practical emphasis is given to the processes of planning and construction. The basic notion is to combine post-and-beam timber framed construction with readily available panel materials related to a dimensional grid. This system can produce one- and two-storey buildings, incorporating for example, flat or pitched roofs, courtyards, split levels and double height spaces. Foundations are minimised since the ground floor is supported on posts above the ground and simple pad foundations are used. Joints are formed with bolts and screws eliminating wet trades (excepting of the roof). Following design a kit of parts is made up from standard-sized mass produced materials readily available on the market. *The method is thus 'open' in that it uses materials and techniques that are readily available, rather than a specifically manufactured system*. It is *flexible* in that it can be assembled and modified by the average family. In most cases the architect can take on the role of quantity surveyor, engineer and advisor on site.

Segal describes the principle reasoning behind his method as to allow elements of the population to take the building of their own homes into their own hands thus making much better use of resources.[88] In particular young people willing to work with their hands could acquire houses for which otherwise they could not hope to get a chance. Segal acknowledged that not everyone wishes to build their own house. Danny Levine points out that protracted development periods exclude many people particularly the young, 'busy' or poor from self-build. Alternatives he argues need to reduce the development period from that of self-build process that uses traditional construction techniques. The 'Segal Method' is thus similar to the 'supports' concept in that it attempts to address the problem of making projects happen. Its physical provision similarly must be supported by institutional arrangements. HOPE (Housing for Young People) recommend the model being advocated by CHISEL (Co-operative Housing in South East London) for the Greenwich Self-Build Co-operative. It involves self-build for affordable rent using the 'Segal Method' of construction.[89]

The Process - Design and Documentation
Planning commences with layout drawings using a grid based on the sizes of the materials being used. A 'tartan' grid is used to accommodate structural members and panel widths. The usual spacing of the grid is 50mm for the thickness of the panels and the structure and 600mm for the width of panels. Other dimensions can however be used. The basic layout is explored by the self-builder and designer typically using squared paper and models. Once the layout has been determined the arrangement for the structure can be worked out. Loads are carried by posts generally up to 4m apart. Such a system gives freedom of layout with the exact structural arrangement worked out around the plan. The principle frame lines are established and column positions determined based on spanning six grid units before deflection requires larger sections. Laminated or composite beams can be used to create greater spans if necessary (e.g. for a community building) although generally economy of material is achieved by keeping depths the same. One wall on each floor however must accommodate cross bracing. When the most economic structural arrangement has been found it may be necessary to adjust the plan slightly. *Critically once the discipline of the frame and tartan grid is understood changes and variations can be introduced*. The basic structure can be adapted to form a number of different 'features': a porch, pergola, seat, trellis, veranda, walkway, or balustrade. A degree of variety not only of form but also colour and detail is possible within the discipline of the modular arrangement. Structural calculations and framing drawings can then be made, materials scheduled, and standard details drawn. The final element of the documentation is a set of annotated step-by-step instructions of the building process.

The Process - Construction
The construction is a step by step process of foundations, framing, frame erection, bracing, roof and floor joists, roof, floors, external walls, windows, partitions, ceilings, stairs and services.[90] Double beams are used in the internal frames and single on the end frame so that loads carried are the same. Beams and joists of the same depths are achieved by using different timber grades. No scaffolding is used but timber to be used later can be nailed to posts at appropriate heights to perform this function. Only frame erection

[87] Peter Blundell Jones, 'The Path to Lewisham', *Architects Journal*, 4 May 1988.
[88] Walter Segal, 'The Housing Crisis in Western Europe: Britain - assessment and options', in Byron Mikellides (ed.), *Architecture for People*, Cassell Ltd, 1980.
[89] Danny Levine, *Building young lives*, NFHA, 1989.
[90] described by John Broome, 'The Segal Method', *Architects Journal*, 5 November 1986 and John Broome and Brian Richardson, *the self-build book*, Green Books, 1991.

requires a group of people and can provide another focus for group activity. The roof construction may be flat (the standard Segal form), tile, slate, turf or thatch. Clearly there are problems with flat roofing in the UK despite the specially developed 'loose fit' Segal system.[91] Even in the Segal system laying bitumen is seen as a job for a professional roofer. Other forms are also likely to involve specialist help.

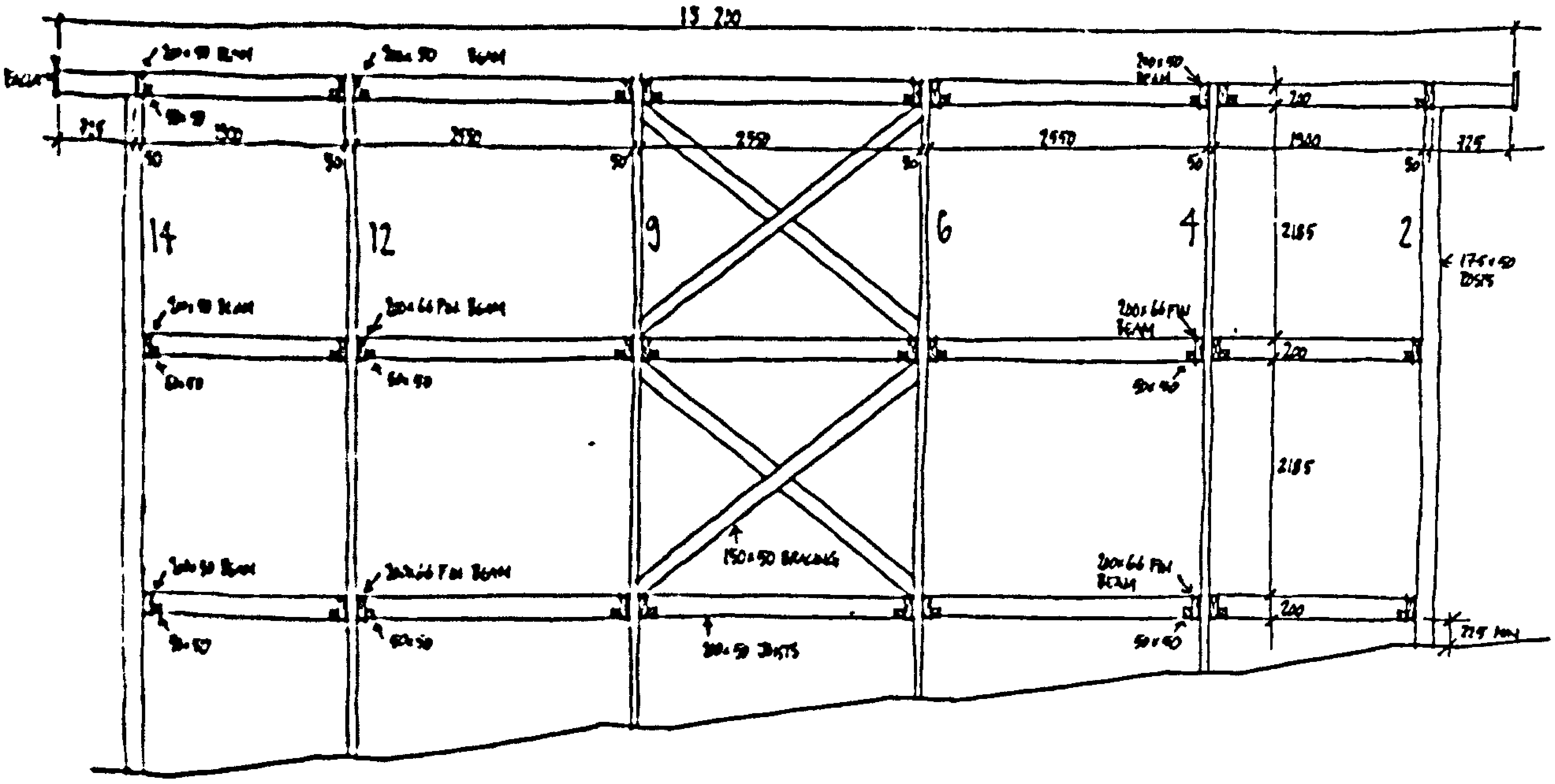


Fig. 9.13. Segal System: framing drawing[92]

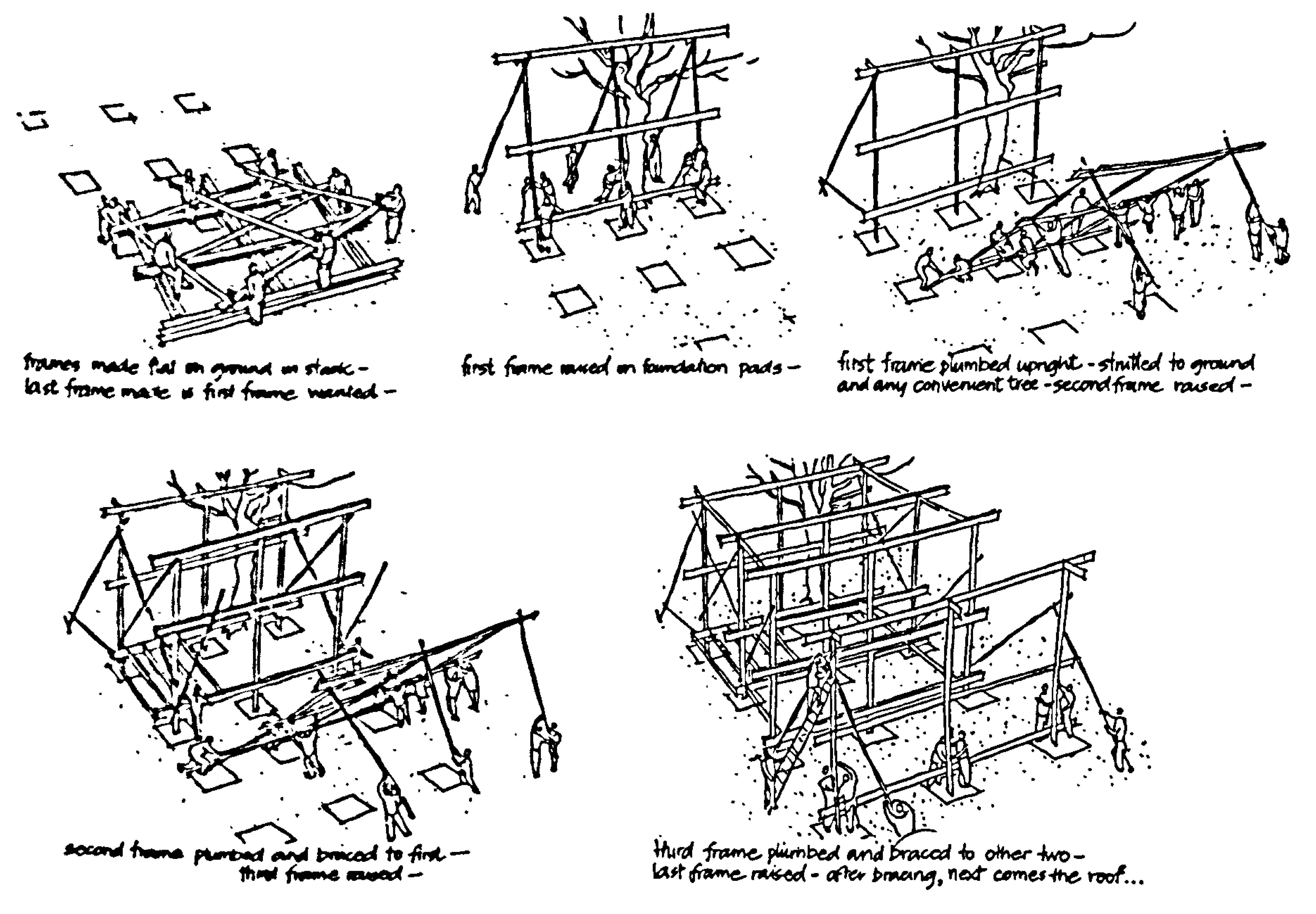


Fig. 9.14. Frame Erection[93]

[91] John Broome, 'The Segal Method', *Architects Journal*, 5 November 1986.
[92] Jon Broome and Brian Richardson, *the self-build book*, Green Books 1991. 182
[93] ibid. p194

The external walls are formed by combing layers of readily available building boards to form a sandwich that is clamped into the structural frame. The materials are selected to give the performance required for the particular situation. The original forms depended on ventilation due to loose fit between layers to avoid condensation and weepholes to drain any water from the unsealed construction. This approach avoids the problem of puncturing vapour barriers during construction but creates problems of ventilation heat loss due to infiltration. Cold bridging is also a problem while insulation is limited by the thickness of panelling.

In summary potential advantages of the method include:

- The process involves only simple carpentry that can be quickly learnt without experience.
- The constructional method is economical since the cost of the simple pad foundations is low and the building can take place without employing subcontractors (with the possible exception of a roofer).
- The construction is relatively quick thus reducing development time using building materials in their basic stock size as far as possible.
- The construction is above the ground on posts removing the need to level the site making ground works manageable for self-builders and enabling construction on sloping sites (economy).
- Trees can be left undisturbed.
- It is possible to arrange group projects so that each self-builder is responsible for the building of his or her own house from start to finish but come together for any common areas. This simplifies site arrangements such the need to specify working hours and have a system of fines to enforce them. In addition all members of a family can take part working at a pace that suits them within their own program. Tension has arisen on self-build conventionally organised that discourages family involvement and which requires each member to work a set number of hours per week.
- Because each family builds their own house they do not have to be identical for reasons of fairness in group construction.
- The walls are formed of panels of standard sizes arranged on a modular grid and are non-loadbearing. The building is thus flexible and adaptable and can be altered even for short periods.
- Flexibility of the system in design and construction allows people to amend the design as they learn (to move a window to take advantage of a view for example). The layout of the house can develop as building takes place. People not used to reading plans can see their designs take shape and thus alter them.
- The ability to extend, change and improve these houses enables them to be developed progressively in accordance with the occupants' circumstances. This may reduce the initial cost and extend its life beyond the 60 year design life.
- Waste material is minimised.

Limitations include:
- The construction is suited to detached housing. Terraces can be built but lead to complications and additional expense.
- Sound insulation is poor principally due to the lack of mass.
- Due to a lack of mass the construction is not suited to utilising solar gains.
- High insulation has been incorporated but beyond a given point further elaboration negates the simplicity of the system.
- Flat roofs can be criticised as high maintenance although they are not an intrinsic part of the method.
- Design choice is limited in the appearance of post and cladding panels. Other cladding can be used however such as weatherboards.
- Completely free design is limited by the system but practically for most the restrictions probably promote design and control.

The Segal system has, and continues to, offer an alternative to subsidised mass housing and private housing expanding the potential of self-build to a variety of groups and individuals. The method enables land and finance to be made available to self regulating groups. It also enables staggering of finances to suit. It comes close to a vehicle for anarchy in architecture.

Low Energy Segal
The low energy Segal house at Machynlleth includes higher levels of insulation and a passive solar conservatory buffer space. The core of the sandwich panels is 100mm of extruded, expanded polystyrene that has a closed cell structure to avoid absorption of moisture. A polythene sheet is placed on the inside (warmside) of the insulation and behind the internal plasterboard to reduce the amount of cold air infiltration while preventing condensation. Another variation is the incorporation of timber studs to provide rigidity usually provided by the use of woodwool slabs. The structural posts are 100mm by 100mm rather than 175mm by 50mm so that they fit within the thickness of the increased wall thickness.

A grid was used where every fourth structural thickness was increased to accommodate change. The roof is pitched and 100mm of extruded, expanded polystyrene is also provided to the floor and roof. It is fixed below the floor joists and over the rafters rather than between them in the usual way. Sealed double glazed windows were used. The design includes a lobby entrance to increase insulation and draught proofing.

Lewisham

The Segal method was used for a council sponsored and initiated self-build scheme in Lewisham completed in 1980. The financial arrangements were devised so that people who had no capital and low income could build. A shared ownership arrangement of small ownership/large rental proportions was initially proposed but later fixed by the DoE at 50:50. A pilot group of 14 households was chosen by lot from a larger group on the council's waiting or transfer lists who had responded to an advert. The council own the freehold of the land and the shared housing ownership is for a ninety-nine year lease. Occupants could buy the remaining share at a later date in 10% portions. The cost of the lease was reduced proportional to the self-build labour fixed as a proportion of the material cost. This was important both for the council in financing the scheme and the future occupants making the lease more affordable. Many of the self-builders now hold the equity on the lease because it is currently almost as cheap to buy the lease as pay the rent (rents have increased but the cost of the lease was fixed at the outset). Self-builders were also able to pay for 'extras' either in cash or by negotiating an extension on the mortgage with the council. The characteristics of the Segal method - limiting below ground work to service trenches and concrete pad foundations was critical in securing the steeply sloping council site with poor ground conditions that could not be economically developed by conventional means.

No previous building experience was needed. Preparatory evening classes were laid on locally offering basic building experience to those selected. Charlotte Ellis argues however that the self builders learned most during building work on site supervised by Segal and co-architect Jon Broome.[94] She also notes that on completion *the occupants were thoroughly acquainted with every inch of the construction as to be able to remedy at once any defect that might occur.* Further, co-operation between households proved to be very close although (or because) they were not subject to any formal organisation. A number of houses have been extended - addition of a family dining room and projecting window bay. One family built another room for a new child over three weekends. Modifications have included swapping windows with external wall panels.

Lewisham demonstrates many of the difficulties of developing such a scheme:

• resolving individual buildings designed with Walter Segal to fit with Parker-Morris 'standards' required by the council,
• providing calculations for cost control with the unknown quantities in such a flexible system
• meeting constructional and planning controls due to the variety of plans to be approved and the unorthodox construction.

The later two problems were basically caused by a vicious circle of needing to design the houses to receive consents but needing technical, legal and financial frameworks to formally constitute as a self-build association. This was exacerbated because houses were being individually designed by occupants. In a second self-build Segal scheme in Lewisham proposals for a standard house were worked up prior to inviting people to join a self-build group. A basic frame for a two storey house was developed allowing for *variations*. It was agreed with the council that additional planning permissions would not be required if extensions were no more than 10% of the floor area. *Segal and Jon Broome then drew up 19 variants to which all the self-builders added to provide a great number of variations.* In the second scheme people were also able to set equity sharing arrangements to suit their particular financial needs starting with a minimum holding of 20% which represented the value of their labour input.

The Segal Method has also been used in group projects for Sea Saw Self-build Brighton (mortgaged property for three couples and 28 single people half of whom were unemployed) and for Greenwich Self-build (collective ownership for rent with HAG grant).[95]

---

[94] Charlotte Ellis, 'Homes fit for Heroes', *Architectural Review*,
[95] Danny Levine, *Building young lives*, HFHA, 1989.

Fig. 9.15. Lewisham Phase 1: variation of plans[96]

[96] Jon Broome and Brian Richardson, *the self-build book*, Green Books 1991. p61

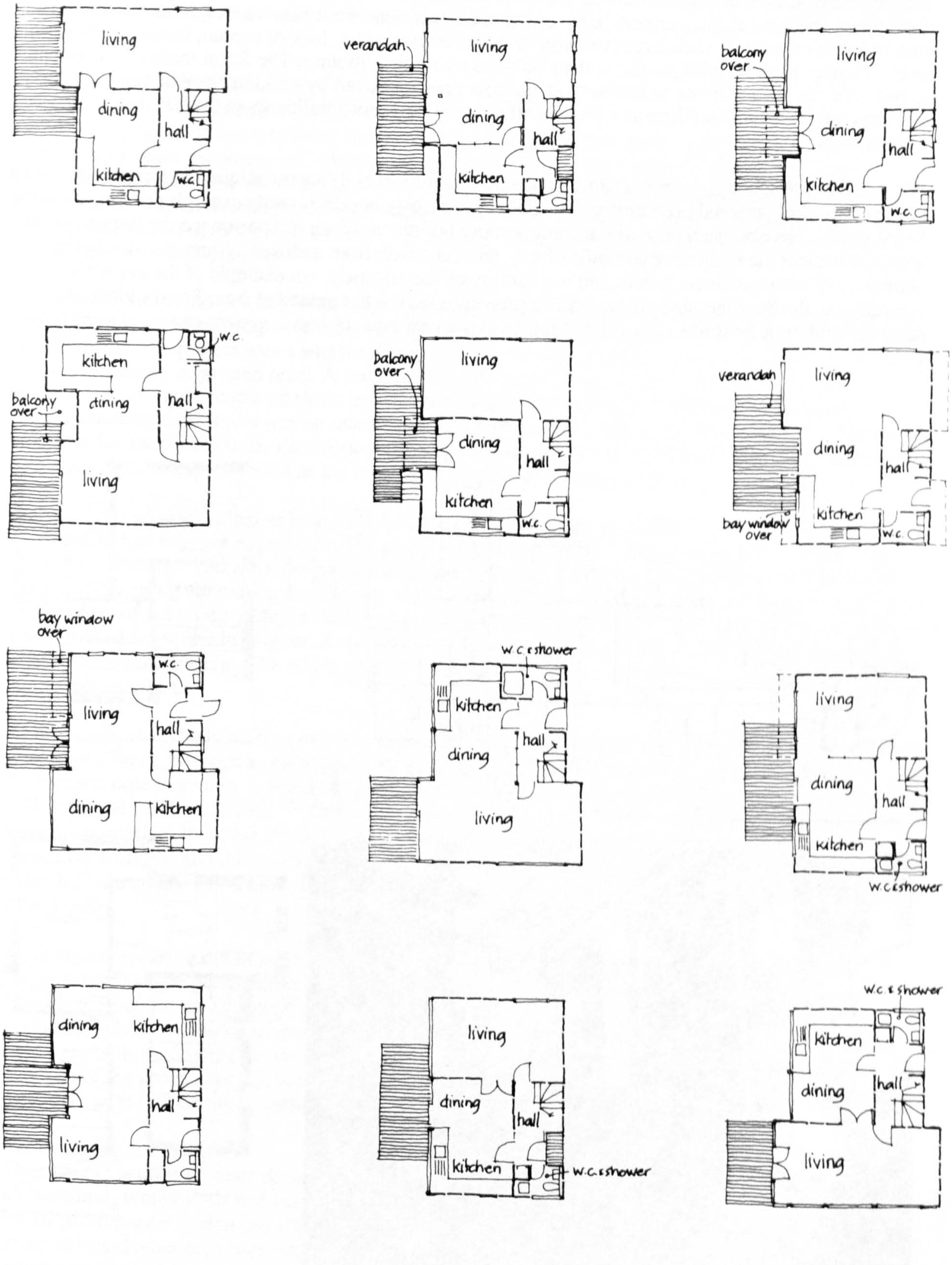


Fig. 9.16. Lewisham Phase Two: range of basic plans[97]

[97] Jon Broome and Brian Richardson, *the self-build book*, Green Books 1991. p67

Segal Conclusions
The Segal method's simplification of building process enables people who are not experts to build and have more of a controlling influence in design. Certainly it allows people (owner occupiers, co-operatives and local authority tenants alike) to participate in providing a house to suit their individual needs at relatively low cost both as built initially and as altered and extended to cater for changing circumstances. Participants become active partners in the creation of their homes not passive recipients. At Lewisham no one was prevented from taking part because of their circumstances, lack of capital, income or building skills. Houses were built by people in their 60's and by a single mother. The Segal method was essential to this success. Critically the Segal method has now been approved by building societies as technically and structurally sound and therefore importantly for timber framed buildings in the UK it is mortgageable.

While the construction system has limitations - innovations in building techniques and improvisation has occurred to meet personal preferences. The Segal low energy houses provide examples of this while the Segal system has also been used to build community buildings. While in appearance the imprint of the architect is clear the monotony and inflexibility that can result from a closed system are avoided by the simplicity of constructional system and workability of the materials. An example of the system's versatility is the Stuttgart students' residence project based on, but extended from Segal's ideas and designed and built by students in 1983.[98] It provides an example of how a system can spark creativity.

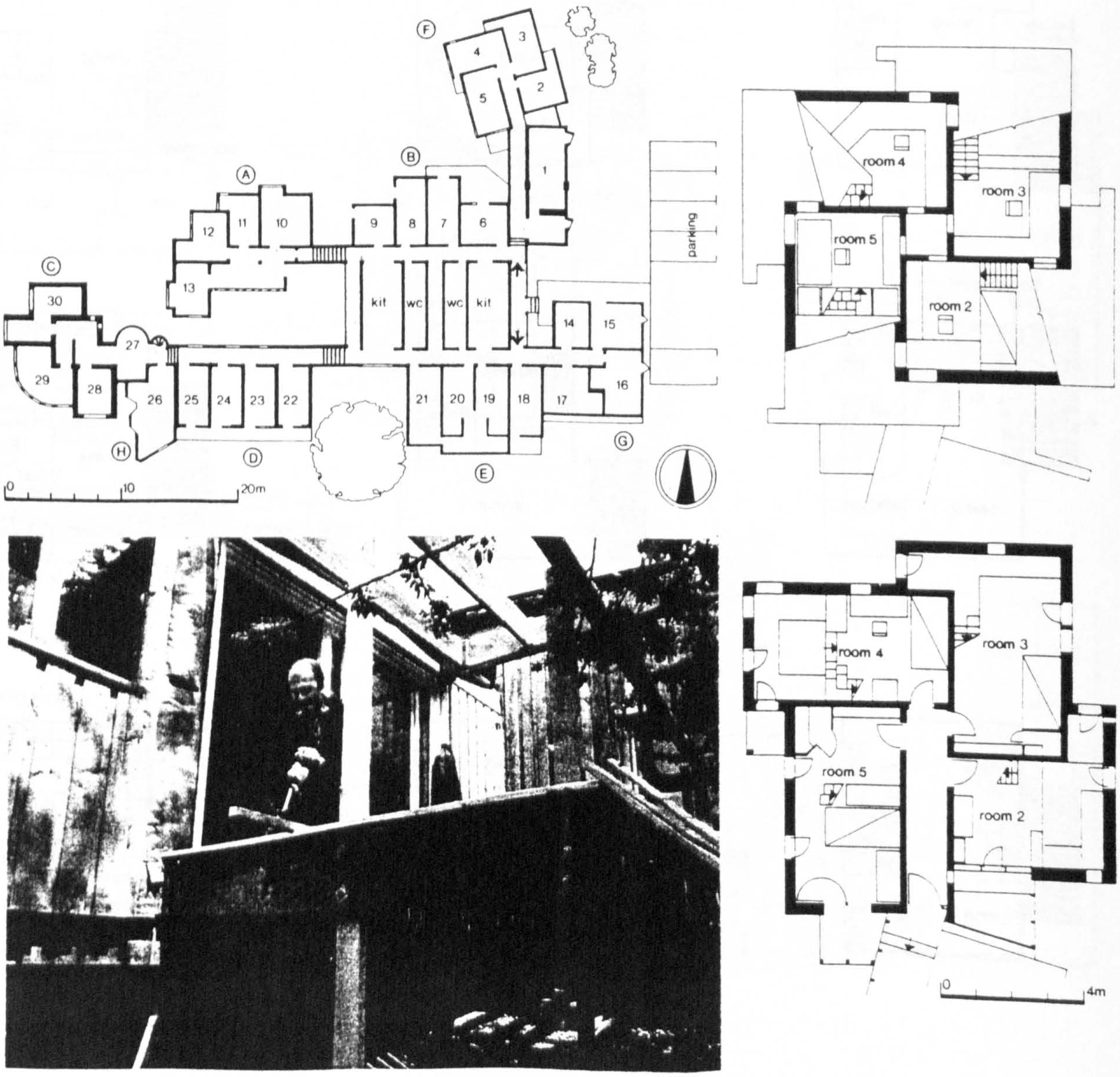


Fig. 9.17. Students residence Stuttgart: variations around a communal core[99]

[98] Peter Blundell Jones, 'Student Self-Build in Stuttgart', *Architects Journal*, 27 July 1983.
[99] ibid. p33

In the context of this thesis critical problems include the construction details in relation to energy efficiency and the lack of urban coherence of Segal housing as opposed to the SAR supports discussed. It is clearly inappropriate for inclusion of mass. The potential urban implementation of the Segal method is also problematic in terms of the need for fire protection. Unlike SAR supports the Segal system seems a broadly suburban notion. A version of the Segal Method could provide a renovation system for derelict inner city houses or perhaps infill for built supports.

9.4.2. Other Constructions

Zenzele - Traditional Construction for Training

Development by a self-build housing association negates speculative gains to developers and enables participants to gain 'sweat equity', and a development loan from the Housing Corporation. These were important at Zenzele, a scheme that provided mortgaged accommodation to unemployed young people. Also essential was an 'available for work' designation for the unemployed self-builders during construction and an agreement that benefits would pay mortgage interest if the self-builders were still unemployed after completion.

The Zenzele Self-build housing association consisted of 12 mostly unemployed people from the St Paul's area of Bristol who came together via personal contacts. Their ages ranged between 22 to 33 at the start of the project. The project was a single two storey block of twelve single person flats *around a communal lobby and laundry at ground level.* A traditional construction of rendered blockwork walls under a pitched roof was used requiring skills including bricklaying, rooftiling, plastering and reinforced concrete work. Mastering these skills was an intentional part of the scheme that aimed to increase the employment prospects for the participants. Participatory design was not part of the agenda. SkillBuilding discussed below attempts to use self-build as the basis for a recognised training scheme.

Conventional wisdom is that at least half the participants should have building related skills although at Zenzele less had relevant experience. The group included a plasterer, carpenter and one member had worked for a roofer. The work progressed through stages and trades from foundations up with skilled work and labouring alternating depending on particular ability in different trades. All the work was done by members of the group with the exception of the external plastering and the concrete first floor slab that was provided for sound insulation. A specialist consultant was also needed during groundwork due to existing cellars on the site. The whole project was overseen by site supervisor with assistance from the consultant architect.

At the outset, everybody entered into a written agreement to work a minimum of twenty hours per week if in employment, but with a commitment to work as much more as they could. In the event Broome and Richardson note that many worked two or three times the minimum and were often constantly supplied with food and drink by friends.[100] Due to insurance complications friends were not officially recognised on site but unofficially aided in some construction. Several members of the group were offered work during construction and thus rescheduled to a lesser rate of working resulting in the program being extended by a couple of months. The construction period was 13 months although the total development took 3 years.

By completion eleven out of twelve of the participants had found employment. In addition many no longer wanted single person accommodation and 11 out of twelve have since sold on their house.[101] Notably a group set up Zenzele Construction. Despite difficulties especially due to the development period the scheme provided usable skills and equity to unemployed admittedly young healthy people. The flats were built for 65% of the mortgage valuation a value that has increased since completion. The exact make up of the group changed radically during the long delays before construction started. These delays were due, as at Lewisham, to negotiations for approval to the scheme, for land and finance.

Netherspring, Sheffield

This scheme is unusual since the core group of the building co-operative possessed many relevant architectural, professional and building skills. It is briefly discussed due to the construction method, its use of passive solar design and the fact that it involves a group not considered in housing need. The core group selected other members after advertising in the local paper and then interviewing. The eventual group consisted of 14 'mortgage-worthy' households. The co-operative was set up for the duration of the building at which time each member arranged their own mortgage.

---

[100] Jon Broome and Brian Richardson, *the self-build book*, Green Books 1991.
[101] Murray Armor, *Building Your Own Home*, Prism Press, 1990.

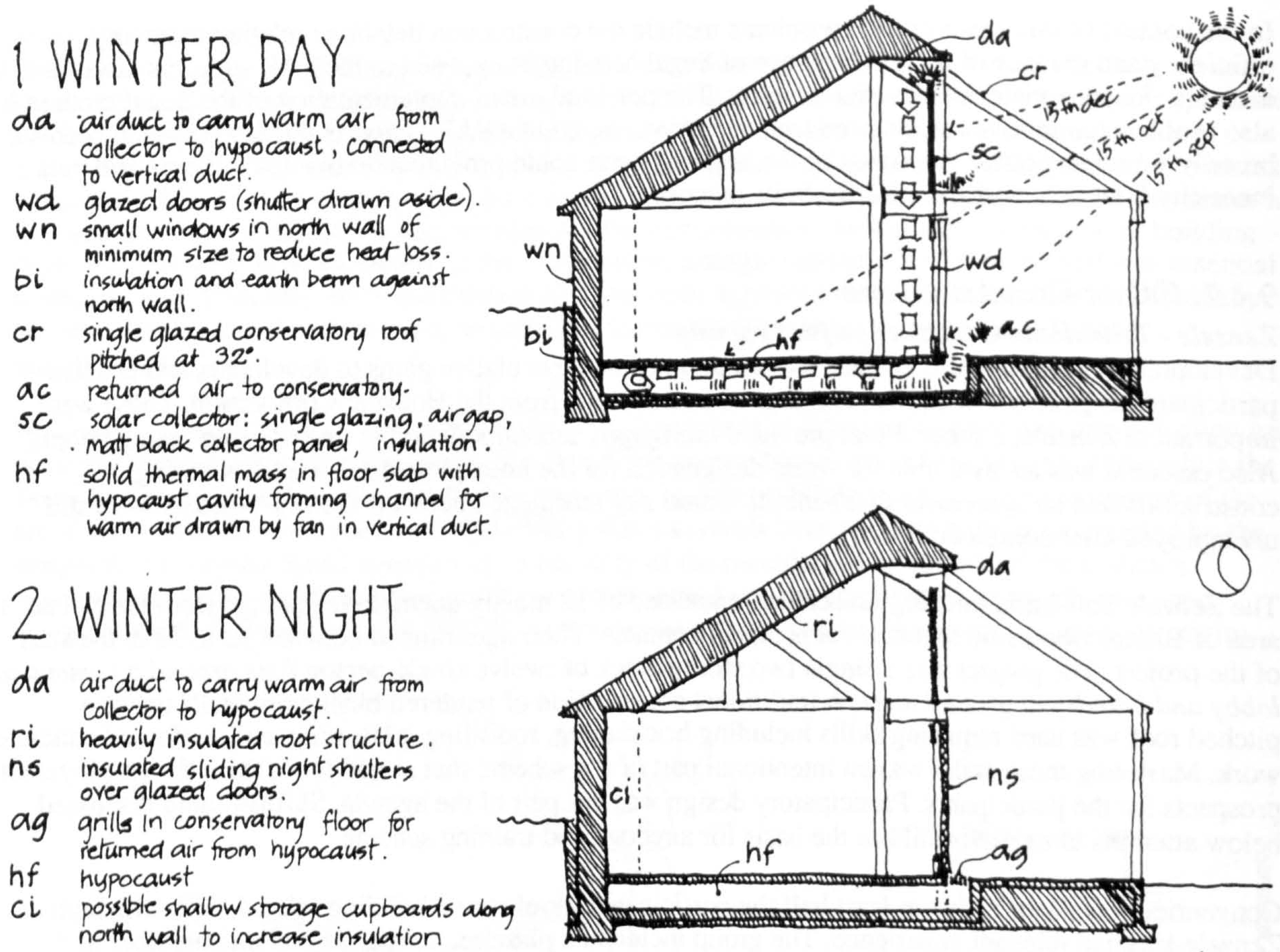


Fig. 9.18. Netherspring: how the solar gains are manipulated[102]

Most of the building structure was timber-framed for rapid construction and to allow freedom of internal layout but not built off the ground on stilts. Instead north-east and north-west walls were built of insulated cavity brickwork built off concrete strip foundations and with suspended precast concrete floor slabs (i.e. spanned from wall to wall and hollow underneath). One of the main aims was to exploit solar energy. Principally this involved using glass conservatories on the south side of the building with heavy, heat retaining construction and a few small windows away from the sun in a highly insulated construction. The use of heavy construction on a steeply sloping site was made possible because the group contained two skilled brick-layers and since they proposed to build co-operatively (rather than each family building its own house). The co-operative building was done house by house rather than trade by trade as at Zenzele. Training was not formal as at Zenzele but picked up from the many in the group with relevant skills as the project developed. If necessary the timber frame section of the building could be built first and supported at the back on posts so that floor laying could take place under cover as the walls were built. Cedric Green architect for the project has suggested that given normal foundation conditions, a co-operative building group with at least one competent bricklayer per eight people can use this combined form of loadbearing brick and timber construction. [103]

The houses at Netherspring were of two types detached L-shaped bungalows and semi-detached houses but each one has been colonised differently particularly the use of the passive solar conservatory system. The timber system allows continuous variation around the two basic cores that enable savings due to economy of scale.

Rehabilitation

Rehabilitation schemes argue Levine demand a greater degree of skill and there are additional safety implications.[104] On the other hand Levine continues the increased use of short life property that would otherwise be empty awaiting demolition or modernisation, has demonstrated that 'lower-tech' but safe

---

[102] Jon Broome and Brian Richardson, *the self-build book*, Green Books 1991. p90

[103] Jon Broome and Brian Richardson, *the self-build book*, Green Books 1991.

[104] Danny Levine, *Building young lives*, HFHA, 1989.

conversions can be developed. If the necessary skills are available or can be taught an existing house can be converted and upgraded more quickly than a self-build scheme using traditional materials. As has been repeated many of our inner cities have a considerable 'resource' of derelict property, the fabric energy of which and need for continuity demand that attention should be focused on.

Giroscope Workers Co-operative
Giroscope is a young persons workers co-op set up in the mid 1980's based in Hull that aims at the purchase, renovation, modernisation of houses in poor condition and the renting out of these houses to unemployed people and other disadvantaged groups such as single parents and disabled people. In so doing they have gradually gained skills experience and credibility that they can pass on. They are not speculative projects but geared to local needs. Giroscope's renovation program also adds to its green potential. By the early 1990's Giroscope owned 19 properties housing 60 people but had also developed a low-energy house and self-run crèche

9.5. The SkillBuilding Approach

SkillBuilding is a framework for self-help that can be appropriated by a particular project. It was set up as a response to the length of many co-operative and self-help projects along with the often high and hidden costs of community involvement (professional time). The SkillBuilding approach is based on the premis that much of the housing construction process in the UK is unnecessarily complicated, too costly, unable to meet changing household needs, and poorly adapted to its occupants. It attempts to:

• aid the provision of high quality, low cost housing for rent or for sale;
• provide for construction training for local unskilled and semi-skilled people;
• promote job creation in the building industry and elsewhere;
• provide community facilities as part of housing development projects;
• promote the active participation of local communities in the development process and control over management of the end-product.[105]

The approach allows for a wide variety of sponsors and ownership patterns. Sponsors may be the community group, housing associations, local authorities, voluntary organisations or private developers and consultants. The framework is in the form of two manuals that attempt to assist professional advice not replace it with empirical information as a do-it-yourself guide. It aims to make the complete building process more transparent to all those concerned thus breaking down barriers between professionals and between professionals and users. Constructionally SkillBuilding balances buildability and flexibility with standardisation and large scale production.[106] Environmental concerns are considered but as one element in the overall organisation of the framework and secondary to the search for appropriate balance between individual and social spheres.

The *Sponsors' Manual* provides information on organisation, administration and management of a community-led housing project, from getting a group together to maintenance of a completed project. It is particularly aimed at communities not specialists. It is divided into four sections, funding, training, project and group. The *Site Manual* provides a stage by stage description of a typical house construction with the suggested organisation of a training program for each stage (Pre-commencement, site preparation, foundations, frame manufacture, frame erecting, roof covering, cladding, first fix, insulation and plasterboarding, second fix, decorations, completion). It thus describes how the SkillBuilding approach translates into practice on site. Each section contains descriptions of the main *elements of work* followed by *specification notes* describing the task more fully and *training notes*.

The training program is a unique feature of SkillBuilding enabling unemployed participants to gain *accredited* training. This reasoning is based on job creation and the wider concerns of the satisfaction gained from effective participation. The former must be questioned as a general principle particularly given the green criticism of economic limitations. The training program has an effect on the constructional system chosen.

---

[105] SkillBuilding, *SkillBuilding Sponsors' Manual*, C.H.I (SkillBuilding) Ltd, 1992.
[106] José Ospina, *Housing Ourselves*, Hilary Shipman, London, 1987.

House Design

The SkillBuilding approach typically envisages housebuilding by small to medium contractors with on site training provided. The construction used was developed with respect to opening up the construction process to a broad range of people and marrying the construction stages and operations to a training program while exposing trainees to a wide range of techniques and materials. Timber construction is used because:

- Timber frames can be erected quickly and at an early stage as opposed to bricklaying that dominates traditional construction throughout. This has advantages for training since a wide range of other, and dry, work areas become available sooner. The skill of bricklaying can be gained in cladding of the building.
- The timber frame offers greater design flexibility and is potentially more adaptable in 'contextual terms'.
- Timber frame offers potential for higher insulation levels reducing fuel bills.

Accepting the approach does not however preclude traditional masonry or other constructions. The method is similar to conventional timber framed housing so that trainees are employable within the mainstream building industry. With increased insulation standards timber framing may become increasingly important. Many of the concerns are also applicable to self-build and an appendix to the *Site Manual* adds notes for self-build modifications.

The specific system for each house is 'platform' framing. The loadbearing walls are divided into a series of panels of manoeuvrable size placed on block perimeter footings with an external brick cladding. Panels designed by engineers may be made on or off site. The first floor flooring is laid before the first floor frames are erected. Roofing is trussed rafters and tiles. Upper floor timber cladding precedes lower floor brick cladding while the scaffolding is still in place. The method is clearly different from the Segal system for the reasons discussed. It enables considerable plan and cladding modifications.

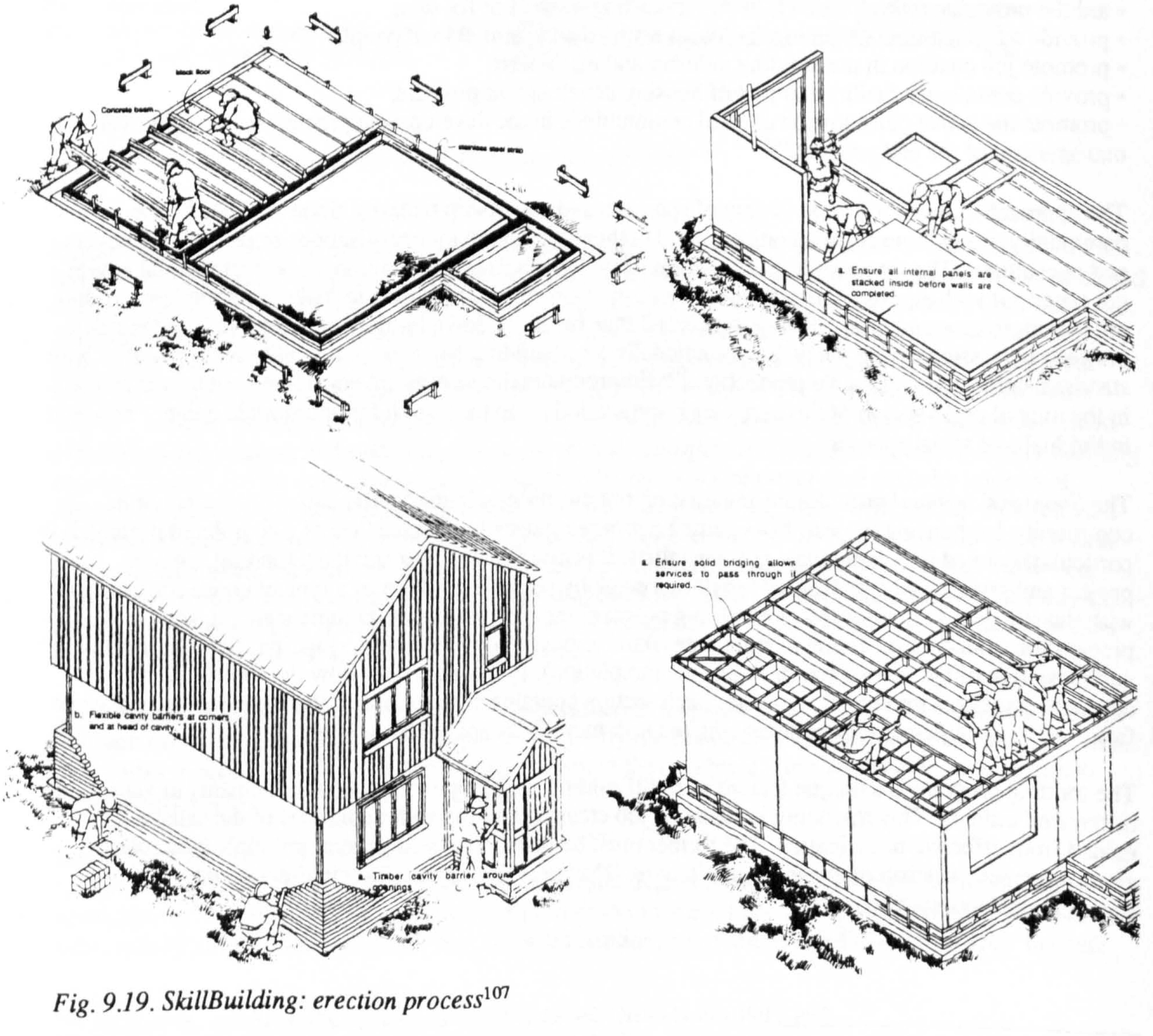


Fig. 9.19. SkillBuilding: erection process[107]

---

[107] SkillBuilding, *SkillBuilding Site Manual*, C.H.I (SkillBuilding) Ltd, 1992.

A range of house types are illustrated in the manuals from a three bedroom five person type to a one bedroom bungalow. This reflects areas where acute housing shortage exists, i.e. accommodation for smaller families, couples, single parent families and the elderly. The range can be extended to larger houses while flexibility and adaptability of each type enables a range of variations of internal plan form. Possible extensions are allowed for to respond to changing family requirements while material options, ecological assessments and the potential for further refinements are also possible.

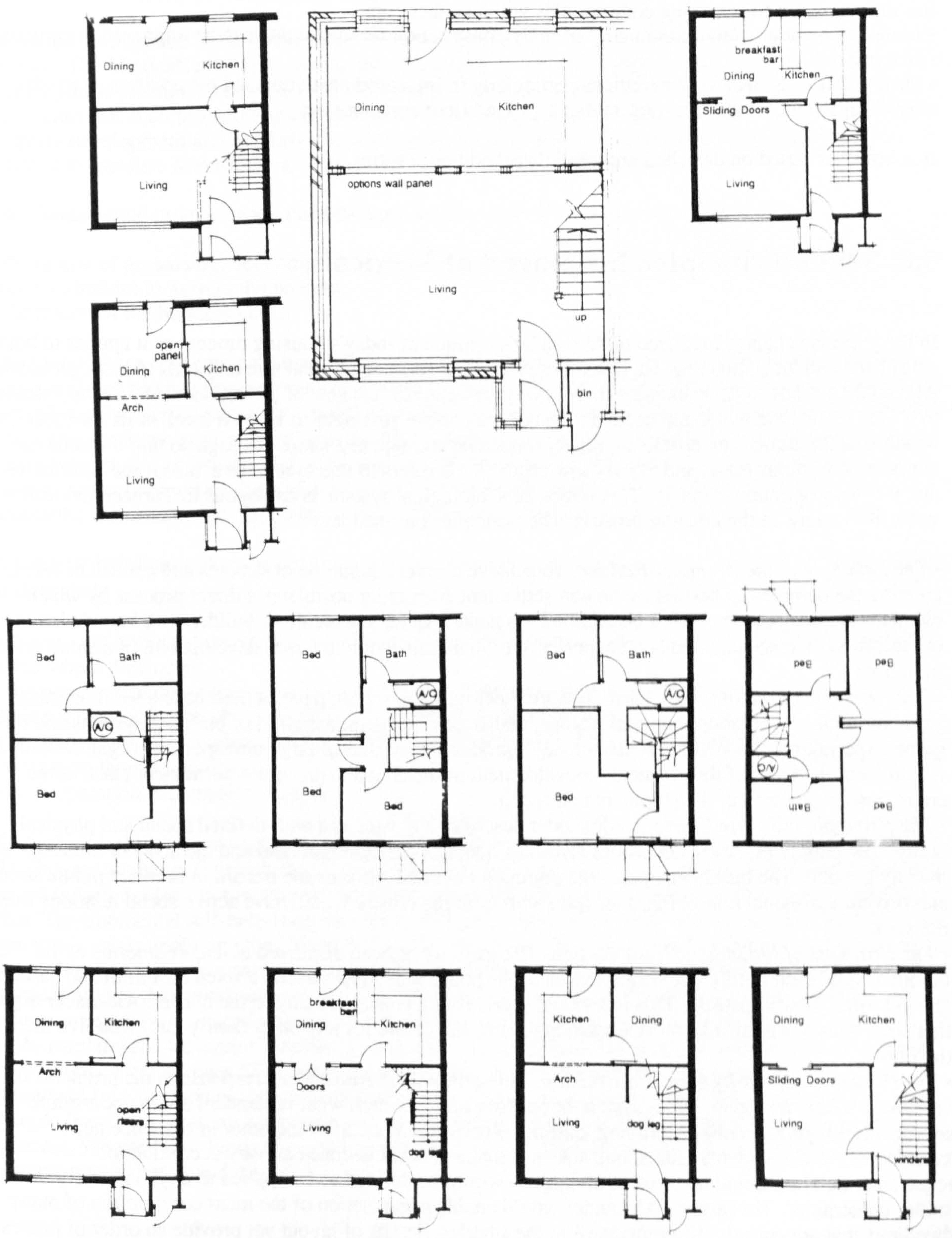


Fig. 9.20. Typical plan and variations[108]

[108] SkillBuilding, *SkillBuilding Sponsors' Manual*, C.H.I (SkillBuilding) Ltd, 1992.

Environmental Considerations
The SkillBuilding idea has several environmental advantages:

• it allows for extension;
• it delivers specifically adapted but also adaptable housing;
• it increases knowledge of housing technologies;
• it combines constructors building skills with commitment of self-build ensuring 'tightness';
• it offers suggestions on ecological building issues within an applicable economic framework although it has limited scope for ensuring communities will take them up;
• it uses a potentially environmentally friendly construction technique that can be improved in particular situations;
• the construction allows for variations particularly in increased insulation and the addition of passive solar design features since it uses 'massive' ground floor construction.

It is however based on detached and semi detached house forms.

9.6. Seven Principles Employed at Mexicali

In the previous chapter I referred to Alexander's critique of today's housing process as it applies to both subsidised and 'tract' housing. He has also developed a self-help system that responds to these problems. Alexander defines seven principles for a system he believes "capable of giving detailed, careful, attention to all the particulars which are needed to make each house 'just right' at its own level, at its own scale, and which is at the same time efficient enough, replicable enough, and simple enough so that it can be carried out on an enormous scale, and at very low cost".[109] He refers to this system as a 'biological' alternative in that it is 'appropriately adapted'. This notion of a 'biological system' is analogous to Turners application of 'requisite variety' to the housing process. The principles outlined are:[110]

• *The Principle of the Architect-Builder.* To achieve correct adaptation of designs and control of users, creating the complexity needed by human settlement Alexander postulates a direct process by which elements are decided on site not transmitted via paper. An on site architect-builder with knowledge of organisation of space and hands on experience of materials would oversee development of a small group of houses.
• *The Principle of the Builder's Yard.* The architect-builders should have as their base a local building yard combining; workshop, material storage, and an area for demonstration of building systems and on-going experiments. This would replace today's production system of large unresponsive organisations. It would form the basis of the physical redevelopment of the area and provide a permanent place in the community, a nucleus of development and repair.
• *The Principle of House Clusters.* Alexander describes a cluster as a well defined social and physical entity. The people in the cluster would layout and control the common land and the array of buildings not the city council. The buildings open from common land which forms the transition between public street and private individual house. Families (sic) who form the cluster would have active social relations from the start.
• *The Principle of Individual House Design.* This notion has been discussed at length in terms of 'fit'. The uniqueness of each family (sic) is expressed in the house it designs "within a fixed cost limit and certain ground rules" (participation). This individual house is in a cluster relating to the cluster. Alexander argues that such houses will also be more human and more full of life for any other family (sic) who live there in the future.
• *The Principle of Step-by-Step Construction.* This principle is Alexander's response to the problems of variations within a system. It is a system of construction in which what is standard are the *operations* (tile setting, bricklaying, painting, spraying, cutting...) performed one after the other in sequence not 'components' and thus where the actual size and shape of what is done can vary according to requirements. The individual steps or operations would be defined to be applied to any plan within certain 'minor constraints'. This argues Alexander would enable organisation of the mass construction of many dwellings that are entirely different down to the smallest details of layout yet provide an order of process capable of maintaining firm discipline, schedule and cost control. The individual steps are also simple

[109] Christopher Alexander, 'The Production of Houses', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[110] Christopher Alexander et. al.,. *The Production of Houses*, Oxford University Press, 1985.

enough for family, friends and unskilled paid labour to be effectively employed. Today houses are built of components some large and some small but the variety achievable is 'within a system'.
• *The Principle of Cost Control.* Today cost control is used as the principle argument for centralisation. The above system argues Alexander allows for cost estimates of price for each house simply as a function of area since the operations are known and closely linked to cost accounts. A fixed budget but without controlling the exact way that it is spent.
• *The Principle of Human Rhythm.* Self involvement extending throughout the building process and beyond so that houses are never finished but evolve continuously.

Alexander has applied some of these principles to a housing 'cluster' for five families at Mexicali in North Mexico. The Mexicali project is open to the criticism that can be levelled at many of the above projects; it is high profile and has involved a high degree of professional input. In his *Commentary on Mexicali* Karl Linn notes that such projects must be seen within an overall political context so that the consequences of property development and the dialectic of property improvement are made clear.[111] In addition it is difficult to translate Mexicali in a UK context - climate, cost, building codes.

Two fundamental programmatic contributions are however of particular importance here:

• the notion of organising, not components, but the operations step-by-step, combined with an on site architect-builder to nurture the process,
• the notion of the builders yards.

The first of these concepts goes beyond all the solutions suggested above. Alexander points out that house building has become a process of assembly - an occasion where prefabricated units are assembled. Instead step-by-step construction would define the building system in terms of actions needed to produce a building not in terms of physical components "the components, which get created by the operations , take whatever size and shape they need to do, to fit perfectly into the place where they will be."[112] This system is clearly based on the notion of craft. It is noticeable that Alexander describes a brick as adaptable; it is friable and can be cut to size. Plaster can cover a wall or ceiling of any size.

A modular building is also a set of operations but step-by-step operations must conform to certain criteria such as that:

• they do not impose dimensional constraints on the plan but create parts which are adapted in size to the place where they occur,
• the sequence of operations generates the building from a rough layout designed directly on the ground it does not merely fill the physical reality of a previously detailed design,
• the operations must enable simple and cheap construction of all the 'patterns' which a group or family may use in their house layout,
• each operation is complete in itself.

Of his builders yard Linn quotes Alexander "The process not only builds the houses, but repairs them... The houses are never finished; they exist, in an imperfect state, constantly changing and improving, just as we ourselves also exist in an imperfect state, constantly struggling to improve ourselves". Linn argues that "Environmental self-help is an idea being catapulted into prominence in all countries caught up in economic crises, including the United States. The expansion and overcentralisation of cities and their top-heavy bureaucratic organisations have begun to generate counter forces that emphasise grassroots citizen participation in the revitalisation of neighbourhoods. *But to conduct broad-based environmental self-help programs effectively, including urban homesteading and open space development, support systems have to be established. Alexander's builder's yard must be considered a central component of such a system*" [my italics]. He continues "The impetus for labour-intensive engagement in production process is generated by a fundamental spiral development in technologies world-wide. So far machines that save people from backbreaking work have also caused people's hands to be disengaged from the production process. We need new kinds of machines and processes to spare people backbreaking labour, but re-engage human hands and minds".[113]

---

[111] Karl Linn, 'Commentary on Mexicali', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
[112] Christopher Alexander et. al., *The Production of Houses*, Oxford University Press, 1985.
[113] Karl Linn, 'Commentary on Mexicali', in Richard Hatch (ed.),*The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

Alexander's notion of the builders yard seems particularly relevant to a green support system perhaps combined with urban demonstration of green and self-help technologies. The builders yard as an integral part of every neighbourhood can collect and recycle salvaged materials and form a basis for community recycling and resource conservation generally. The skill acquisition element can be utilised for maintenance and communication of green systems incorporated in design. Confederated yards would provide a base for development of regional standards in terms of energy efficiency. In the UK the existing network of city farms would provide an ideal base.

9.7. Centraal Wonen (Central Living) in the Netherlands

The concept of *collaborative housing* emerged initially in Denmark among groups attempting to balance privacy and community, the isolation of the suburban house and the problems of shared housing and dense urban living. In 1969 the concept also emerged in the Netherlands largely in response to the isolation of suburban living. By 1991 there were 55 *central living* schemes in the Netherlands and 15 being developed.[114] Their motives are to share amenities and management and create communities with more social contact. In the Netherlands the co-ordinating body aimed to reach all levels of society through developing affordable housing. It was thus not only the future residents who had to be convinced but sponsors.

Central living is characterised by common facilities, private dwellings, resident structured routines, resident management, resident participation in the development process and design for social contact. Generally each household has its own house or apartment and one share in common facilities, which typically include fully equipped kitchens, crèche and play areas, meeting spaces, hobbyrooms and common gardens. Occupants agree to reduce the area of their individual house for co-housing provision. Residents may share cooking, cleaning and gardening on a rotating basis. Each project may be divided into smaller housing clusters sharing facilities or one large common house may be provided.

Central living may be compared in some respects to co-operative housing as carried out in the UK. While co-operative housing involves shared activity and the involvement in the development process it has however no shared *built* accommodation. Central living as co-operative housing does not necessarily involve design participation. Literature on central living proved difficult to find in this country as were any examples. Central living in the Netherlands as with co-operatives in this country remain on the fringe of housing activity. The central body Landelijek Vereniging Centraal Wonen consists of two people in an anonymous flat on the edge of Utrecht. It performs the role of a central umbrella group and promotes cohousing.

While collaborative housing is still most widespread in Denmark it has become popular in the Netherlands under the title of Centraal Wonen (central living) in a slightly different and often more radical and experimental form. Dorit Fromm argues that Dutch central living is typically more urban than in Denmark and includes a greater range of people, not only couples and young families but also single people, single parents and the elderly. The Dutch she argues viewed collaborative housing as a tool to reform society. The National Association of Centraal Wonen (LVCW), created in 1971 as an umbrella organisation for the new collective housing questioned not only the isolation of the one-family home but also the isolation brought about by the nuclear family structure. Further while Danish cohousing was originally a home ownership alternative Dutch central living was seen more as a rental alternative. In fact 93% of Dutch central living schemes are rental usually owned by large independent non-profit making organisations funded by the government. Central living projects in the Netherlands have involved ownership, rented and mixed owner occupier/rented housing. In Danish cohousing schemes two-thirds of the residents are in traditional families while one-half those in Dutch central living schemes are single and one-third are single parents. It should be noted that the concept of central living is clearly relevant to the problems faced by the growing number of single parent or otherwise non-nuclear families.

Ownership
The ownership arrangements for cohousing schemes are varied and complex and related to equity and financing. Other determinants include resale possibilities, liability and development timing. Options include condominiums, co-operative ownership of various forms and rental/management co-operatives. In condominiums the individuals own their apartments outright (or lease) but have a share in a resident-

[114] Dorit Fromm, *Collaborative communities: Cohousing, Central Living, and Other New Forms of Housing with Shared Facilities*, Van Nostrand Reinhold, 1991.

owned company which owns the freehold and common areas (buildings and land) and which provides services at cost to members. Residents secure individual mortgages and govern themselves through a homeowners association. Dutch social (subsidised) housing is traditionally built by non-profit housing associations with government funding. These associations act as housing sponsors channelling government subsidies to build rental housing. Rental (management co-operative or tenants association) from large non-profit housing associations are common form of cohousing in the Netherlands.[115] Management may include choice of new residents. The residents sign a management agreement with the non-profit owner. Various mixed tenures have also been experimented with so that if A has X pounds and B has XX pounds they can choose different ownership in the same housing scheme. In the Netherlands five schemes are of some form of mixed ownership.

Common Facilities
Common facilities in central living projects are generally funded by donated floor space i.e. reducing the floor area of the individual houses. The average floor area donated is 17%.[116] The largest space reductions are in the kitchen, dining room and living room i.e. rooms with shared equivalents. Community kitchens are usually in addition to kitchens in the individual houses and flats. The private kitchen lacks large refrigerators, bulky freezers, surplus storage, washer and dryer. Collaborative communities are often further subdivided into clusters that have different levels of participation and shared meals. Occasionally a project may include shared bathrooms and kitchens as in shared housing. One cluster in a project may be like this. Projects such as Het Punt and Hilversumse Meent also include space for small studios and offices providing opportunities for people to work on site without the isolation home working usually involves. Initial difficulties in securing funding for this physical separation of space involve its mortgage value.

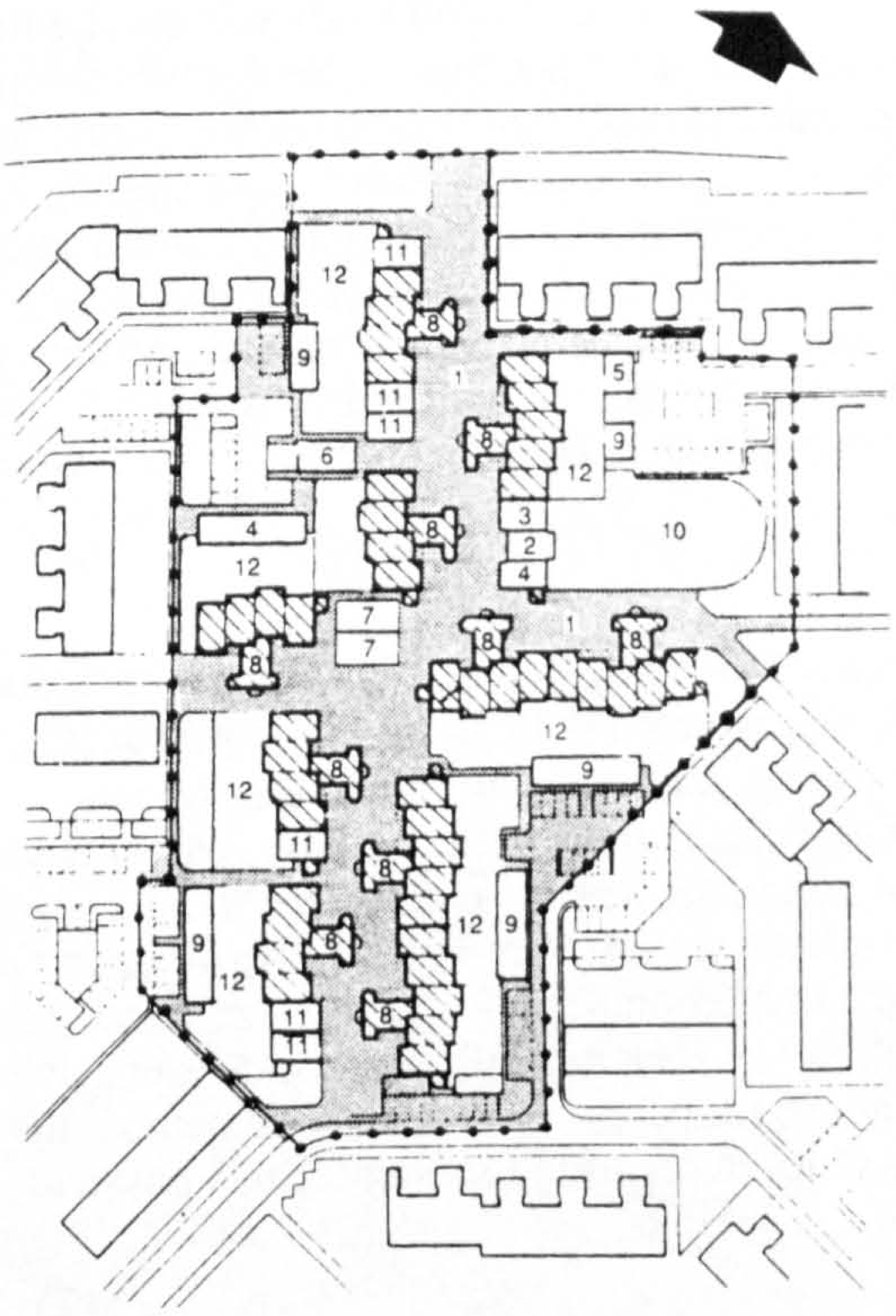
Design
Although common characteristics can be isolated the individual qualities of each Centraal Wonen project in the Netherlands are determined by the requirements, character and number of its group inhabitants and are never generic. Relationships can be seen on three levels between individual residents, residents and the co-housing community, (and perhaps cluster), cohousing community and the public. In helping to eliminate isolation and stimulate interaction and integration of different social groups the physical design must succeed at all these levels. Many of the project designs for the individual units have been developed around the need for adaptability as the community changes enabling occupants to modify their unit or move within the community. *A formalised decision making process may resemble the supports concept discussed with initial decisions at a community level.* Variations on a theme ensure economy of construction.

Ecological Co-housing
In the Netherlands there has been a merging of green and central living ideas. At Landelijck Vereniging Centraal Wonen they describe how schemes that used to go under the category of central living in the 60's and 70's are now called eco-schemes and combine the intrinsically green co-housing ideas with explicitly green energy saving devises. Het Groene Dak, Maaspoort, Heem and Buziaustraat are all examples of the merging of green and central living projects.

Hilversumse Meent
Hilversumse Meent in Hilversum just south of Amsterdam designed by Leo de Jonge and Pieter Weeda in 1977 was the first Dutch collaborative housing project. The group formed in 1970 with the intention of developing collaborative housing and then approached some of the government funded non-profit housing associations (group initiated). Many refused to fund the project since common facilities were not defined in the government's affordable-housing legislation. Eventually a housing association agreed provided that *an alternative floor plan was produced showing how dwellings could be converted back to traditional forms.* Critical to the development of Hilversumse Meent was the agreement of the architect to work free of charge until sponsorship was secured. The group formed an association that leases all the buildings from the sponsor, rents out the housing to members and is responsible for collecting rent (common ownership co-operative). A second association of all the residents (the membership association), makes decisions and manages the community. Fifteen percent of participants were unemployed.

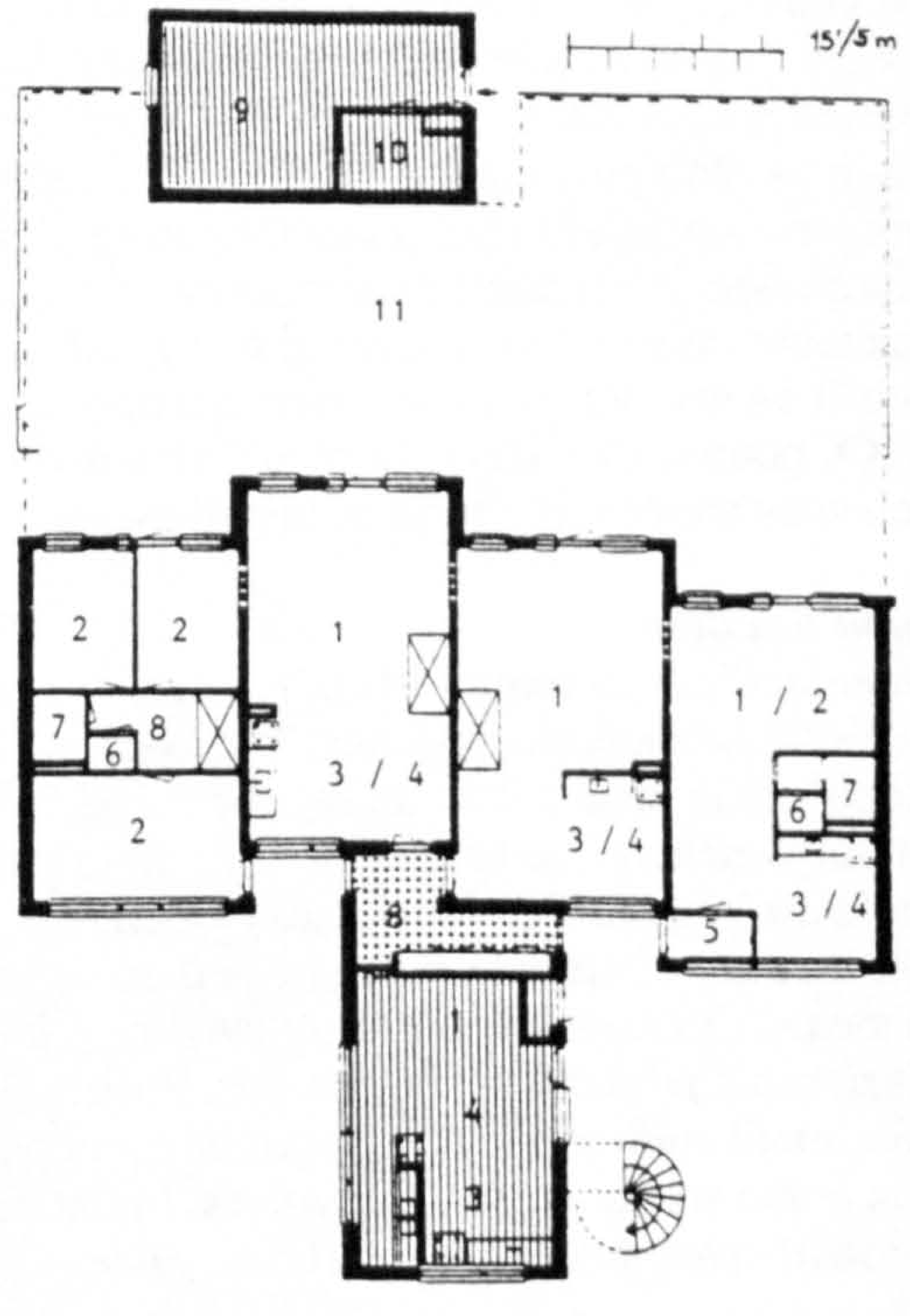
---

115 Herman Van Rooijen, interview, LCVW, Utrecht, August 1993.
116 Dorit Fromm, *Collaborative communities: Cohousing, Central Living, and Other New Forms of Housing with Shared Facilities*, Van Nostrand Reinhold, 1991.



Hilversumse Meent has ten clusters, each with a common kitchen-dining room. *(Jonge).*

1. Public pedestrian walkway; 2. library; 3. meeting room; 4. bar-café; 5. sauna; 6. workshop; 7. studio (formerly teen room); 8. cluster kitchen-dining room; 9. cluster laundry and storage; 10. common garden; 11. dwellings not sharing cluster kitchen; 12. private or cluster garden.



Each cluster consists of five complete living units, each with its own kitchen, bedrooms, and bathroom, plus a shared kitchen-dining area in front. There are sixteen different combinations of units, with bedrooms and kitchens on either the first or second floor. *(Jonge)*

1. Living room; 2. bedroom; 3. kitchen; 4. dining room; 5. entrance; 6. toilet; 7. shower; 8. hall; 9. cluster storage; 10. cluster laundry; 11. private or cluster garden.

Fig. 9.21. Hilversumse Meent: Site Plan and Cluster Plan[117]

Hilversumse Meent is an example of the urban nature of many Dutch co-housing schemes based on a pedestrian street. It s divided into ten subgroups or clusters of four or five houses based around common kitchens facing onto the pedestrian street. Four houses and two houses for young people do not belong to a cluster. The roofs of the common kitchens form access terraces for two of the associated dwellings. At the centre of the pedestrian street are studio, meeting room, bar-café and library. A large common garden and private/cluster gardens face away from the pedestrian street on the other side of the clusters. Cluster laundries and stores open off these. In design emphasis was placed in the continuum of space from the private level of dwelling, semiprivate shared backyards, semi common cluster kitchens, stores and laundries, common shared workshop and pub and public pedestrian path. Fromm notes that the ten clusters have different levels of participation in terms of daily activities. The notion of clusters seems a successful form of social construction.

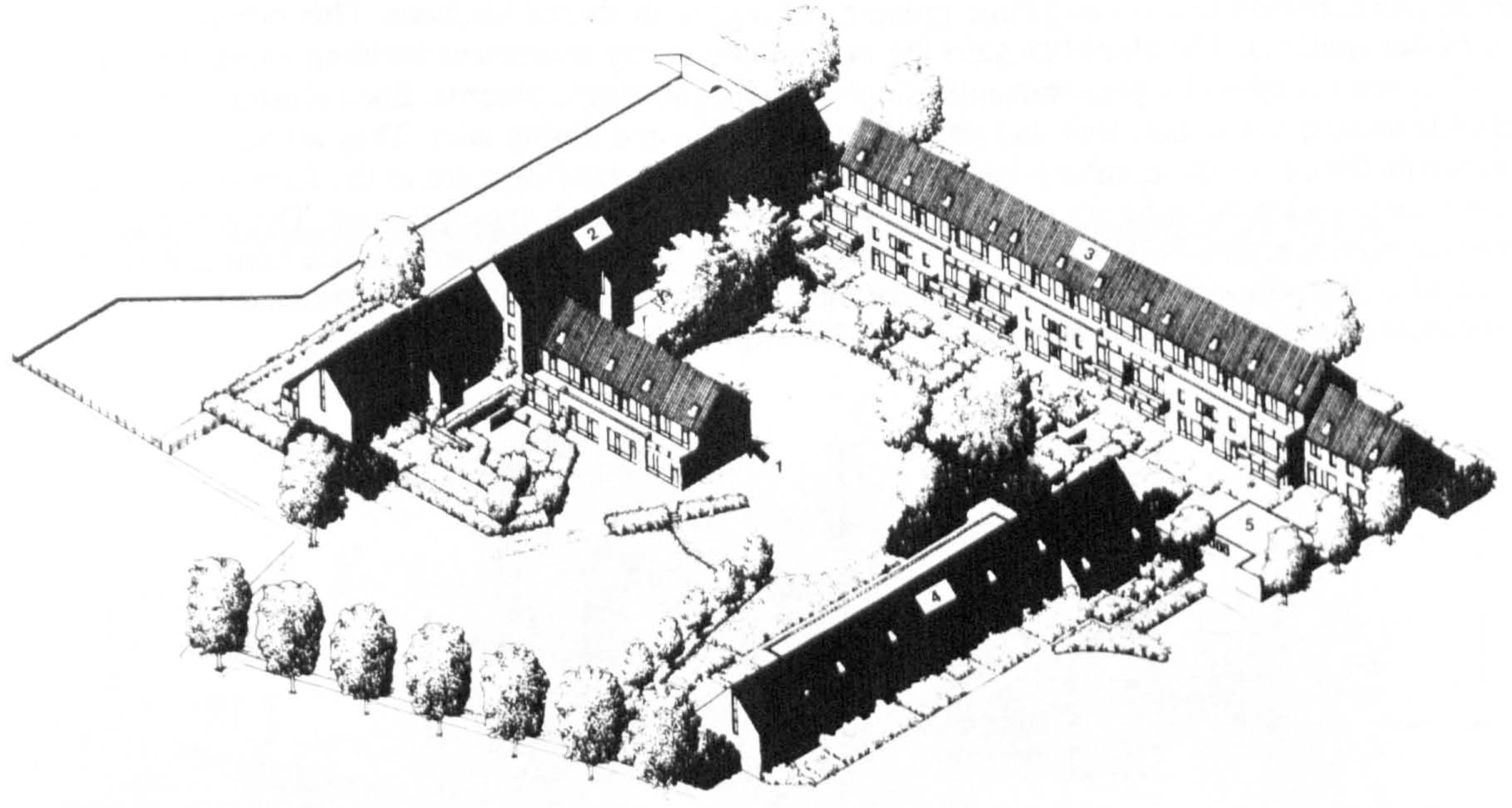
Four basic housing sizes were provided. In the manner of supports the layout allows for many combinations by locating stairs and bathrooms in the centre freeing the rooms on each end to become the living room, kitchen or bedrooms. The families participated in the design of their own units, resulting in about thirty variations.

Het Punt (The Point)

The Het Punt group originally came out of a participative process for the whole new neighbourhood or 'extension' to Wageningen near Arnhem. The co-housing group that developed accepted the architects who had been chosen for the whole area Hellinga/Treffers and Polgár. The houses are of the same size as, and similar to, their neighbours. Het Punt was finished in 1985 and again is rented from a housing association with a management agreement. Proposed new occupants are taken from the local authority waiting list if they state a preference to live there. They are however vetted by existing occupants of the cluster in which the vacancy occurs.

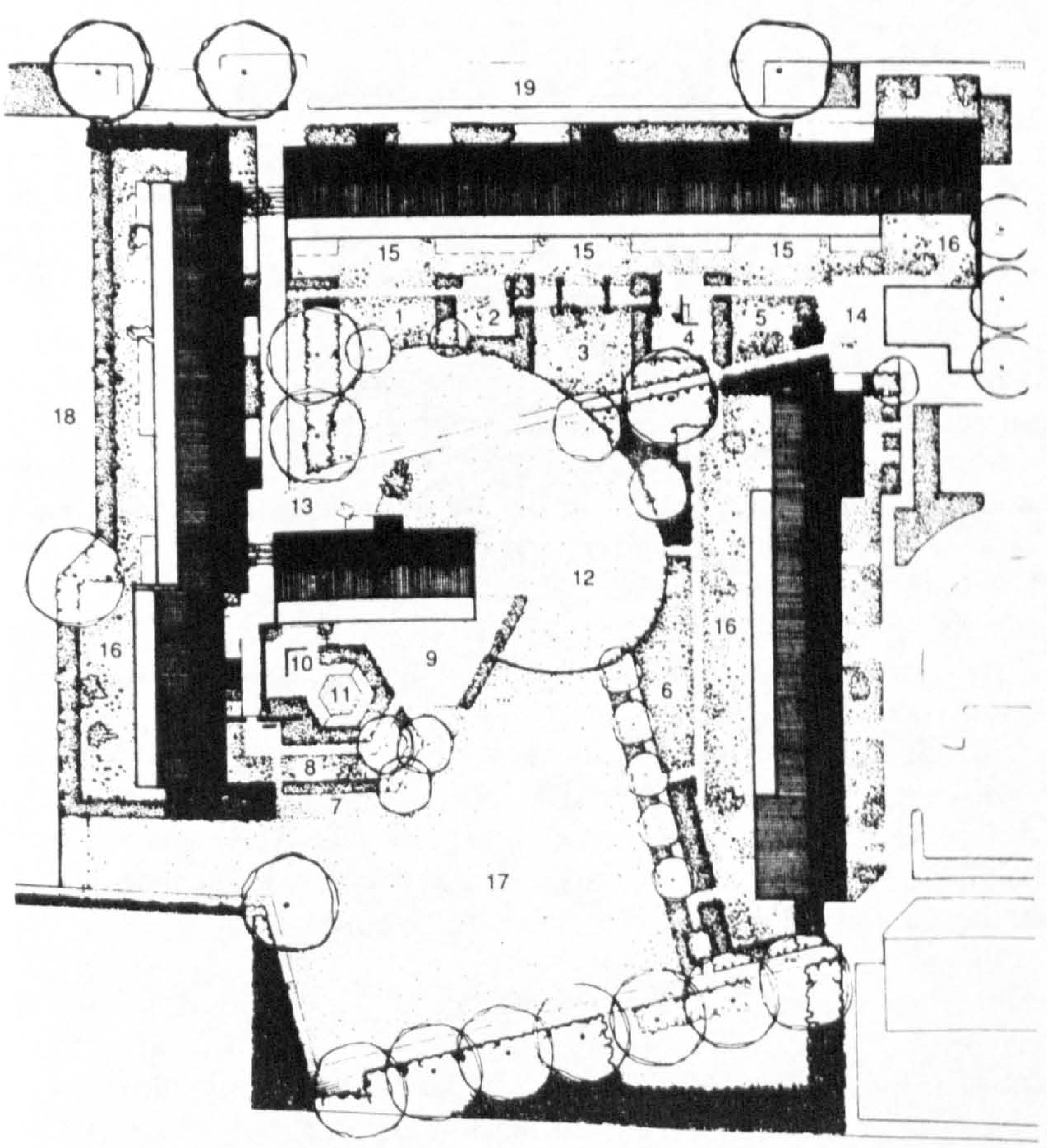
---

117 ibid.



Het Punt, Wageningen, has three clusters, three group residences, and twenty-one independent residences with four rooms in the common house for troubled teenagers. *(René Siemens)*

1. Common house; 2. independent apartments; 3. closed cluster apartments; 4. row houses; 5. bicycle storage.



1-8. Flexible gardens
1. Children's garden
2. Rabbit and chicken pen
3. Swings
4. Sandbox
5. Picnic tables
6. Flower garden
7. Compost area
8. Botanical garden
9. Common house patio
10. Child care play area
11. Sandbox
12. Grass oval
13. Common house square
14. Bicycle repair area
15. Cluster garden
16. Private garden
17. Municipal green (accessible to public)
18. Water canal
19. Parking area off of public street

Fig. 9.22. Het Punt: site axonometric and plan[118]

[118] Dorit Fromm, *Collaborative communities: Cohousing, Central Living, and Other New Forms of Housing with Shared Facilities*, Van Nostrand Reinhold, 1991. p56 and p223

Het Punt incorporates three types of living arrangements - three closed clusters, 22 independent dwellings that share one common kitchen and three group dwellings with shared kitchens. This provides scope for a variety of occupations. The closed clusters are in the three storey apartment building along the main street. They are occupied by predominantly single people and single parents. Each cluster contains six households around a common stair and ground level kitchen and dining area. They all have different arrangements for use of the common kitchen. The independent dwellings are in the form of apartments and row houses and make primary use of the common house through eating groups. The group dwellings occupy five bedroom row houses and one apartment. Each member has a private bedroom but shares the kitchen and living rooms. There are also four rooms over the common house for [problem] teenagers. A special committee oversees teenagers and receives a stipend from the city.

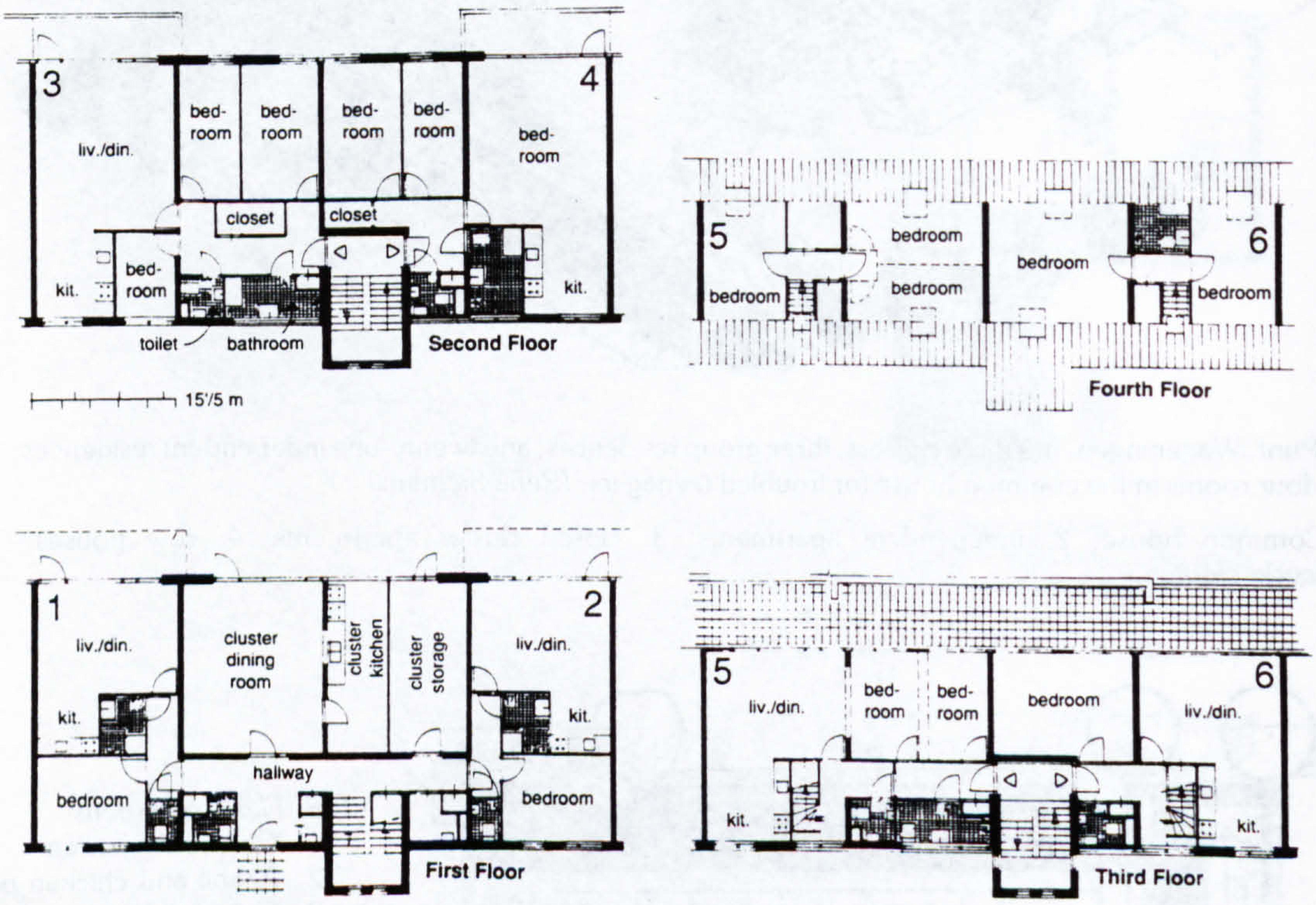


Fig. 9.23. Het Punt: Cluster Floor Plans[119]

The crèche (twelve children maximum) located in the community house at the centre of the scheme is open for children of the whole neighbourhood although first priority is given to the co-housing community. At present 50% of the children are from the co-housing group. The crèche is run by one paid member of staff, volunteer parents and other members. Beatrice Kesler a founder member of the group argues that this enables people without children to get involved if they wish and that this has proved successful. The common house also contains a workshop/studio for people who want to start 'an activity'. The rent for the studio space is subsidised by the group for two to three years and then reviewed. There is also a workshop in the corner of the site for everyone to use that was a hive of activity on my visit.

The play areas close to the houses is for small children while further from the buildings a football and basketball pitch are provided for the use of the larger community. The location of this area was agreed by the community and the co-housing group. Its location is of benefit to both parties. One resident described the scheme as a 'paradise for children'. The community also organise a music festival on this land each year for the larger community. Again the attempts not to become an isolated group is clear.

Tenants can and do move within the community. In addition apartments are flexibly designed. In effect, they have two front doors and between them one or several rooms allowing for various uses. One wall within the apartment is easily movable. The group obtained a waver from the local authority allowing some (specified) alterations to units to be made without applying permission. Beatrice Kesler describes how despite this several people moved out after a few years due to the lack of room after having families.[120] Beatrice Kesler has written an English summary of her book describing the scheme in *Open Building International.*

---

[119] Dorit Fromm, *Collaborative communities: Cohousing, Central Living, and Other New Forms of Housing with Shared Facilities*, Van Nostrand Reinhold, 1991. p244
[120] Beatrice Kesler, interview, Het Punt, Wageningen, August 1993.

Fig. 9.24. Buziaustraat: from the communal Garden

Buziaustraat
Finished in 1992 Buziaustraat is five minutes walk from Het Punt and inspired by it. The member of the group I spoke to proudly proclaimed its similarities and differences. The project consists of one block rising from two to four storeys and forming an angular semicircle facing south around a secure common garden. There are six clusters each arranged around a common staircase. The project includes several energy saving features including solar domestic hot water for each cluster and double low-emissivity Argon filled glazing that faces S±45° from the main living spaces looking over the common garden. Sustainable non-tropical hardwood is also used. The green credentials of the project grew from initial discussions among the group. Apple trees have been planted in a semi circle beyond the private terraces. Chickens and goats are also kept.

The garden is overlooked by all the houses. Notional private but open terraces link the building to the communal garden at ground level. The potential efficient use of space should be noted here (more 'usable' space) compared to the subdivision of semi-detached or detached housing whose private closed gardens are not big enough for many requirements. The density of accommodation is however high and access to the garden immediate. The communal kitchen, dining and meeting rooms are located in the centre of the block on ground floor and open onto a communal terrace onto the garden. Unlike Het Punt there is no organised crèche but there is a communal room for children with shared toys and facilities. Communal stores for each cluster are located at each end of the angled terrace.

Het Groene Dak (Green Roof)
Het Groene Dak located a new project on Simon Bolivarstraat in Utrecht consists of four rows of terraced housing and apartments forming a rectangle around a large communal space. Again notional private yards join the houses to the central space. Allotments are located between the two. At the centre of the communal space is a polygonal grass roofed, straw insulated communal building (eco-building) unfinished at the time I visited that will be used by the surrounding occupants for parties, meetings, individual activities crèche and as an eco-information centre for distribution of information (nb Bookchins revolutionary project discussed in *Chapter One*).

The individual houses differ in their extent of green provision *according to the desire of the occupants*. Solar domestic hot water, sustainable timber, insulation standards to higher than Dutch building regulations, double low-emissivity glazing and condensing boilers are used almost throughout while one house includes compost toilets and a reed bed for sewage treatment. Green provision is not imposed and the particular provisions were decided by the occupants *even in rented houses*. Scope for modification is available and conservatories are now being added to several houses. The scheme mixes rented social housing and owner occupied housing approximately two-thirds to one-third.

Woon Kollektief
Located in Purmerend north of Amsterdam and completed in 1985 Woon Kollektief also mixes owners and renters (42 households rent and 29 are owners). Of the 71 households 35% are couples with children, 35% are singles, 26% are single parents and 4% are couples. The 71 households are divided into ten clusters each with a cluster kitchen. Each cluster is a three storey terraced or 'row' house with its own staircase off which are seven apartments. An interior 'street' runs at ground level along the U shaped terrace connecting all the clusters. The common house at one end guards the entrance to the common garden around which the houses curve. This garden courtyard is open at one end to connect with the rest of the neighbourhood. Inside the common house are pub, kitchen, meeting rooms, day care, laundrette and office spaces. Notice boards are located along the street. The common garden contains children's play area, an outdoor meeting bench around a central tree and communal eating area. The surrounding terrace steps back giving each house a gallery facing the communal garden. Cost savings were made at Purmerend because prospective residents contributed 80 hours of work on construction.

Conclusions
Co-housing demonstrates an extension of the co-operative management and ownership into the sharing of some physical amenities and open space. Like co-operatives they have involved participation in the development, design and in one case the construction of housing. They respond closely to the social ecological brief I have outlined in previous chapters. In moving towards sustainable cities the collaboration and sharing of activities, with the benefits of increased efficiency they offer may play an important role in addition to the benefits of self-help. They extend the advantages of co-operative self-help.

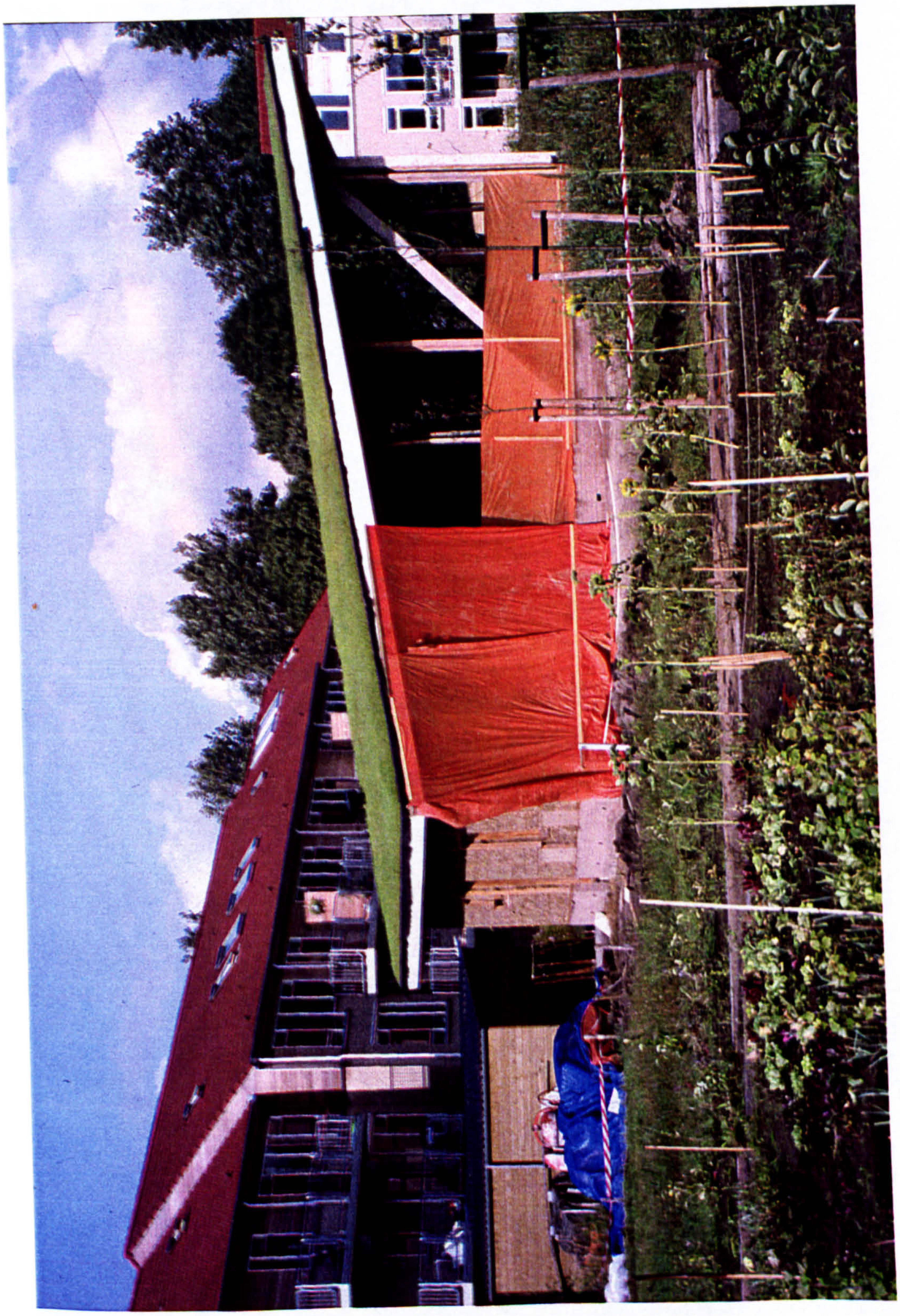


Fig. 9.25. Het Groene Dak: the communal house

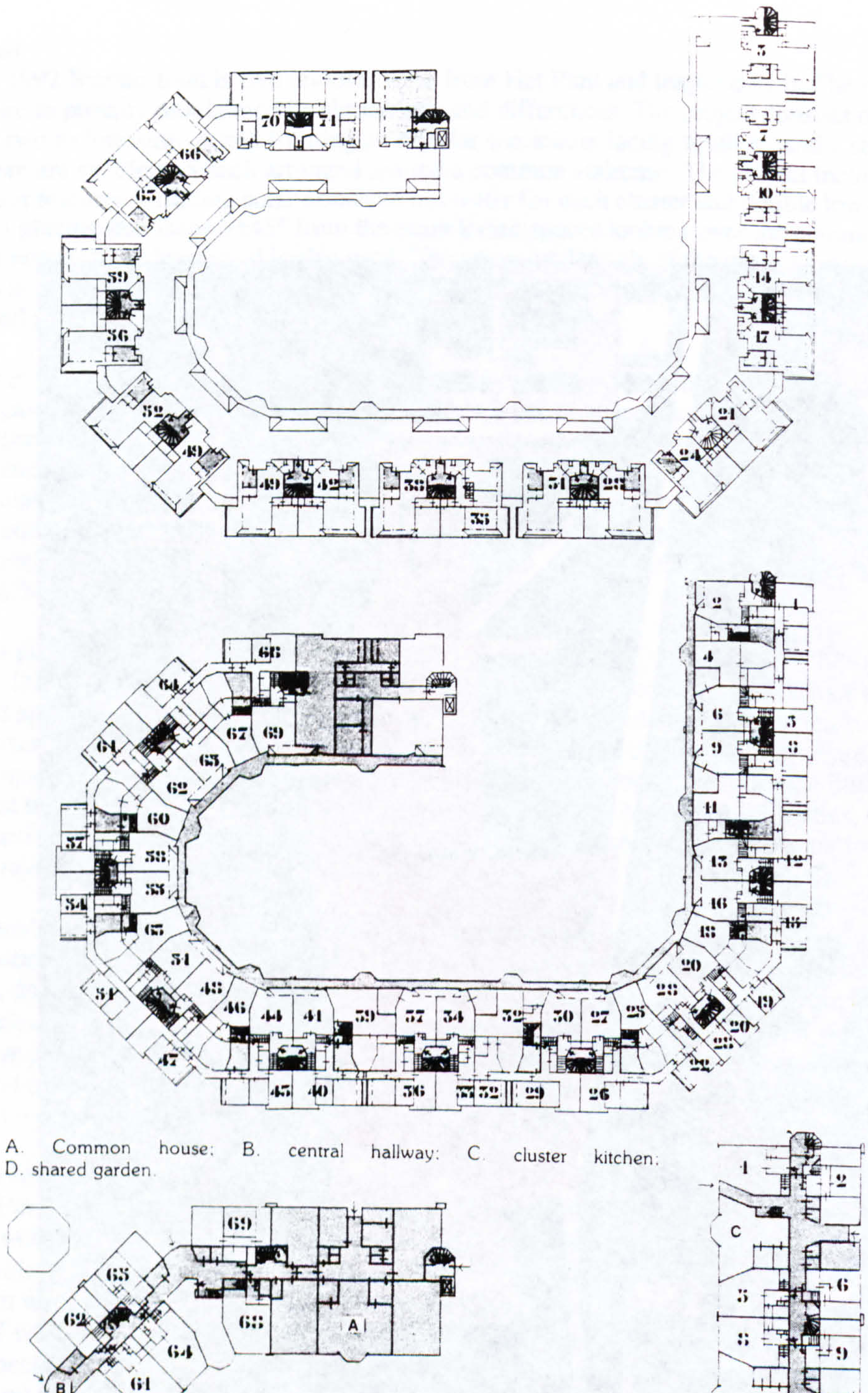


Fig. 9.26. Woon Kollektief: floor plans - dark grey indicates common house and common passageway - light grey indicates cluster kitchen-dining rooms[121]

[121] Dorit Fromm, *Collaborative communities: Cohousing, Central Living, and Other New Forms of Housing with Shared Facilities*, Van Nostrand Reinhold, 1991. p58

Fig. 9.28. Woon Kollektief: from the communal garden

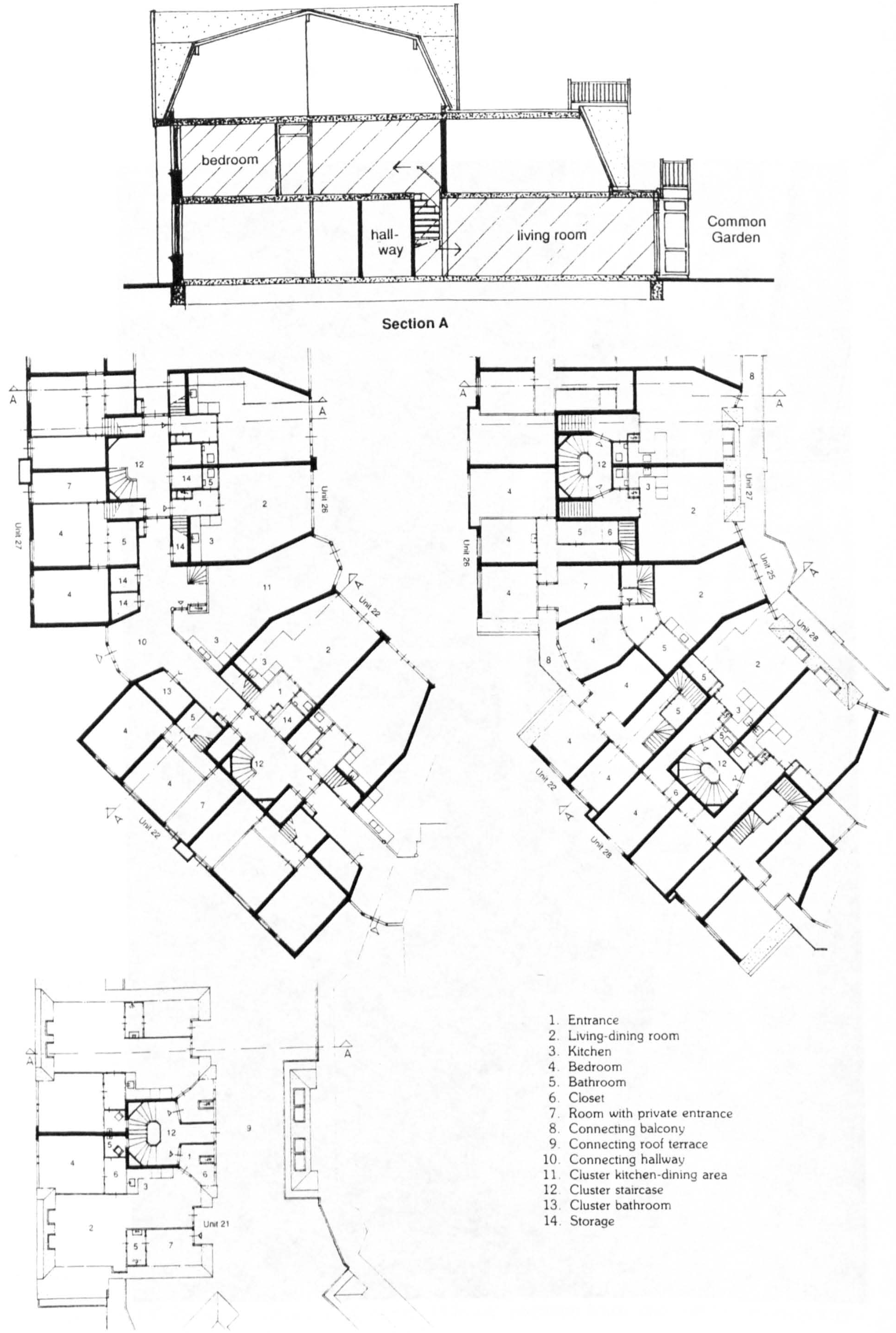


Fig. 9.27. Woon Kollektief: section and floor plan[122]

[122] Dorit Fromm, *Collaborative communities: Cohousing, Central Living, and Other New Forms of Housing with Shared Facilities*, Van Nostrand Reinhold, 1991. pp 245-247

Green advantages include the possibility of increased density and more usable external space, potential to exploit mutual warmth, passive solar design and district heating, potential of solar domestic hot water and shared facilities such as toys, workshop, gardening and transport. Scope is also available for efficient recycling, grey water use in shared laundrettes and water recycling in communal gardens. The potential of home based working (reducing daily commuting) is provided without the associated isolation. Those living in a central living project can benefit from shared knowledge and skills of how to maintain and modify their houses. Such projects provide a potential base to acknowledge the economic features of domestic life, the denial of which, I have argued has been one reason for housing failures. In moving towards sustainable cities the idea of cohousing as a development of co-operatives clearly deserves attention. *Dutch Co-housing is the closest 'architectural' expression of the social ecological city. Experiments with supports have been less formal than SAR and involved group design of a support.*

Conclusions

Above I have described several participative methods that responded to different specific contexts varying with lifesyle preference, financing and tenure, group organisation and degree of self-help. One predominant feature in construction was the notion of variations within a theme to utilise the benefits of standardisation with individual adaption.

Environmental Benefits Related to Participative Methods

Several themes can be isolated to develop the environmental benefits of participation:

- pedagogic notions of participation and the success of participative 'regeneration' in it's own right;
- knowledge gained by participants of the building process and thus their increased ability to maintain their housing and local environment;
- the linked issue of the adaptability of many of the resulting forms so that they can be easily modified with changing needs;
- the ability of architect and user to increase 'fit' of the housing to the occupants and the potential energy efficiency (and other environmental) developments of such a notion;
- the ability of an architect working with a group to develop co-ordinated site strategies (with individual variation) that would allow development of 'on cost' energy saving measures and appropriate introduction of further measures if finance was available or pay-back periods acceptable;
- the potential development of co-operative developments into co-housing and the potential design of co-housing supports.

From a social ecological point of view however it is the control given to residents and the development of self-reliant communities that is important. Participative design clearly aids the transference of control.

Freedom within Restrictions

All attempts at self-help and participation are compromises at some level between 'freedom' for the user and imposition by the architect, sponsor and appropriate regulatory bodies. This is usually based on the resource input of the participants and resource bodies. Turner describes complete freedom as being able to squat, if it meets the particular housing needs of those concerned at that time (e.g. location to suit particular possibility of a job). The closest examples of such instances are the shanty towns of many cities in the developing world. Such developments are however limited by resources. In the UK housing subsidy is available for most with stipulations of certain standards, rents and locations. The option to build illegally on *spare* land as in developing countries is not open (except squats and cardboard cities). Both individual and group self-help housing need external assistance in terms of both financial and human resources. Even those building for owner occupation usually require a mortgage and some professional human resources. Freedom exists within these limits. Questions remain as to possible flexibility within these limits, the role of the architect in empowering the user and the potential of introducing green specifications (that can increase self-reliance) without further reducing freedom.

Clearly not the least of these 'resources', and perhaps critical in an environmental sense, is knowledge of *design and construction*. I have described participative design as one stage of the development process following the proposal and organisation of the group. It has however important connotations for construction, maintenance and management, cost, adaptability, energy efficiency, self-expression and 'fit'. Careful attention to the design process can maximise user control *by reducing costs and achieving 'fit' within limits imposed. While self-help, user controlled or co-operatively owned schemes do not necessarily involve participatory design enabling architectural services are important if people are to fully control their own environments.* Neither does this preclude the architect suggesting design ideas.

Individual and Social Spheres
Two basic, interrelated divisions of control can be distinguished. The first involves the general division of control over the resources needed for the housing process and the second deals with the more specific role of the architect in designing houses with the user or user group. The second contrasts complete liquidation of the architect with the participation of both users and architects in the generation of buildings on an equal and creative level. More generally the first of these points can be used to describe the role of resource bodies in funding the housing process and thus the control demanded, the later, the role of the architect in facilitating construction and design. Both challenge the notion of buildings made solely by the users through self-help processes. The former appreciates that resources must usually be made available to facilitate self-help and that the resource body will demand control in proportion, the second deals with the idea that while people may best 'know what they want', in a specialised society the architects has a role to play in informing people of possibilities, meeting standards, ensuring economy and increasing energy efficiency. The architect user relationship will also affect resources used.

Housing then, usually exists somewhere between the individual and social spheres of operation both architecturally and in terms of control. The individual self-help described tends towards the former (in terms of control of resources and design) while the co-operative self-help described tends to the later. In a co-operative self-help scheme the social sphere includes central government (regulations), the local authority or housing association, the professionals who provide essential resources or other sponsors who may initiate the scheme. *Another level of control however - the co-operative or group is established.*

The Architects Role
The problem with all participative design methods is to enable users to successfully complete their house (within restriction) while maximising 'fit'. Relying on the perceived norms of the users in design may well have the effect of reducing the 'fit' that participation tries to achieve since in a specialised society these norms are restrictive. In addition the user may not be able to complete the building within the conditions of the social sphere. The architect then plays a role of mediator between individual and social. *Technically based information on energy efficiency that will reduce running costs may also increase user freedom particularly if measures can be included on cost or connected to a pay-back period for which a grant may reasonably be given by the social sphere. Such initiatives would require appropriately qualified architects.*

Geoffrey Broadbent describes a hidden agenda beneath *participative design* used to manipulate users by the architect.[123] This will always be an accusation and one response is that architects should play as small a role as possible. Alternatively however what we want is clearly based on experience. There is a need for the architect to introduce ideas since our horizons of expectation are limited by what we know. It is "insulting to the people one is trying to help to keep from them conjectures as to what might be possible".[124] In Bookchins terms the architect can be seen as a specialist advising the Polis if the community are in control of the resources. In terms of the revolutionary project of social ecology however Bookchin has noted that what people do not do for themselves they will never control.

Many of the initiatives above involved pre-determined systems. Again these are developed to increase freedom by reducing costs and facilitating design and construction while also maximising flexibility so that occupants can develop appropriate and individual designs. *The architect's role here is to facilitate these variations*. The use and development of the Segal system is a clear example of how such a system can stimulate design. Kroll has shown the huge variety possible within standard structural systems. It can be argued that for most they are only possible with restrictions.

Resources and Design
Various methodologies have been developed to enable people to effectively take part in the design process while meeting technical requirements, standards and costs specified by resource bodies and regulations. In assessing the effectiveness of various methods a complex argument develops between, resources used, individual creativity (architect and user relationship), meeting user need within resource framework, control in terms of ownership, adaptability, the extent of the pedagogic notion of participation, at what scale participation is best encouraged.

Observations from the last two chapters show that effective local control is achieved only through officially constituted resident groups. Ideally ownership will be at a co-operative level. This is true for

---

123 Geoffrey Broadbent, 'Commentary on Lycee David', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
124 Geoffrey Broadbent, 'A Last Word', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

lower income groups seeking government subsidy, but may also be true for self-funding groups. Clearly non-equity co-operatives are unrealistic for potential home owners who invest in a home for material gain. As noted however co-operatives have other forms and advantages.

Given constitution of a group there are then various means of developing appropriate designs within resource constraints. The Segal system provides a flexible constructional system utilising off-the-shelf materials. Sweat and enterprise equity can be added to the economy of the system. SAR supports divide the constructional process into two. This is particularly relevant to producing adaptable forms and addressing those who do not wish to or cannot involve themselves too deeply in self-help. Participative design methods of various types involve less formal methods. They deal with a *known group of residents who can be consulted about the site planning and then individually*. This enables variations on a specific site and community support. The group decides democratically and controls the admittedly limited resources. The solar development of such a technique originating from site analysis and variety of residents should be noted.

It can be noted that any green developments must be built on the back of specifically developed supports addressed to specific groups.

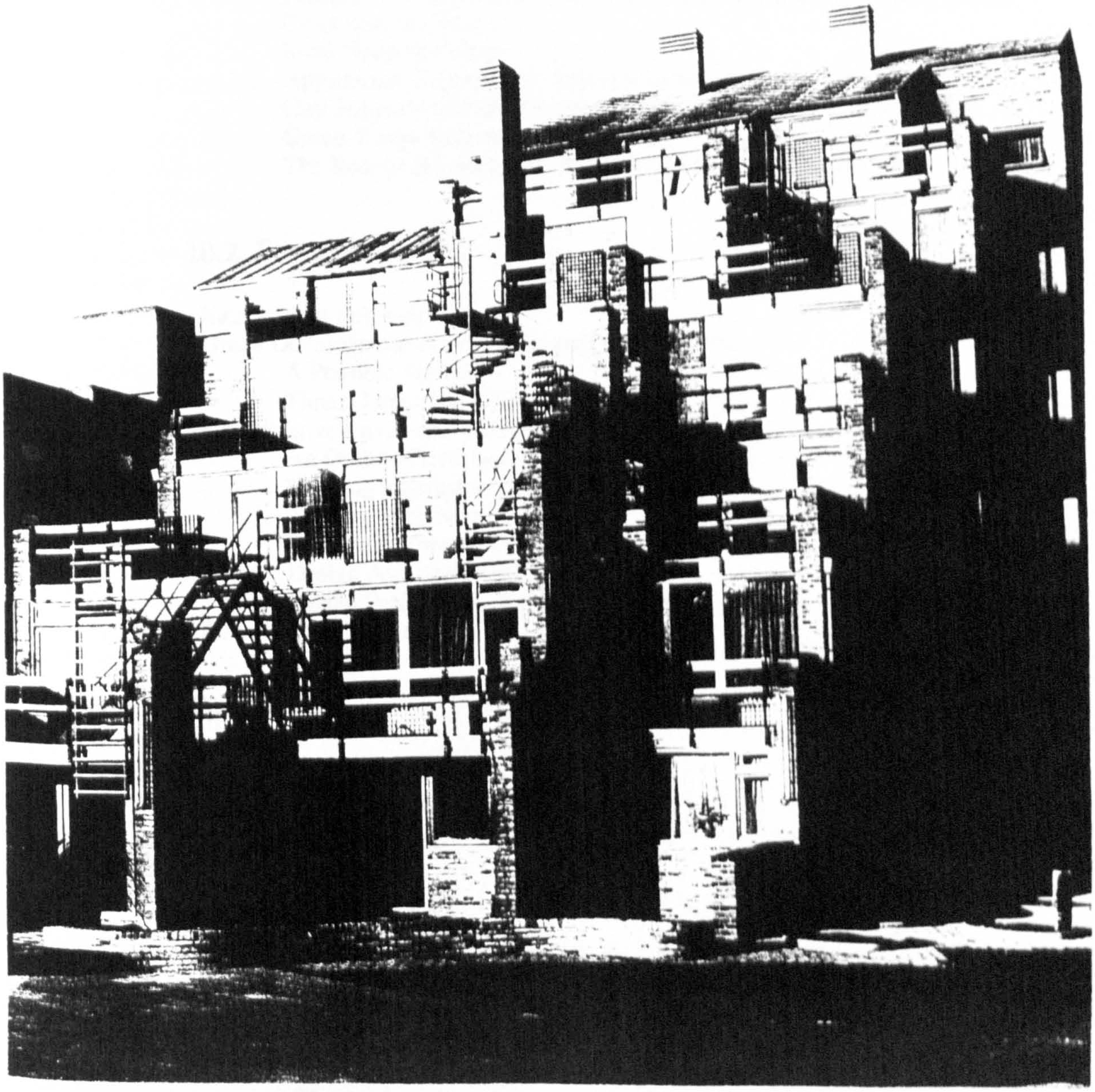


Fig. 9..29. L'Université Catholique de Louvain, Zone Sociale, Brussels

BLANK IN ORIGINAL

Chapter Ten:

Conclusions

10.1. Theory of Social Ecological Support

Remaking Society

My initial aim in approaching this thesis was to develop, from a city-wide perspective, a brief or 'design guide' for environmental architecture. A critical review of the global environmental debate however revealed numerous criticisms of such an apolitical or environmental approach operating within our growth economy even if it addressed the efficiency of the city as a whole. For radical greens, creating a sustainable society involves remaking society according to a different political, social and economic logic. It generally involves reducing western consumption and creating steady state economies at those levels. For social ecologists creating an ecological society cannot be separated from creating an anarchist one. The fundamental libertarian precept that every normal human being is competent to manage the affairs of society and, more specifically the community in which he or she is a member becomes an ecological one. For social ecologists exploitation has its roots in human domination of human that has culminated in capitalism, abstract labour and our growth ethic. Technologies cannot green a hierarchical society but *certain technologies can play a part in moving towards a non-hierarchical and therefore sustainable society.*

From a social ecological perspective then, environmental action must go beyond the implementation of efficient technologies within our present capitalist systems. Ultimately we must address hierarchical structures of human domination that are *psychological, cultural and social.* We must move towards political, economic, productive and social self-reliance to break down hierarchical attitudes and de-marketise social relations. We must bring an end to the private ownership of the planet. We must move towards mixed use, more politically and productively self-reliant settlements and more politically, productively and creatively self-reliant individuals. Social ecology proposes a revolutionary project based on historical anarchism. This raises the issue of whether architects and planners can contribute to such a radical agenda. In this thesis I emphasise the similarities between the social ecological and environmental projects that enable a radical agenda to be addressed. I also however develop practical social and environmental benefits of self-reliant architectural initiatives at various scales so that my critique is not purely based on a radical agenda. I suggest that the architects critical role is developing the relationship between the user and their environment. The architectural brief is no longer purely one of efficiency of buildings or cities and is not quantitative.

Other Benefits of Self-reliance

From less ideological or environmental perspectives my review of global trade and specialisation in *Chapter One* and my review of environmental city techniques in chapters two to six showed that greater national, regional and local self-reliance has numerous benefits in terms of environmental efficiency. These included: reduced global swapping of goods; encouragement of technological efficiency; the efficient spatial arrangement of mixed use cities with a more direct connection to their productive hinterland based on city self-reliance; and potential energy benefits of mixed use form. In terms of political decentralisation and participative process potential benefits might include the increased environmental knowledge of communities; the management efficiency of requisite variety; increased environmental responsibility; improved control of environmental architectural systems; and longevity and fit of projects that are controlled locally. In *Chapter Seven* I also observed that development of increased self-reliance in some of our existing cities has had social and economic benefits within today's context in line with requirements of sustainable development. Self-help processes have responded to problems of increasingly powerless communities. Finally increased self-help process will be important in implementation of environmental measures if they are to be effective and not further disempower. Many of the practical benefits described are recognised by the European Commission's concept of 'subsidiarity' (decision making at the lowest 'appropriate' level).[1] Subsidiarity will increase support for, and applicability or fit of, environmental measures or non-environmental measures.

Architectural Process and Form for Self-reliance

• Process for Self-reliance

Architecture, landscape and city planning are critical disciplines within which to address notions of empowerment particularly at the local level of living and working environments. Self-help initiatives in local environmental process (planning, food growing parks and local landscape, etc.) and particularly housing production are important in encouraging greater political, productive and creative self-reliance generally. Social ecological housing, then, cannot be based on the same *process* as housing today but should be based on more participative techniques and attempt to increase local control and creative

---

[1] Michael Breheny and Ralph Rookwood, 'Planning for the Sustainable City Region, in Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993. p184

localised design. I have noted how increased self-help or participative design in housing are also of particular importance with respect to environmental efficiency of housing projects. It should be noted that the revolutionary project of social ecology extends the applicability of self-help from low income to all housing while environmental efficiency also demands a general increase in participation. *Here, for both environmental and social ecological reasons, I suggest the development of structures that will increase self-help and participation in housing process generally.* Efforts should also be made to extend participative democracy to larger scale planning through mechanisms that confederate local groups.

• Technologies for Self-reliance
It should be noted that control can be given to people beyond the housing production process through introduction of certain environmental technologies. Some technologies which increase local control are also transparent in that they communicate process. Reed beds, for example, mean that processing is visible. These technologies increase efficiency, communicate process and enable local control and thus provide a basis for participative democracy. Settlement forms are also essential to increased local control in terms of spatial arrangement and mixed use forms can thus be seen as a social ecological technology (biotic). Such forms also increase transparency of process. *Development of appropriate 'ownership' patterns and mechanisms of community association will be important in encouraging these forms.* Improved environmental 'regulations' in the 'social sphere' could *require* some of the following social ecological techniques for *environmental efficiency*:

• Permaculture that, preferably considered at a community level along with microclimate consideration and design, can also bring some food production into the city in a realistic way and utilise the cities resources;
• climatic and low energy design that also brings into local and personal control the ability to partially heat houses and communicates process;
• local energy production systems that can provide auxiliary heating and can be confederated at the city or neighbourhood level;
• water and waste recycling that brings into local and personal direct control water provision and use of resources of waste (again best on a community level of local interdependence);
• water collection that measures can reduce use of metered water supplies;
• defragmentation that brings production of goods and services under local control (*mixed use facilitating spatial arrangement*) and makes the city more transparent;
• flexible regional environmental regulations that allow different targets depending on the specifics of the project.

I have outlined forms, processes and technologies that will architecturally enable greater self-reliance. A critical problem is that people may not want empowering in these terms. Clearly environmentalists can impose an environmental framework. For social ecologists however political empowerment is critical and personal limits to material growth will be the ultimate outcome even if political empowering may not necessarily increase environmental responsibility generally today. More practically however all these initiatives can be encouraged by developing the benefits they have for people today.

Here to There
For social ecologists the revolutionary process cannot be separated from the goal: libertarian means are essential to libertarian ends. This infers not a seizure of power but dissolution.[2] Dissolving power involves re-empowering the individual to control their own life. Bookchin accepts that a long period of enlightenment is required. The revolutionary project is a slow and uncertain one. Between 'here' and 'there' lies an indefinable zone of highly complex transitions, one that involves the development of a new *sensibility* as well as new *politic* but "what people cannot shape for themselves they will never control".[3] The anarchist revolutionary project is thus one of continually pressing against society in search of its weak points and trying to open areas that would make revolutionary change possible. I noted in *Chapter One* how this is a problem in terms of theoretical limits to growth to existing capitalist systems.

The revolutionary project of social ecology implies addressing the West as a 'post-scarcity' society. It must address itself to present systems and attempt to build on appropriate existing initiatives. There is a need for effective education and agitators to provoke and demonstrate the local benefits of such initiatives and promote movement to greater self-reliance. Such issues form the basis of applications suggested here. Having discussed appropriate technologies in chapters two to six I went on in chapters seven, eight and nine to describe processes that most closely approximate the social ecological project in terms of the process of producing built environment. These initiatives tackle the complexities of the existing city and

---

2 Peter Marshall, *Demanding the Impossible*, Fontana Press, London, 1993. p615
3 Murray Bookchin, *Remaking Society*, Black Rose Books, Montréal, 1989. p196

aid devolution of power to the local level. Bookchin notes the need to develop on the 'objective benefits' of such initiatives.[4] There is a need to promote:

• the benefits of self-help housing particularly co-operatives in terms of the potential they offer for control over housing with low internal financial resource input;
• lifestyle and economy benefits of co-operatives, grouped self-help and co-housing generally;
• the energy saving benefits and financial benefits of environmental techniques;

Increasing self-help in housing demands systems that facilitate its introduction within a specialised society. This means developing systems that, for example, enable partial self-help. Preferably these will be within an environmental context. Clearly governments will tend to oppose developments of direct democracy. By developing the environmental benefits of greater self-help, communal action, transparent technologies and mixed use form however top down support may be realistic.

Architectural Supports for Self-help - Variations on a Theme
As noted in chapters eight and nine optimal self-help processes balance resources in terms of finance and skills with developing housing that meets residents needs. Clearly however meeting individual needs depends on economy that is often the reason for self-help. *Variations on a theme is characteristic of most of the methods described to maintain flexibility with the resource benefits of standardisation:*

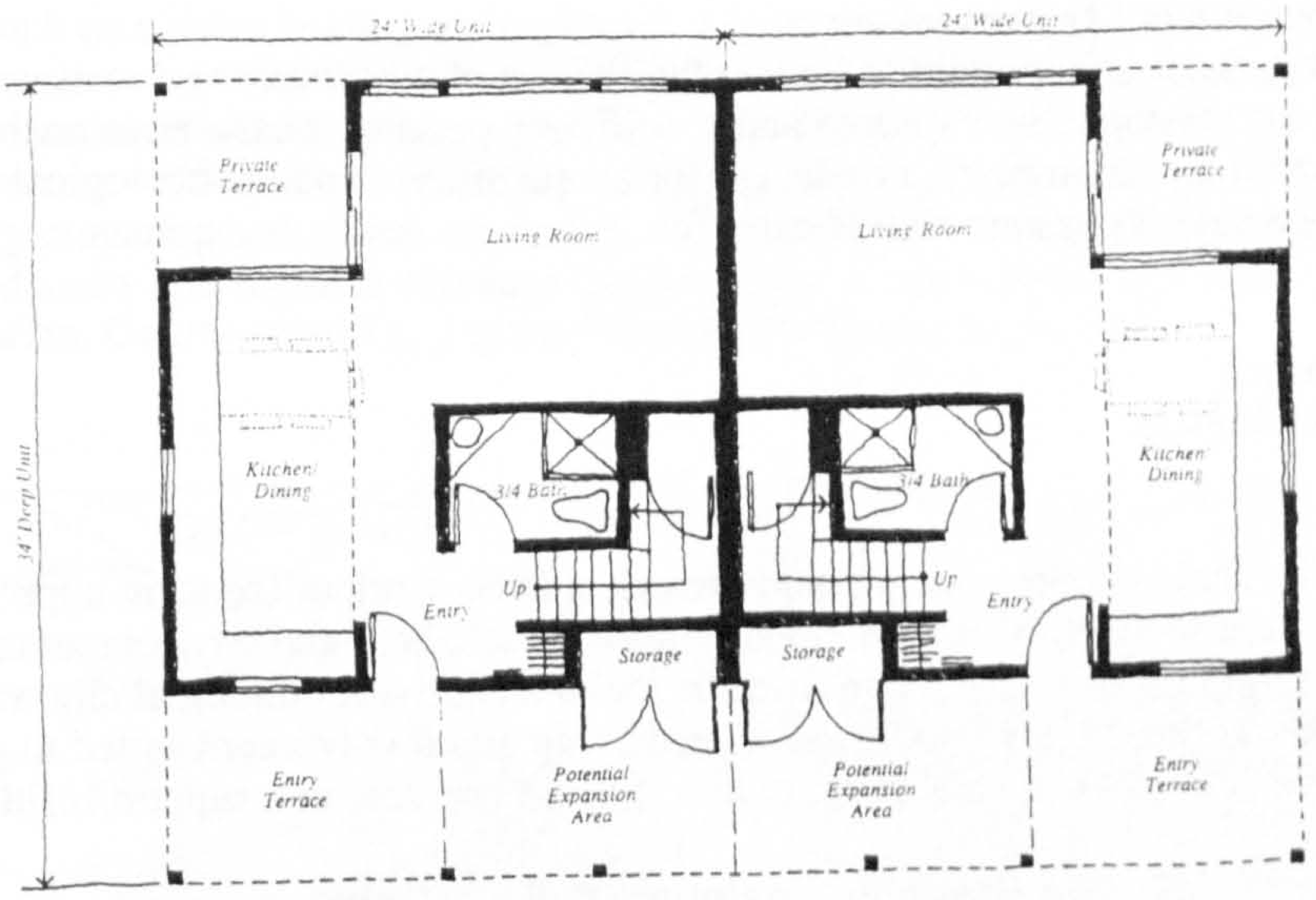
• The Segal system designed for self-build simplifies the building system while enabling variation in form and plans within an economic cost controlled system. Alterations of basic constructional forms are possible. At Lewisham individual modifications were designed but the number limited by resource bodies for subsidised housing.
• The SkillBuilding system is less simple than the Segal system since it is designed to involve contractors for some of the building with participant training and gradual take-over of the process. It thus has for example strip foundations that enables brick cladding and precast concrete ground floor elements. Again form and plans can vary within limitations of the timber framed walling system and cost. Critically the process is the same for each house despite form differences.
• SAR supports also balance economy and personal choice. The self-help component is much reduced involving participative design of variations within a physical framework. The framework built by contractors has benefits of potential density and storage mass over the timber framed forms. Timber frames are however suitable to self-build and potentially our most benign construction form.

The Segal System and SkillBuilding are predetermined self-build systems and enable limited group adaption for specific sites. Adelaide Road, Papendrecht and Diagoon, involved no group level negotiation but were site specific with consequent potential environmental advantages. The later was privately developed as flexible but architect designed housing. Some constructions discussed were developed with known groups of users participating from the start. While not using predetermined systems the groups developed common forms around which variation took place. These included:

• Contractor built co-housing schemes involving design participation with a group have often developed standard 'cores' around which flexibility can occur (see *Fig. 10.1.*) - variations for each house are developed to suit individual preferences (also contractor built). Possibility for future extensions are often accommodated in each plan and construction. Wageningen as rented ownership was contractor built to designs developed through group participation in developing unit types with slight flexibility only in movable wall designations.
• Liverpool co-operatives achieved variations within standard constructions developed for each project and site. The potential for extendibility was often catered for.
• The Netherspring group (self-build building co-operative) developed two basic cores with slight variations as to each basic core. Some considerable variations were later facilitated by the timber 'infill'. An element of the construction was brick on strip foundations to provide mass. The timber elements were built first to achieve quick cover for participants. The group also enabled a sharing of work and skills for foundations, pre-cast concrete suspended floor and brick laying.

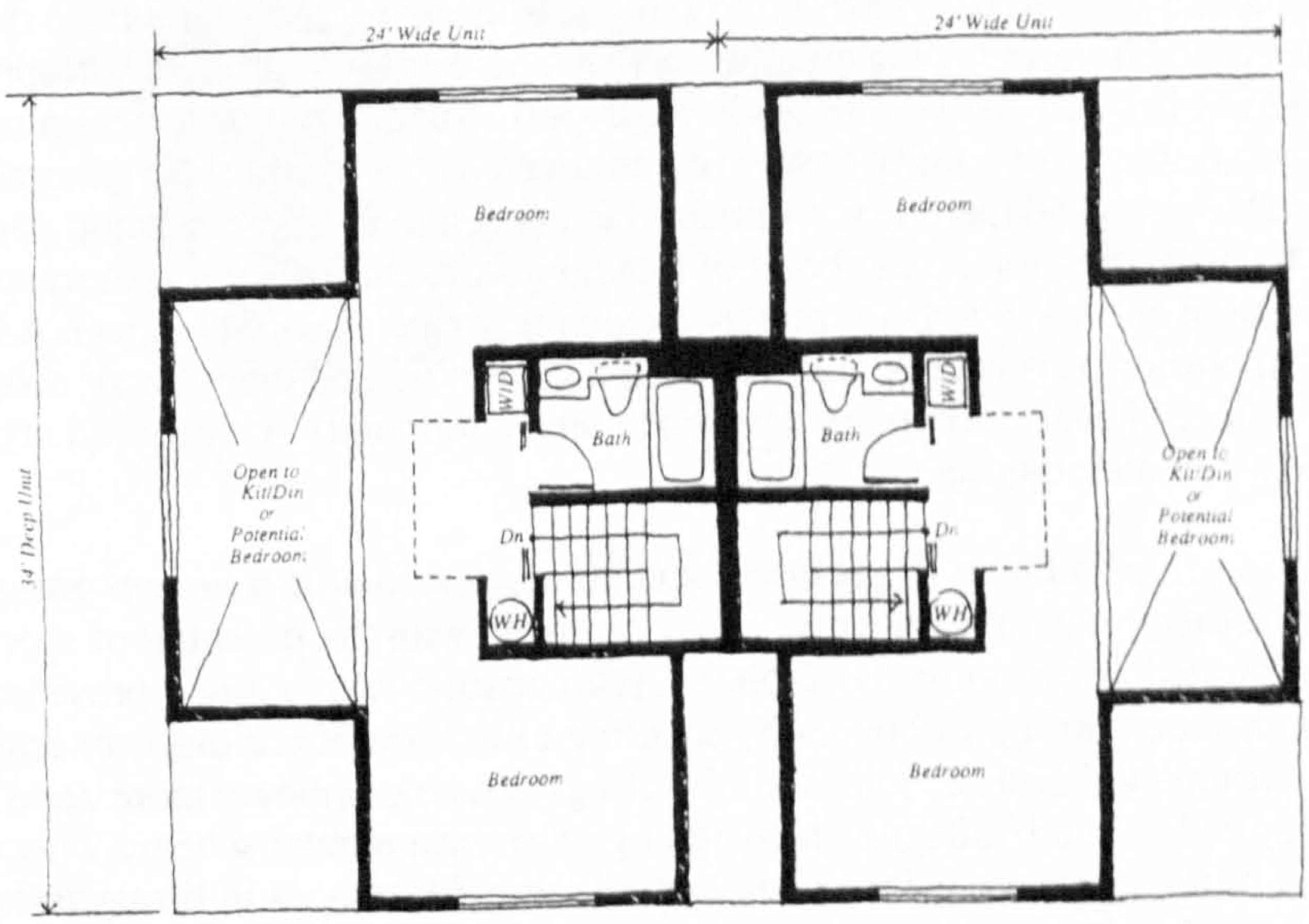
•

[4] ibid. p184



Lower Level Plan Basic Core: Kitchen/Dining Living Stair / 3/4 Bath

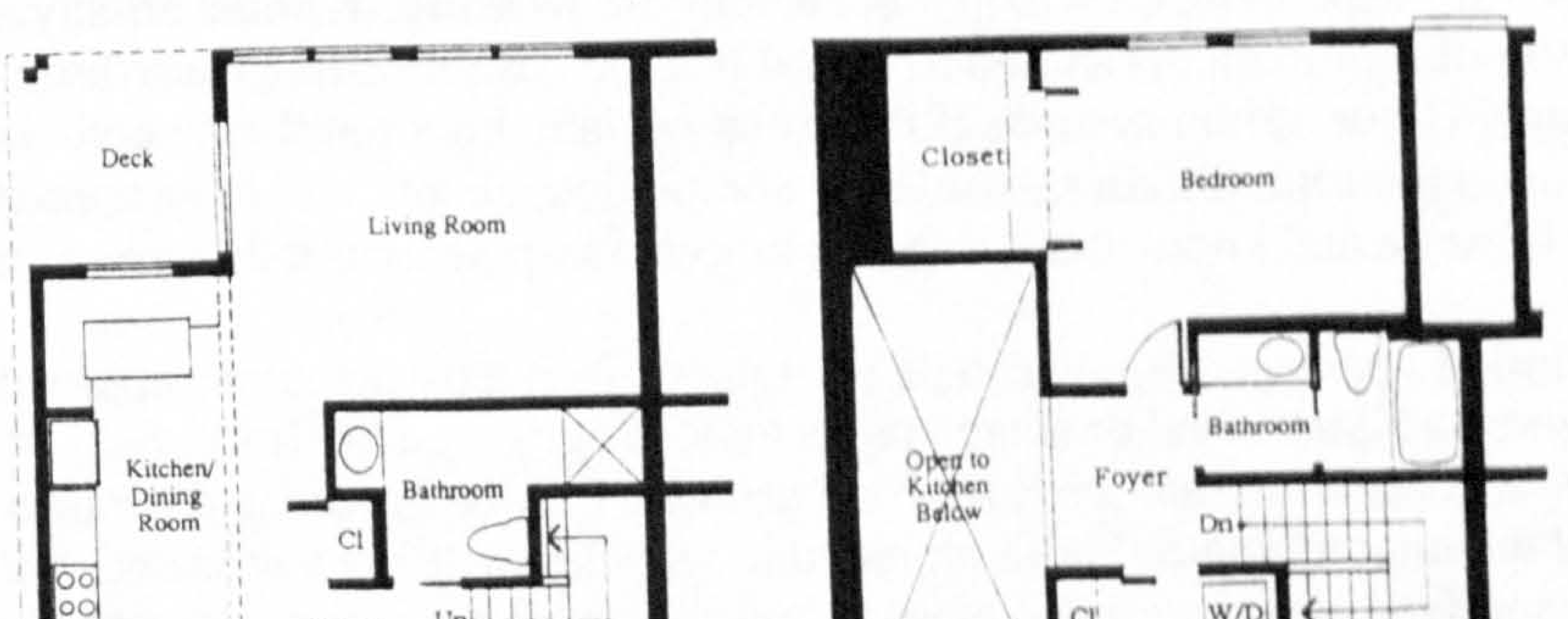
1/4"=1'-0"



Upper Level Plan Basic Core: Stair/Bath Potential Bedrooms

1/4"=1'-0"

Three-bedroom unit.



LOWER FLOOR UPPER FLOOR

Fig. 10.1. Winslow Co-housing plans[5]

---

[5] Dorit Fromm, *Collaborative Communities*, Van Nostrand Reinhold, 1991.

Facilitation of Environmental Improvements
In the context of this thesis it is important to look at facilitation of environmental measures while allowing freedom of expression to be explored and specifically gearing measures to occupancy and lifestyle for efficiency. It is also important to design for adaptability. A social ecological support thus adds variables so that a support system should cater for:

- user variations;
- financial resource needs;
- environmental technologies;
- adaptability.

A social ecological physical support system could provide a framework of the most appropriate materials and constructional system to meet this balance. Facilitation of self-help and environmental improvements can however be structural or not. It will range from financial incentives, municipal city wide participative initiatives and methods. It should develop forms of ownership and involvement suited to group and individual participative design, group and individual self-build or a role in a support/infill system.

Potential of Design with a 'Known Group' in Environmental Self-help
It is important to stress the social, environmental and social ecological benefits of group participation in housing even if the group is not formerly constituted (e.g. a co-operative). The potential of design with a known group of users and a site can be compared to individual designs, speculative site designed supports (as SAR) and predetermined if variable construction systems (as Segal) in group developments. Critically group development adds a level of decision making. A support structure or construction method based on a known group and site enables community design of certain elements to suit their general needs and allows individual variability and adaptability. Compared to speculative supports group participation increases the potential for negotiation on the basis of mutual needs, abilities and resources. It balances the potential of standardisation and variations (although it requires greater architect input). A site and community specific support or constructional system can increase 'fit' and diversity of solution while allowing for possible future changes. Supports developed on a community scale would create a more diverse housing stock while maintaining flexibility.

As noted in chapters four, five and nine in environmental terms design with a known group has further benefits (for example Netherspring and Buziaustraat). Compared with the potential of speculative low energy estates, even designed as uncompleted supports, participation with a group provides scope for a non rigidly ranked south-facing group of houses by enabling utilisation of various user requirements for sunlight and other environmental criteria. Different dwellings can be combined more appropriately on sites for 'on cost' energy efficient advantages. In designing an environmental scheme without group involvement of owners or tenants there is less chance of utilising differences in lifestyles and combining these with the specifics of the site. The tendency will be for all houses to have similar aspects and any site specific benefits will be reduced. Clearly a Trombe wall system may be suited to certain occupants and conversions while sunspace systems, direct gain systems and high insulation options may be suited to others. This may vary depending on whether occupants are working, at home all day, young, old, or have children. Diversity of requirements should aid good passive design while group discussion may result in adoption of group CHP or atrium systems if more appropriate. Importantly the architect will know more about the clients and their interrelations while, on completion, clients will have appropriate locations and houses for their lifestyle and know more about its low energy potential in the group and individually.

Uses and provision of open space may also be optimised given a participatory approach again based on differing requirements. Communal or shared areas may be agreed and defined away from or adjacent to appropriate houses. Joint or private areas for food growing may be agreed and located where appropriate to occupants and the microclimate. Those prepared to recycle waste via a reed bed system or dry toilets may be grouped and facilities shared. In some co-housing developments mixed use facilities have been developed (as part of the project) by joint agreement with certain users renting these spaces from the co-operative. These may start of as, for example studios, but then change use. Such functions with different daylight demands and time requirements can add to the potential of climatic design. Services for a group of houses agreed by a group such as laundrettes, common workshops, stores can be used to climatically buffer housing. Employment possibilities 'within the scheme' for certain members of the group may be exploited.

Simply then, priorities can be given against 'known' lifestyles and preferences. Group participation will allow for recognition of existing acquaintances (young living above family), joint ventures and shared facilities between the group or parts of it. Acknowledgement of different cultures can also be incorporated. A community support may simply provide, through group participation, inherent restraints to individuals such as a site planning arrangement or extend to a constructional system or core designs. Both could be environmentally determined. The former would not help in the completion of designs but may be appropriate in certain circumstances. Generally the environmental benefits of such designs would involve a community willing to participate in environmental building, having sufficient funds or wishing to reduce energy consumption. Some environmental restraints may however be applied by the social sphere such as density and insulation values (preferably as a limit to non-renewable energy use) prior to group participation. Grants geared to payback may be important incentives.

Fig. 10.2. A Speculative Solar Estate[6]

Co-operative Options
Generally more effective user control over the housing process will be achieved by encouraging more co-operative housing tenure. Today co-operative ownerships are a means by which local control over housing can be increased over owner occupation. Some co-operative ownerships enable access to external resources, since they provide social housing, while enabling local control. Co-operative ownership is also a means of accessing improved housing for variety of income groups. From a social ecological perspective co-operatives should be encouraged not only for those for whom such methods are the only way of acquiring housing but also for those who have the finance to build independently. They would preferably be of a form that would reduce individual equity gain. Non-equity co-operatives are an optimal form of ownership in terms of the social ecological city outlined. Clearly however completely private funded co-operatives (i.e. funded by participants) will not be non-equity. Initiatives then, would advocate non-equity co-operatives where appropriate and develop intermediary forms where non-equity forms are unrealistic. Some alternative variants were noted at the end of *Chapter Eight* including shared ownership without the right to buy, and building co-operatives who come together to build even if they later dissociate to individual ownership. Such initiatives are also potentially our most environmental form of development since as noted they enable group environmental design and promote co-operative self reliance as opposed to individualism.

Ideal Housing Forms
The ideal form of housing for social ecology can be defined as non-equity co-operatively owned co-housing with some shared facilities and a degree of mixed use. A group of users would participate early in the design with an appropriately qualified architect to develop a site strategy that would maximise potential for environmental development of the site. Key issues would include solar gain and shelter and

---

[6] Commission of European Communities, 'Giffard Park', Project Monitor Case Studies: Issue 1, Commission of European Communities, June 1987.

utilising various heating requirements of mixed use and different users to appropriately locate different functions. An appropriate structural form could then be determined to accommodate individual planning and form requirements but allow for economy of standardisation and adaptability around the low energy system (CHP) or systems (passive solar, high insulation, active design) used. The constructional system should also take into account a palette of appropriate materials for the region. Advantages include:

• the potential in terms of low energy design and fit generally of the user client/architect discourse;
• the further low energy and resource benefits of designing with a *group*;
• potential efficiencies of co-housing, for instance, shared laundries may have two washing machines for 30 people);
• efficiency advantages of the mixed use and density achievable;
• non commodification of non equity co-operatives and their democratic control as training grounds for participative democracy and local self-reliance generally.

Some Dutch co-housing schemes approach this optimal form. Promotion of co-housing over suburban and inner city forms would be an important environmental development. Social ecological development would ideally be participative, mixed use, transparent, grouped, co-operative and confederative. Clearly however numerous obstacles stand in the way of such developments although it may be possible to define a notion of 'supports' that will develop *self-help, environmental techniques* and *co-operatives* where appropriate in an existing unfavourable context.

Appropriate Supports for Appropriate Groups
I am concerned here primarily with developing the architect user relationship in creating housing but again cannot ignore finance and ownership that the architect/user relationship affects and is affected by. Increased degrees of participation or self-help for example increase control in terms of skills gained and potential equity share. I have noted how:

• architects can develop techniques to allow people to complete their dwellings successfully, with support in terms of both reducing finance and required skills, while maximising their design input;
• encouragement of co-operative ownership forms enable local control of housing despite limited resources.

From both *environmental and social ecological* perspectives I argue that there is a need to develop a broad notion of 'supports' for self help housing (financial, constructional and regulatory) to facilitate it's uptake. There is also a need to support the introduction of 'biotic' and 'environmental' technologies that are efficient and extend self-reliance, while maintaining control, design and construction inputs of those being housed. Ideally any environmental pro-active self-help application would encourage co-operative developments when possible. Finally there is a need to develop grouped housing forms even if they are not co-operatively owned.

In conclusion there is a need to:

• encourage self-help housing generally for a variety of income groups;
• make self-help accessible 'by degrees' through 'physical supports' for people not willing or unable to develop housing for themselves - complete self-help is not always possible or desirable but more accessible forms may be;
• improve existing environmental performance standards while maintaining scope for personal decision making;
• facilitate introduction of a wider range of environmental techniques (increasing the chance of take-up and fit to requirements of different communities) to self-help and other housing initiatives;
• develop environmental technologies that can facilitate self-help beyond the housing and environment production process - *this includes requirements for mixed use provision*;
• develop optimum forms of self-help processes (constructional and ownership) for social ecological and environmental reasons;
• encourage more grouped and communal housing forms and co-operative ownership in their own right as environmentally efficient and social ecological, and because they facilitate genuine local control today through: financial benefits; potential for sharing of skills and the potential for use complementary requirements in participative environmental design;
• promote confederation;
• encourage the development of co-housing forms;
• promote links between workers and housing co-operatives breaking down the notion of abstract labour.

The problem is simply one of appropriate supports for appropriate types of co-operatives, self-help, biotic technologies or co-housing initiatives building on their particular potentials and appropriateness to different individuals or groups. The situation is complicated since these types are not mutually exclusive.

City Support and Organisational Structures
My argument of the similarity between immediate environmental needs based on subsidiarity and the social ecological project enable me to consider the notion that city level 'supports' can be developed. City level environmental supports should develop city technologies and form that allow for greater self reliance at a variety of scales - neighbourhood, district and city. An example I have referred to is the development of a co-ordinated city forestry strategy. This would involve introduction of some agricultural process in and around the city including limited food production initiatives (utilising city resources) and farmed timber production. A co-ordinated municipal strategy would include forests on the urban fringe, urban trees in squares, pocket parks, provision for allotments and city farms. Such a policy would allow communities or groups developing food production or gardening initiatives to plug-in by for example supplying or using compost or land. Allotments or other land developed municipally could be taken over by co-operatives.

City level supports could recognise in development plans the importance of integrated living, working and leisure environments that; reduce the notion of 'abstract labor', increase the transparency of the city, reduce transport costs and can increase environmental design possibilities. Other support initiatives would include municipal recycling bases and builders yards (again enabling communities to plug-in), information centres in the city, improved and co-ordinated public transport networks, road calming and cycle paths. The type of builders yards suggested by Alexander would be a way of informing and swapping ideas as well as storing appropriate materials, experimenting and exploring techniques and recycling.[7] They would preferably be developed through federation of self-help housing groups and co-operatives with whom municipal authorities should explore the possibilities. 'Green centres' in the city may give environmental technical aid, local climatic data, lists of appropriate building materials for that locality or advice on food production and local initiatives such as LETSystem's. Material selection could then come from locally defined green building materials. A broader initiative would be to extend the notion proposed by Alexander of architect/builders to environmentally qualified architect/builders by developing appropriate courses.[8] It would also be important to develop real co-operative links between architects, landscape architects and planners. These issues are now beginning to be explored by CTAC's.

Green Tissue Support and Negotiation
One important contribution of the SAR development of supports was its extension to planning levels.[9] This may especially be the case in environmental terms. Infrastructure controlled by local government is an area where the social sphere can usefully dictate environmental arrangements while maintaining freedom at lower levels. This involves 'theme' and 'variations' at higher levels than supports. Habraken notes that an infrastructure theme actually increases scope for creativity at a lower level (as Hertzberger argues at lower levels).[10] He uses the cross wall pattern of Amsterdam as an example. A green tissue 'theme' or 'typology' would be 'fine grained', dense mixed use. It would include traffic calmed streets, public transport provision and small local pocket parks. It would be based predominantly around terraced or courtyard housing form of three floors (based on 'UK typology', energy and microclimatic benefits). Regulations such as specifying a degree of mixed provision without specifying the mix would be of benefit.

Green design requires co-operation and communication between groups to increase efficiency. Efficiency of operation also depends on the occupant and architect negotiations at various levels. These suggest the value of inclusion not only of a community decision making level (as in a co-operative) but a tissue level in the form of negotiation between housing groups and co-operatives. The levels of control notion with it rigorous application of participation at various levels is important to environmental implementation (subsidiarity) and democratisation of the design process generally (tending to social ecology). Appropriate regions could be defined in cities from an environmental perspective and participative processes developed to discuss issues as listed at the end of *Chapter Seven*. Environmental surveys and feedback would be a feature of this level.

---

[7] Christopher Alexander et. al.,. *The Production of Houses*, Oxford University Press, 1985.
[8] ibid.
[9] John Carp, 'Twenty Years of SAR', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, 1984. p26
[10] N. J. Habraken, 'The Leaves and the Flowers', *Open House International*, Vol. 15. No. 1. 1990.

The Role of the Architect (Possible Architectural Supports)
As noted in *Chapter Nine* Habraken argues that "Only when individuals can make their own decisions concerning the plan and equipment of their dwelling can the dwelling be expected to truly reflect personal aspiration".[11] Clearly this has environmental consequences in terms of 'fit' and longevity (although adaptability may be more important). The dilemma is how to successfully inspire the occupants to complete *their* homes (finance, skills, time, motivation) without trespassing too far into *their* realm. It should be noted however that peoples horizons and expectations are limited to their experiences and thus there is a clearly defined role for the architect in; suggesting design possibilities, increasing the transparency of the process generally, and maximising resource use. Habraken, Kroll, and Hertzberger have developed the notion that creativity is generated if occupants operate within fixed architect designed support structures. The student self-build scheme in Stuttgart discussed in *Chapter Nine* illustrated the potential of a fixed system to develop and encourage responses and extensions that moved away from the basic system. The system however controlled cost and was as it were a spark to the generation of new forms. There is a critical balance between:

• the benefits of minimum external assistance in housing that are stressed by Turner as important in reducing bureaucratic waste, creating architecturally expansive structures that fit, and increasing localised responsibility and;
• achieving adequate environmental performance (thus empowering), increasing design awareness and options *and meeting resource limitations* that can all be assisted by external input.

External assistance can increase 'freedom' within existing confines. A dialogue between architect and residents will utilise complementary knowledge. Neither is this in opposition to social ecology. Bookchin notes the role of experts in Ecotopia advising the polis who have direct democratic control. The environmental/social ecological architect's role will alter depending of the specifics of a support or self-help project. Two broad potential applications are:

1 - Design of physical supports for sponsor clients such as housing associations or speculative developers. These could allow variations of infill within an architect designed support and an environmental framework. The architect would also have a role in the participatory design of the individual units.

2 - Assist a group who sign to join what could be termed a Co-operative Environmental Self-help (CESH) project. The CESH application would be based around co-operative development of some form. The exact form would vary depending on the groups requirements and resource inputs. Design input would vary but could be:

> • Participative design of physical supports or cores with the group for construction by specialist contractors and participative design with individuals of 'infill' or 'variations' that may be self-built (i.e. as speculative supports but designed with and owned by the community in some form). The co-operative and individual division of control would have to be negotiated. It may be that two or three basic constructions are developed within a group with individual variations around these. Each basic construction may be climatically determined depending on location on a site.
> • Participative design of physical supports or cores to be completely self-built with the co-operative and individual division of control negotiated. Self-build would reduce costs.
> • Participative design based around a primary constructional system or choice of primary constructions developed for all CESH projects. Generally architects would have a role in development environmental primary constructions that may be regionally determined (developments of Segal or SkillBuilding methods). They would more specifically negotiate possible variations with a given group and site. System could be developed for self-build or not.

Individual customised design of each house within a group is financially prohibitive whether contractor or self-built. The notion of standardisation and flexibility (variations on a theme) is critical to economy and raises the potential of a coherent environmental strategy. *The standard part of the design may be the constructional system, shell form, or a core plan of the dwelling.* Variations may be added in several ways by groups and individuals. *A critical problem is how to develop uptake of such a proposals by individuals and groups given an environmental component that adds restrictions in initial cost and design terms. The additional problem is how environmental factors can be consistently and fairly implemented between projects.*

---

[11] N. J. Habraken, J. T. Boekholt, A. P. Thijssen and P. J. M. Dinjens, *Variations: The Systematic Design of Supports*, MIT, Cambridge, Mass, 1976.

10.2. Four Proposals

I have noted how the social ecological project generalises the application of self-help (general human interest) so that target groups should preferably be from a variety of incomes and participation should be aimed at a number of levels of involvement. From a social ecological point of view, in the development of self-help some form of co-operative ownership is preferable since it offers user control without commodification. It must be recognised however that building co-operatives and self-build associations that are dissolved on completion still have benefits of establishing group connections and facilitating group design. I have also noted ideal design methods as design of flexible site strategies with a known group of users and have reported how this has been approached in some Dutch co-housing and at Netherspring. Such developments demand groups committed to self-help, with an environmental agenda, and a desire to live in a community (affinity groups). Given the extra resource costs of environmental measures they would also, unless they could attract government funding, require groups with the resources to back up the commitment despite potential lower running costs. 'On cost' low energy and passive solar projects are possible although they have creative restrictions. Many less conventional environmental approaches remain an additional expense initially (sunspaces, water-meters). Ideal developments would also require groups with the time to give sufficient input. *Below I note four applications that address one or two of these obstacles.*

In developing on objective realities appeals to both low and middle income groups could be based on the financial benefits of group developments, control potentials of co-operative developments (given limited resources) and the 'life-style' benefits of grouped and co-housing. Other 'objective realities' that could be promoted include the financial savings potential of adaptable buildings or simply a desire to participate in individual design within supports. One of the most impressive features of Dutch co-housing was the way it built on emerging dissatisfaction with suburban living and offered *a bridge* between isolated suburban and fully communal living. Clearly however the proposals suggested here would generally demand incentives from government. Bridging finance or grants connected to payback periods for environmental measures would be possible incentives. The incentive to government may be environmental efficiency, the potential of an adaptable housing stock or provision of housing in the public domain through non-equity co-operative ownership and self-build for rent. A limited role could also be seen for commercial developers in this respect.

10.2.1. - Independent Self-help

Independent self-help is *group* or *individual* housing provision that does not use external resources except loans and mortgages. It thus involves those with sufficient financial backing to procure land, materials and sometimes labour. Motives are normally financial necessity or the desire for a more appropriate house at reasonable cost. Groups may form as self-build associations or building co-operatives to reduce costs and to pool skills. Ideologically, independent self-help is problematic since it is a way of securing a place in the *housing market* although it is self-motivated and increases self-reliance. Groups at least form some informal associations even if they disassociate after completion. They are therefore also more likely to design houses whose interrelationship is considered in some way. At present independent self-helpers contribute significantly to UK housing production and thus environmental facilitation can have a major impact.

Technical assistance is available to groups and individuals through professional advice (at a cost), grant aided or voluntary support organisations, adult education, friends and literature. Together these provide some form of resource but one that is difficult to access and incoherent. It is suggested here that an environmentally committed government or existing community organisation/confederation should develop a technical assistance package that would widen the available resource base. It would specifically describe environmental methods suitable to self-build techniques and the benefits of environmental design in cost terms. It would give examples of designs appropriate to self-build that meet a variety of 'pay-back' periods. It might include material lists specific to certain areas and outline preferable low energy building types for self-built or contractor built houses given different site densities. It would also describe the benefits of designing for extendibility including initial cost advantages and outline basic design strategies for staged construction. Many self-builders favour environmental techniques and a well-designed package could increase uptake. The assistance package would also include descriptions of, and locations for, further information on a variety of the less conventional methods I have outlined and alternative service provision generally. Finally, it would outline the benefits of co-housing. An education course for self-helpers could be offered through the package and may be used to bring potential groups together.

It should also be possible to develop the popular Segal system by adding energy efficient construction options and planning forms for various orientations and degrees of overshading. This would include appropriate methods for incorporating thermal mass and insulation depending on the form of low energy design chosen. Development of a new self-build system with improved environmental features is another potential development. I outline such a system for groups under *Co-operative Environmental Self-help* below that, I argue, would develop a crosswall construction of terraced form with timber intermediate frames and cladding options. Contractors could be employed to build the cross walls and roofs enabling dry construction of the interiors by users. Individual systems may however simply develop means of incorporation of appropriate mass in the; floor, one structural wall, independent walls, or as dense internal render and relate it to appropriate glazing levels and insulation.

It should be noted that a predominant aim of any technical package would be to outline the advantage of forming a group with which to build even if houses were eventually privately owned. I noted in *Chapter Eight* how communal tenure options should be developed to encourage grouped design and tax measures favouring private ownership be reversed.

10.2.2. - Green Development of Physical Support Structures

In *Chapter Nine* I noted problems of the purely technical distinction (not involving ownership, tenant management options or group design) of support and infill and the development of co-ordinated infill 'systems'. Reappraisal based on environmental demands in housing however illustrates a potential continued role for physical supports. Firstly it can be argued that low energy design needs 'technical facilitation' over and above other participative housing projects if it's design and construction is to be effective (the skills of self-builders is often criticised even given that they will invest considerably more care). In this respect the support and self-build/participative design infill balance will be ideal. Secondly physical supports enable accessible participation in infill design. There are many foreseeable instances when this reduced participative obligation would fit the demands of occupants in a specialised society. People may not want to design or build their own houses but may wish to be able to play a part in design, modify, add to, and personalise them. Thirdly continued adaptability is important to longevity and fit to different occupants particularly give low energy measures. The support concept enables layout and the equipment of the dwelling to be adapted in much smaller steps than with traditional construction (involving participation or not) tending towards a process of continuous improvement. Given this potential role for 'supports' or 'adaptable housing' I noted how many of the problems of the technical separation could be addressed by using timber framed not industrial system infill allowing; possible self-build, easier occupant modification, and increased scope for expression. I noted that at least some group participation in support design would also be an improvement and some form of ownership, at least of the infill or co-operatively of the support.

Here I propose environmental support structures that could develop flexibility around increased environmental specifications (e.g. microclimate, density, mixed use, communal open space, waste systems, heating performance, insulation values, individual solar design, atria and group solar design, and solar domestic hot water). Habraken notes how supports are *site specific*.[12] Speculative design of support structures would involve the architect working for the sponsor without consultation with the user client to develop, design and build flexible housing for sale or for rent on a given site. The latter could for example be developed by housing associations. No formal group constitution need occur, except perhaps co-operative ownership of some common areas or a management co-operative for rented property.

Although I have noted how site design of interrelated housing with users is important speculative support initiatives would introduce participative process of an intermediary (and thus accessible) nature. Such speculative initiatives are limited in terms of benefits of self-help generally but clearly would be a development on the notion of speculative solar estates. The support design and its possible sophistication would depend on who it was aimed at. The architect would have a creative role that, I have noted, can promote user creativity and low energy design. A basic support and plan could have numerous potential infill variations depending on lifestyle requirements and cost. Simple direct gain designs for example could be developed 'on cost' while sunspaces could be added with current pay-back periods of eight years or a high insulation form infill used. A sunspace might be added for amenity value by an occupant with the financial resources or a grant system could be developed and allocated based on the payback period. It may be some form of loan for the payback period. As noted such infill would not be industrial infill construction or co-ordinated systems but be designed as flexible and adaptable timber infill (as Segal).

---

[12] ibid.

It is difficult to prescribe a set of inherent restraints and latent possibilities without specific design parameters (should be negotiated for each project and site) but a set of general parameters can be draw up that could be used in developing flexible environmental support strategies. Restraints and variations (latent possibilities) may include:

• location in the city or on public transport accessible sites (developed from district participation described);
• consideration of renovation at least in part (again potential of sites developed from district participation);
• some provision for communal open space (determined regionally and specified as a proportion of floor area);
• provision for some communal functions (may also be co-operatively owned as part of buying a unit) specified depending on the target group and located depending on the specifics of the site and functions (they may 'lift' housing units to the sun, 'buffer' some units; or in other ways climatically benefit the site strategy);
• a degree of mixed use (perhaps owned by and rented from the co-op owning communal land and functions) specified depending on the target group;
• an emphasis to be placed on terraced and courtyard development;
• specification for design for association and links to the rest of the city (requirement of the architect);
• two and three storey housing with possibly four storeys for mixed housing and flats;
• a cross wall system of preferably recycled or locally produced brick with sustainable timber intermediate frames and infill would allow compact housing with flexibility in spacing of units initially, free spatial planning internally, variations in depth and extendibility front, back and up;

- masonry cross walls would provide mass and allow an efficient terraced form for low energy housing allowing infill to accept or reject solar gain depending on its location in the support;
- depending on the specifics of the site, occupant demands, orientations and the response of the architect infills could exploit solar gain in various ways (sunspace, direct gain, clearstories, atria) or tend towards highly insulated forms;
- if a solar design was used further mass could be provided in appropriate floor areas (e.g. in the sunspace) but if highly insulated forms were chosen then insulation would be used to line the cross walls;
- atria, sunspace buffers, or sunspaces could be utilised for all orientations as part of the support or infills;

• 'typology' may be established as a means targeting areas of the support and fixing appropriate locations (for example all day occupancy by a young family would suggest appropriate solar access);
• design would allow owners to extend their interior at the expense of exterior space - the timber system could expand upwards and backwards but not forwards if their neighbours had a direct gain system whose sunlight would be intercepted;
• individual occupants would develop the most appropriate infill for their lifestyle;
• infill material choices could be chosen from lists of environmentally most favourable options for the location and site (not simply the most energy efficient in use or in manufacture but also considering transport costs, ease of use, potential to recycle, and design life);
• environmentally approved finishes would could also be listed;
• solar domestic hot water could be an infill or support element (a groups system is possible as part of a support and would increase efficiency over individual systems) with grants offered (based on payback) for inclusion;
• compost toilets could be infill or support elements;
• water and waste systems could be infill or support elements - a neighbourhood handling system would be the later (a common laundrette could use collected water from all roofs) but again could for example be incorporated as infill two several linked houses.

Occupants would typically design their infill with the architect according to their needs. The method allows increase in environmental specifications by including them in the support (microclimate or passive design, active solar hot water, water collection, density) or designing the support for compatibility with future provision. Requirements of certain energy performance could be set considering the parameters of the site and thus support. The users, with the architect, would determine how to meet them. The mechanism of meeting environmental performance standards would be similar to the supports means of meeting cost restrictions with basic options given. Minimum insulation levels could be set with examples of external infill elements that would meet energy use targets (timber or brick cladding). In terms of energy performance one example of each solar form would be required that met the performance or simply appropriate glazing mix for the orientation of the unit given. A post design monitoring program of energy use would also be important. This would build on the *Global Action Plan* discussed in *Chapter Five*. Comparison between different units in a support would be particularly useful. Small grants could be used to encourage take up of lower energy options based on pay-back periods.

A Possible Support

Figure 10.3. shows how one environmental support system may be structured. It may be seen as a development of the Malcolm Newton design in *Chapter Four* and the Diagoon Housing discussed in *Chapter Nine*. Figure 10.3. shows three possible units based on a cross wall support and timber infill. The former would be contractor built and provide a shell for participative design and potentially some self-building in dry conditions. Each unit is based on a brick core that forms a winter retreatable space similar to that in the Malcolm Newton design. This space can be closed off to operate separately if the users wished and potentially contains kitchen, bathroom, minimal living space, two bedrooms and heating equipment. Centrally locating the water systems allow simple incorporation of active hot water systems if desired in the support or added as infill. Focusing heating functions in the minimal space potentially makes efficient use of incidental heat loss and reduces runs. The rest of the space is thus flexible allowing for creative design input. The extended space may be a sunspace as in the Malcolm Newton design or more insulated and used as part of the house for more or all of the year. In the later case and given some southerly orientation the sunspace may be added to the south facade or direct gain utilised. The southerly wall of the core is shown as a mass Trombe but may more effectively be an active Trombe, utilise transparent insulation, direct gain glazing or simply an insulated wall. Both southerly and northerly facades would allow considerable personal expression by the user. Sunspace form for example could vary and be restricted only by overshading neighbours. The spacing of cross walls could be varied in the support as could the depth and height of the units for various size houses.

The form as noted in *Chapter Five* utilises mutual warmth, heat losses to the extended space and solar gains to that space. It can be developed in some forms independent of site overshading and orientation and thus is suitable for incorporation in built up areas as recognisable environmental architecture. It could be used in gap sites. I have shown a flat grass roof over the heated core leaving the option of utilising the extended section to collect clearstorey light from any direction or be glazed as described and as in the Malcolm Newton design. The roof construction could be simple trussed rafters spanning the bay width at appropriate angles or be more complicated and personalised. Cladding, the location of the staircase, interior materials and finishes, room division in the extendible space and allocation in the core, any void in the extendible space and the use of the core as a minimum space or not could all be the choice of the occupants as is the degree of solar power used as against insulated design. The extended space could be continued beyond the building line on a north elevation preferably as a buffer space for storage or for use in the summer or as a terrace. The staircase may be part of the core or extendible space depending on the specifics of the energy system chosen. I have shown two storey houses above single storey adaptable spaces. These spaces could be used as highly insulated extensions to the houses associated with the street (if shaded)or solar powered spaces (if not shaded). They could be communal space and linking spaces in co-housing schemes. They may also be used for single storey housing units or other functions where required (preferably heat producing if shaded) raising the houses into the sun. Two storey units without this lower level could be used with three storey units to achieve maximum solar penetration where possible and appropriate to the site. Houses could be potentially be extended upwards and utilise the grass roof as a garden.

The design is a prototype. It's detailed design would depend on site and potential ownership. Clearly performance could vary widely depending on infill design, site overshading and orientation. I have estimated possible solar contributions of 35% using calculations based on *Passive Solar Architecture in Europe*.[13] This was for houses orientated 20° East or West of South with sunspace addition to the southerly elevation of the core, 30% double glazing in the core facade, night time insulation shutters and other U-values of wall and roof at $0.3W/m^2K$ and floor $0.4W/m^2K$.

Three Ownership Options

• Speculative Flexible Housing for Sale (e.g. as Diagoon)

Such a support could be compared to a speculative solar estate. It would not be strictly a support project because the occupants would own the shell and infill but the technical distinction would enable the bought shell to be easily adapted. The initial infill would be worked out with the architect. Potential attractions would be reduced running cost, extendibility, and the ability to design the initial layout with the architect for contractor or self-build. The former to save time and the later to reduce cost. In buying their unit participants could co-operatively own communal land and any communal functions in the support.

[13] Ralph Lebens, *Passive Solar Architecture in Europe*, Architectural Press, 1980.

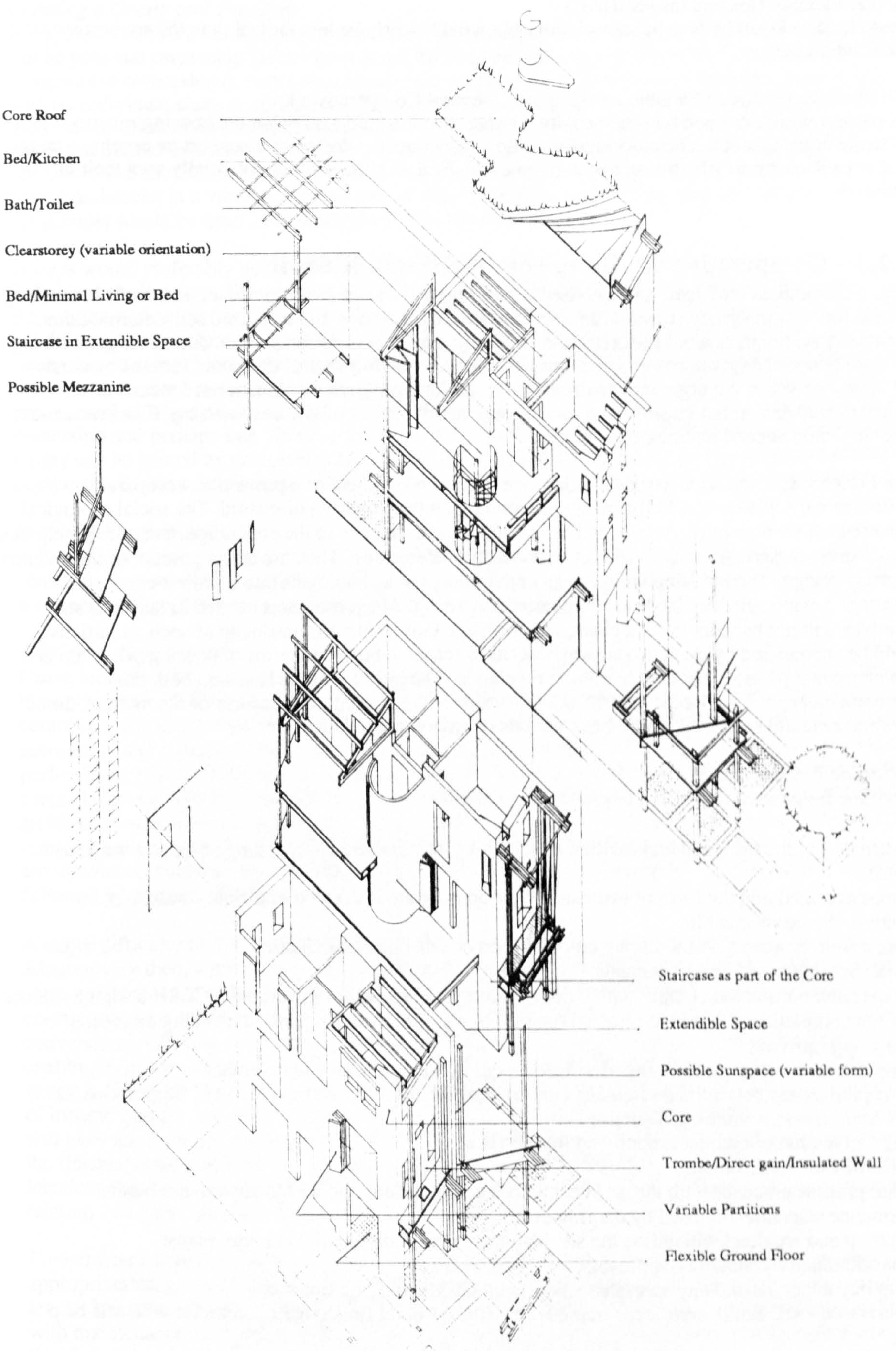


Fig. 10.3. Exploded Axonometric of three units of 'A Possible Support'.

• Rental Flexible Housing (as PSSHAK)
Would be developed by housing associations but would clearly be less radical than the support structure described above.

• Co-operatively Owned Flexible Housing (as Liverpool Co-operatives)
If a support was developed for a non equity co-operative it would also mean the housing remained part of the social housing stock. The co-operative could appropriate the design as a support or develop a targeted version of the support with the architect given a site. Each occupant could potentially own their infill design.

10.2.3. - Co-operative Environmental Self-help (CESH)

Despite ideological criticisms an 'organised' self-help program can have considerable benefit in assisting specific low income groups towards appropriate housing provision and increased self-determination. Financially participants would benefit from, self-help equity, economies of scale due to the group design and state assistance (given co-operative ownership) while having control due some form of ownership and increased skills. An organised environmental self-help program would aim not for state of the art environmental design but improved environmental quality and fit of low cost housing. Exact measures possible would depend on the groups income.

Here I briefly describe some issues of relevance to the development of a pro-active, co-operative, environmental self-help (CESH) application building on the examples discussed. The social ecological credentials of such an initiative are, as I have emphasised, intrinsic to the encouragement of self-help that exists wholly or partially outside the commodification of housing. They are also a product of the potential for group design. The implementation of any environmental technologies into a project can further encourage greater self-help beyond completion of housing. Again measures needed to facilitate such initiatives will not happen without change in priorities. Government sponsorship of such an initiative would be encouraged by emphasising the benefits to resource bodies in terms of housing provision and with increasing pressure for environmental regulation. The later would be based on both the environmental benefits of local control and any intrinsic environmental measures of the method. Some loan finance could be linked to pay-back periods of environmental measures.

An Outline Framework
An outline framework for a CESH system would involve:

• advertising of the initiative and inviting applications from individuals, existing co-operatives and groups;
• groups accepted and the form of eventual tenure appropriate is decided - outright ownership, co-operative, shared ownership;
• groups form co-operatives, building co-operatives or self-build associations;
• initial distribution of design manuals;
• groups enter contract to comply with CESH conditions in return for government CESH bridging finance loans (on completion either individual co-operative or shared ownership will depending on capital funding appropriate);
• group decide level of participation desired or required to meet financial restraints;
• any capital grants determined - housing corporation, DoE and Urban Development Corporation, DTI, Local Authorities or Building Societies;
• groups given list of architects approved for CESH work;
• choice of site or allocation;
• design process proceeds with the architect working with groups and within any environmental performance standards imposed by the framework,
• the group and architect will define the site plan then work individually on house plans;
• plans submitted for statutory approvals;
• group buy materials and any specialist labour with CESH bridging finance;
• construction - self-build, contractor framework with self-build finishing or contractor with self-help input;
• progress meetings - self-build and self-help variations;
• completion and handover;
• mortgage, tenancy and management agreements arranged depending on the specifics of the project - responsibility for management will depend on ownership and in the case of co-operatives will preferably be carried out by the group ensuring democratic control;
• monitoring and environmental feedback started.

Forming a Group and Funding
Groups may form a housing co-operative, building co-operative, or self-build association. Tenure patterns can be personal ownership (after dissolving a building co-operative or self-build association), non equity co-operative ownership (tenants own or lease the property *in common*), co-ownership (as non equity but with an individual share in collective equity) or shared ownership with a local authority or housing association. Ownership or shared ownership will depend on degrees of private funds or labour of members. Shared ownership may allow for eventually buying the remaining equity. Non-equity co-operatives use subsidised capital public funds and contribute to housing stock. The framework would thus enable assistance in a variety of forms, one of which, bridging finance (and perhaps costs for setting up the groups) would be used as an incentive to join the scheme.

Groups would preferably be formed prior to application but may be formed by the organisers from individual applications. Government sponsored initiatives would require restrictions of income to enter the scheme and restrictions of ownership to maintain a public housing stock. Private funded applicants would require some special loan assistance as an incentive to participate as well as more flexible ownership patterns. Mixed income groups (as with Dutch co-housing) should also be encouraged. Groups would vary in size but, I argue, optimum sizes would vary between 10-30 units for reasons of self-help process and efficient community size. Self-build would similarly be for co-operative ownership, shared ownership and perhaps sale. Sweat equity of self-build will usually save 25%. If not full self-build sweat equity can be gained by groups in areas such as site preparation, finishing, landscaping and building play equipment. Sweat equity in self-build co-operative ownership is paid to the participant on leaving.

Training Programme
A formalised training programme such as SkillBuilding is not envisaged here since it would limit constructional possibilities. Benefits of a self-help process are, in any case, more generally associated with increased confidence not acquiring the specific skills of qualified builders.

A Primary Construction
I have looked at some constructional and support methods for self-help schemes that may be developed for a pro-active CESH framework. The most efficient means of delivering environmental benefits and controlling resources while maintaining some design freedom will be some division of primary and secondary (and tertiary) systems. Potentially the most appropriate fit and improved environmental performance given the development of a co-operative would be a primary structure developed by the particular group with the architect for the site (as the Liverpool Co-operatives). The group with the architect should decide on a principal constructional technique (or core plan arrangement) that would remain a constant theme for all the houses but allow variation in the individual houses. Simple environmental benefits could be gained by negotiation of site layout depending on occupant lifestyle followed by appropriate climatic design.

A major difficulty of this is ensuring consistent environmental requirements between projects. Alternatively then, a primary constructional system could be developed for all CESH schemes that meets some environmental criteria. I envisage a combination of traditional brick and timber framed constructions as; suited to the UK climate, environmentally benign, suited to inner city sites (particularly conversions), offering potential for complete self-build or partial self-build, offering flexibility in design, enabling high insulation values. The system would be a variation on the speculative support discussed. It would build on the limitations of the Segal system noted in *Chapter Nine* that has been used by a variety of income groups. It would include means of increasing mass and insulation levels. Ideally a co-operative will have all its dwellings allocated before commencement and thus everyone will have participated in the finished design including initial group participation in the site planning and individual housing location. Discussion could take place on the best location for each home given occupancy pattern in relation to a solar and microclimate survey of the site.

Timber frame constructions are self-build friendly (light and easily worked with dry connections), appropriatable, potentially sustainable (given development of city forests) and suited to high insulation levels. Longevity clearly depends on a number of factors including species and construction quality along with maintenance, care and location of the timber with reference to vandalism. Brick construction might thus be used as a core from which to develop timber additions.

The primary system would be described in a manual with examples of variations that would be negotiated for each group with the architect. Negotiation of this constructional system would clearly depend on the specific characteristics of the group and project, its funding, skills available, degree of self-build, the site and location. While houses must meet building regulation standards exemptions could be organised in specific cases with negotiation based on suitable alternative measures.

The use of a theme for self-build would mean the group initially working on similar tasks acquiring skills for the later phase of completing individual houses. The method used may involve specialist subcontractors depending on the specifics of the project. Ideally a temporary shelter for material storage, site meetings would be the first construction designed for eventually converting into a community house or other function determined by the community. This should be designed in close collaboration with the co-operative and built by the participants acting as a training scheme. It would preferably be built early enough to hold on-site design meetings.

Design Assistant Manual

I have argued that a housing project must involve participation at the earliest possible time using consultation with a group to develop a the site strategy allowing individual variation within these limits. A manual may include priority lists for consideration of green elements within this process divided into community and individual realms aiding introduction of green ideas at appropriate stages. If a palette of environmental techniques is available the architect has a chance of fitting these into any given project. The green measures would then fit the demands of the community and individual households. Participants would have an appreciation of the measures implemented and how to use them to maximum benefit. Debate over different issues would be generated and comparison possible. Further environmental measures would also be more likely to develop as a result. A monitoring schedule could form part of this manual to be completed by users.

10.2.4. - Environmental Performance Standards

At present the social sphere is given the 'legitimate' role of ensuring health and safety requirements through the building regulations. These also give minimum insulation standards and examples of constructions that meet them. I have noted possible enhancements of environmental specifications but how such environmental performance standards including increased insulation or solar gain requirements limit design freedom. Development of continually increased insulation standards will restrict housing design in terms of, for example, window areas. Despite encouraging self-help there is a need to ensure some minimum standards today (otherwise the houses do not empower) as well as increasing and expanding environmental specification (insulation standards, solar contribution, auxiliary heating requirement, material selection, heating system, DHW system, density). Environmental performance standards, as part of the social sphere, must be implemented to balance with the decision-making freedom of groups and individual participants. The standards must be devised and implemented to improve the environmental quality of housing without having an oppressive and restrictive impact on final form and cost. Ideally any framework would allow this balance to fluctuate depending on the specifics of the individual project (regional location, site, participants [if there are any] and funding) unlike the building regulations at present that embody uniform national standards. In a speculative project site and location would be known and standards could be based on these. Ideally measures would depend on the project and exemptions would allow for more appropriate environmental design. Practically this could simply result in reduced standards while negotiation of performance standards is extremely difficult to achieve in contract form and impossible to apply fairly and consistently. Potential Developments may be:

• Environmental performance standards theoretically have no physical supports to help meet them but practically in a self-help project they are the only way to guide meeting increased requirements and allowing variations within cost restraints. This involves a standard primary constructional system with individual variations. Examples that meet basic requirements would be provided. As standards are increased the need for technical aid for self-help increases and the benefits of a constructional system that can meet (or tend towards meeting requirements) and allow variation becomes more important.
• Development of whole house performance standards as opposed to insulation levels would allow variety of planning arrangements and location of windows or insulation to meet targets depending on occupant wishes and the site. A constructional system that provided for variations to meet these requirements would aid self-helpers and importantly allow them to creatively interpret from an approximate base.
• An important feature of this thesis has been the variety of environmental possibilities and how green developments cannot be limited to energy efficiency. Use of the full variety increases potential fit. A fixed number of requirements could be selected from an appropriate list although it would be difficult to ensure consistency.
• Features such as water collection systems could be applied to all projects consistently as a social requirement and not affect design although they may reduce freedom due to cost. This would not be the case if they resulted in less water use on a metered supply and if this could be linked to a payback grant. Similarly if dry toilets were used digested waste would eventually provide a resource (for sale or local use).
• Standards could perhaps be negotiated and set by a group for the site with the social sphere with reference to a set of standard parameters and individual variations developed around this.

• Performance requirements such as building energy performance and material selections should differ with region.
• Material choices can be taken from an approved regional list.
• Environmental performance standards can best be addressed by defining several levels - tissue level, support level (primary structure), group level (secondary structure), and the household level (tertiary level). Density and mixed use would be requirements of the tissue level and would ensure a general increase in standards from mutual warmth.

10.2.5. Some Final Remarks

In striving to develop a framework for the development of a truly sustainable European city I have aimed to balance political and social ideology with the practical constraints of existing systems. In so doing I have attempted to develop a coherent approach in response to a perceived tendency to tokenism. I have developed the mutual relationship between self-governance and ecology at the global, city and local level. I suggest that architects, planners and landscape architects with a sustainable agenda should address participation and their relation to the user client. This is true ecologically and environmentally but is also a social issue. I suggest that carefully designed supports can develop such links building on objective realities and moving towards both more efficient and less hierarchical and thus more sustainable cities.

10.3. An Elaborated Synthesis

Summary

• In *Chapter One* I develop the radical criticism of environmentalism and the critical role of social ecology as against other forms of political ecologism. I discuss the ambiguities of the term sustainable development based on environmentalism or ecologism. I outline the principal features of the social ecological sustainable society and the methods proposed to reach these ends. In particular I note its anarchist imperative and demands for a consistent empowering approach to change. Social ecology focuses on empowerment and participative democracy to create a society that is less hierarchical materialistic and thus sustainable. It focuses on the self-governing self-reliant citizen not necessarily the productive self-sufficient communities often associated with green politics. Critically I also note environmental arguments for increasing productive self-reliance in the West and suggest social benefits. I develop these at a more local level throughout the thesis.
• In chapters two to six I review some features of more sustainable (and self-reliant) cities being discussed at present particularly; appropriate transport infrastructure, use of buildings and landscaping to control the microclimate, low energy design, city food production, ecological landscaping and water supply. I focus on the general consequences for urban form but also highlight several other issues that arise such as benefits of participation to solar design and low energy landscaping at an individual but particularly a neighbourhood level. I also note the qualitative benefits of a city form not based around the car and the techniques described. I advocate dense, mixed use more self-reliant cities with a more direct relationship to their hinterland as environmentally efficient. This develops the critique of the inefficiencies of global distribution systems discussed in *Chapter One.*
• In *Chapter Seven* I extract and develop the critical notion of greater self reliance and appropriate urban form to both environmental and social ecological sustainable cities. I note other socially relevant features of mixed use cities and self-help initiatives. I note how appreciation of the benefits of subsidiarity are now generally accepted with reference to the need for levels of regional and local government and local participation (TCPA).

There is a contradiction for social ecologists if not environmentalists between imposing productive self-reliance, mixed-use and low energy (even if empowering) within context of political self-reliance and thus local choice within our present systems. Bookchin acknowledges that he cannot define the shape of future society. He can however suggest forms and technologies that seen relevant today. Agitators can develop initiatives that suggest and enable while we can develop common objective realities where they exist. In this respect I redefine his vision of ecotopia to make it more relevant to the existing fabric and efficient technological possibilities.

• In *Chapter Eight*, postulating a central role for self-help housing in encouraging creative self-reliance, I outline the various forms of self-help housing on which I might build but also note other benefits and Marxist ideological criticisms against them that suggest certain favourable forms. I attempt to expand on the objective realities that will favour increases in self-help housing.

• In *Chapter Nine* I review examples of self-help and participative design with reference to the enabling role of the designer within the wider political context and thus the possible role of the designer in enabling self-help and participation within an environmental framework or not.

Having reviewed environmental techniques and forms of self help housing in conclusion I suggest methods that may appropriately advance both and build on the links I have established between the two.

The Global Environmental Debate

This thesis has attempted explore the contributions architects, landscape architects and planners can make towards the development of a more sustainable society. I thus began by expanding on the definition of the sustainable society. This was important because the definition varies within the environmental movement and thus so does the definition of what may be termed sustainable architecture. It is also important to consider how the sustainable society will be created since *architecture today is a means towards sustainability not an end.* In discussing the on going debate between political ecologists and environmentalists my introductory chapter raised several concerns. Critically I questioned the purely environmental agenda that technological methods within a growth economy will be sufficient. For political ecologists we must rebuild society to a different social and economic logic. In architectural or planning terms political ecologists argue that the tendency to supply low energy and low impact designs without questioning our present context cannot create a sustainable society. Political ecologists see environmental action as insufficient while environmentalists see political ecologism as a unrealistic utopian program that prevents realistic action. *An important role can be seen for exploring the connections between environmentalism and political ecologism and I do this through social ecology.* I note social ecology particularly because I argue that while revolutionary it has a clear and progressive social project based on historical anarchism that can be developed to criticise environmentalism. Deep ecology on the other hand is regressive and dismissive of existing social realities and problems.

The global scale of the environmental debate has developed to the extent of discussing 'sustainability'. Further complications of the environmental debate are however illustrated by the 'weighting' given to existing social problems by environmental groups. The concept of sustainability cannot be considered in isolation from social conditions today and this further complicates any definition of 'sustainable development' since it may be argued that social divisions today and in the future are more important than any theoretical concept of sustainability. I argue that the motives of 'saving' middle class people in the future while people starve today must be questioned. Here social ecologists agree with Marxists that poverty is essential to capitalism and thus again efforts within a capitalist system are questioned.

Environmentalists argue that growth will both raise standards of living and provide technological solutions. They are typically unquestioning of social and economic problems today or of the potentially more overtly hierarchical societies tomorrow. They are also unquestioning of the fact that present systems may be preventing development of the poorest nations and encouraging polluting technologies by allowing export of pollution costs. Environmentalists argue that the present capitalist growth systems will universally harmonise standards upwards. Social ecologists are critical of this notion and use evidence of growing divides between North and South. Instead they develop the notion of empowerment. For social ecologists equality globally and locally is a critical means by which we will stop the hierarchical competition that is driving the destruction of the planet. If equality is essential to sustainability it is also a goal in its own right that given the problems of defining sustainability is as important. Another linked issue is that if we can technologically and hierarchically continuously stave off environmental catastrophe the society we create will be inhumane and prone to dramatic failures.

In *Chapter One* I argued that we should address technology change and consumption in the West not as we are prone to do blame population growth in developing countries that is a consequence of present systems. I noted the critical role of the western city - its reliance on exploitation of global environments and people. I concluded that the obligation was on the West to write off debts, increase aid not tied to trade agreements but above all to become self-sufficient at existing levels of consumption. For social ecologists empowerment and self-reliance are ways by which we can address Western consumption (material and efficiency) as the critical environmental determinant. Encouraging political, economic and social self-reliance in the West aims towards replacing conspicuous consumption with freedom but is also a means of increasing environmental efficiencies (improved technologies and reduced exploitation for example if costs were internalised).

The principal conclusion from *Chapter One* is the variety of evidence for more self-reliant systems even if the social ecological position that overcoming hierarchies and developing political self-reliance is a means of replacing material consumption as the final locus of human expression is not accepted. Other arguments for greater self-reliance that emerged included:

• development of national self-reliance by internalising markets but with free flow of ideas would facilitate environmental technological development by internalising environmental costs;
• greater Western self-reliance would reduce exploitation of developing countries and thus enables them to tackle population pressures due poverty
• inefficiency of global transport and particularly swapping of goods in a global free market.

A common theme to social ecologists, environmentalist and deep greens can be seen as degrees of productive self-reliance. Critically however social ecologists advocate self-governing citizens. This demands greater if not total internalisation but the democratic process is more important than productive self-reliance. I note in these terms how political self-reliance and productive self-reliance are not necessarily analogous but development of productive self-reliance is a training ground for political self-reliance (rounded human beings). Ultimately sustainable society will be anarchistic not locally self-sufficient as deep greens argue. Only an anarchistic non-hierarchical society (based on creative self-governing citizens) will develop sustainably.

The Architectural and Planning Brief
Direct action of squatting, demonstration against the Criminal Justice Act, LETSystems, local environmental action and food and housing co-operatives are attempts to achieve re-empowerment over social, economic and political life and provide services central authorities are increasingly failing to deliver. Communes and co-operatives are teaching people how to administer self-managed enterprises. For social ecologists they provide seeds of a diverse and general movement for change but need co-ordinating. The social ecological revolution involves gradual empowerment and confederation of affinity groups and déclassé elements into a progressive social movement. There is however a role for agitators to develop new programs "structured around the immediate environment of the individual - his or her housing conditions, neighbourhood problems, transportation facilities, economic conditions, pollution issues and workplace conditions". Agitators should explore and promote social ecological forms.

The social ecological critique has implications for architecture and city development that by their nature will be critical to political and productive empowering but are also at present rooted in the capitalist context. Greater Western productive self-reliance will ultimately depend on greater local and regional productive self-reliance. In the remainder of the thesis my search was for an architecture of social ecology. While certain architectural and planning technologies are efficient from an environmentalist point of view they also enhance local control and bring natural and production process into the city. By aiding self-reliance they may from a social ecological point of view tackle issues of hierarchies and capitalist consumption. These are social ecological technologies since they can empower but must be implemented within a social matrix of empowerment (i.e. devolution of political power). In terms of the built environment this means developing participative, co-operative and self-help initiatives.

Such a notion I argue is a means by which architecture can broaden its present narrow environmental agenda. Throughout the thesis however the practical not utopian benefits of self-reliance become increasingly evident. This enables me to suggest that architecture whether environmental or social ecological should aim to encourage self-help and participation. This common theme gives a coherent approach that I argue any architect concerned with the environment and poverty must recognise. It also provides a realistic mechanism through which such initiatives may be funded. My discussion in *Chapter One* gives a point of departure for an alternative and qualitative definition of sustainable architecture. I went on to look at environmental city techniques and then self-help techniques emphasising the benefits of each to the other to explore how a social ecological definition of sustainable development may be best progressed in architectural development terms. Imposed initiatives will not be as true to the social ecological project as grass roots movements but by building on objective realities will realistically tend towards it. Principally:

• development processes should facilitate self-help and user participation in design, construction and maintenance;
• environmental initiatives should be linked where possible with development of participative and self-help initiatives and local and municipal scales;
• environmental technologies should facilitate user control and be transparent in communicating process;
• city form should facilitate greater socio-economic self-reliance through developing mixed use patterns.

Transport
In *Chapter Two* I reviewed more efficient transport policies within our present systems. I developed however a broad view of city transport problems that involved not simply attempts to increase efficiency and reduce global pollution levels but also considered creating healthy, safe, more equitable and less congested cities in which less time would be spent in daily commuting and access to services would be

improved. Policies would involve focusing on public transport to replace particularly daily journeys by car in and around cities. Critically in the longer term land-use planning to increase density and mix of land uses would allow more geographical self containment and increase the potential of pedestrian use and public transport. I noted how such a policy was consistent with development of more self-reliant city neighbourhoods. It could address equality, health, and social diversity (qualitative development) not simply efficiency. Technological solutions to increasing the efficiency of, and reducing the pollution from, the car I argued were problematic in their own terms and did not address social issues. In simple energy efficiency terms evidence in this chapter questions developments of solar suburban housing developed around the car within our present forms. I also noted how land reclaimed from the car could be used to develop a greater mixture of uses (including green space) and facilitate the development of passive solar housing and microclimate design. Traffic calmed streets would give scope for community initiatives in street design. In *Chapter Seven* I expanded on qualitative benefits of such an approach particularly in terms of the isolation of the spread city and alienation of those in the inner city. I thus focus on regenerating the inner cities. I note how more inner city living would reduce the need for cars and reduced car use would make city living more attractive.

Microclimate
In *Chapter Three* I gave an overview of the use of landscape and building to passively modify the external and internal climate. I noted the potential for some energy saving but particularly the creation of more habitable external environments in association with reduced car use. The benefits are potentially almost free. Such microclimate considerations could play a part in making cities more attractive places to live and thus encourage re-colonisation of cities and more pedestrian and cycling transport. I reviewed the UK climate and methods of modification to human and vegetation advantages. I noted that ideally considering the complete range of UK climatic factors urban form would be of even height, low to medium rise and medium to high density based around courtyards. I noted the consistency of this form with that discussed in *Chapter Two*. This would suggest grouped housing form similar to Dutch cohousing initiatives discussed in *Chapter Nine*. Participation would also be important. Such an approach contrasts to the opening up of space advocated in reaction to the Nineteenth Century city. I also suggested a co-ordinated city forestry strategy for control of the mesoclimate that would fit into the policy advocated in chapters five and six.

Low Energy Design
In *Chapter Four* I reviewed low energy housing design in some detail. I noted a broad distinction between passive solar design, super-insulated design and active design. I discussed passive design in more detail since it is; potentially the most environmentally benign, a method that introduces natural process, and as the method most influenced and limited by city form. I explored the feasibility of different low energy techniques in northern latitudes, potential energy savings for various methods (particularly 'free' methods), rules of thumb for design, appropriate urban densities and appropriate construction methods. Similar savings can be made from the various techniques but the more important issue may be there relative effects on attitudes through involving people in the workings of their building. In this respect I noted how participation in design is important to correctly 'gear' methods and inform users of operation. Again passive solar design is more informative of process but limited by site characteristics. I noted problems of direct gain passive systems at high latitudes where emphasis should be placed on insulation rather than increasing southerly glazing above current norms. Sunspace passive systems are more effective at high latitudes since they operate as buffers or intermediate spaces not simply as solar collectors. On-cost sunspace design is however more difficult. I noted how, in solar designs generally, efficient enclosure of interior space and zoning are important. In conclusion it seemed that higher densities may be more appropriate than arranging housing for 100% solar access in suburban locations with large areas of southerly glazing particularly given limited storage capacity and unreliable sunshine. Superinsulated and active solar designs along with large scale renewable energy sources could then be used where solar exposure to facades is low. I noted in particular a terraced housing form developed by Malcolm Newton as appropriate given that it is designed for a north/south running terrace. I also noted the potential of glazed corridors and atria within the city as recreational and energy saving spaces. Critical to make maximum use of various forms I isolated a need for emphasis to be placed on design of groups of housing and the *social structures that would enable this.*

The City Context of Low Energy Design
In *Chapter Five* I placed low energy in use design in the context of total energy consumption and impact of buildings, energy in materials and appropriate materials for low energy design, energy production, the existing fabric and adaptability, user control and participation, and qualitative factors such as building biology. I proposed a balanced use of the three low energy techniques within the existing fabric. Timber framed superinsulated housing for example is extremely energy efficient but as a universal panacea is problematic given our existing brick fabric and construction methods and the reduced daylight and

ventilation levels in superinsulated houses. Passive solar designs work with and involve people in consideration of the climate but may only be suitable where residents can control their environment through the day. I noted the potential of timber construction in renovation given the development of regional sources of timber and particularly given the solar mass provided by our existing fabric. Regeneration of this fabric is valuable in energy terms but also in terms of social continuity discussed in *Chapter Seven* and density. I suggest an urban forestry strategy for timber production that I develop in *Chapter Six*. I also noted how other materials would critically be local to the importance of transport energy. I suggested setting up of recycling bases and local material lists at municipal level. Critically I discussed the effect of occupants on performance and the potential benefits of participation to effectively target low energy measures *particularly if conducted initially at a district or neighbourhood level.* I noted how development of adaptable forms could enable new occupants to adjust their houses to suit there heating needs. I noted the potential of decentralised renovation programs and feedback initiatives. Again I noted the benefits of mixed use form, here in terms of utilising complementary heating regimes. Within a grouped housing project housing forms and mixed functions can be used to maximum advantage. Superinsulated design would for example be used in shaded corners and heat producing functions used to buffer housing. Grouped design would also enable utilisation of the potential of common atria.

Agriculture, Water and Ecological Landscape
In *Chapter Six* I discussed other features of more sustainable city design - food production, water supply and ecological landscaping. I noted how problems of sustainable agriculture were of production but also consumption and distribution. I argued that our most efficient techniques would utilise plant succession and demand more mixed farming in the direct hinterland of the city. I noted the potential of cities for food production given reduced levels of pollution. They have available derelict land (including buildings), labour, heat and nutrients. Efforts should be directed at city farms, allotments, edible commercial landscapes, edible municipal landscapes and Permaculture with food production on and around buildings utilising sunspaces. I noted how self-sufficiency is not a realistic possibility and how it would demand dispersed settlement but that some introduction of food production into the city and a focus on utilising the immediate hinterland to increase regional self-reliance would be advantageous from many points of view. Such a policy would require more mixed use farming in the city hinterland and some city production. It would involve creative intervention in today's city fabric. Mixed use farming was not only potentially more efficient than monocultural farming but in addition resources of the city could be more efficiently used, global and regional transport minimised, and energy in processing and packaging reduced. Natural and production process would be introduced to city environments physically and also through development of direct purchasing. Critically an informed city population may result in less exploitative farming techniques and less tendency to exploit distant lands and people. Dependence would also be reduced. Many existing initiative have developed in response to this dependence including local food growing schemes and direct city to farm links. These should be developed.

I also discussed ecological landscaping techniques that can reduce energy use in establishment and maintenance. I noted how they can bring natural process into the city as opposed to today's horticultural and manicured almost static landscapes. Such ecological landscapes I noted however are not 'naturalistic' but require careful design and maintenance within their specific city context. I also noted how participation was an important feature in their success. They can be defined as an interactive relationship with natural process based on the specifics of site and local inhabitants. Well designed ecological landscapes will be robust, long lasting, low maintenance and thus energy efficient. Although water systems are not directly linked to sustainability shortages are increasing, we use increasing amounts of energy to clean water and water systems are essential to any discussion of city form. Addressing water systems involves reduced consumption, use of appropriate grades and separation of types after use. Treatment and separation at a variety of scales can enable efficient processing and use of resources on land. Much can be achieved at the level of the individual house or group of houses. I noted how technologies have developed to enable low energy and low impact water recycling and how these may also fit in around a dense mixed use fabric at various scales.

Following from *Chapter Five* I discussed the potential of city forestry for timber production and recreation predominantly on the city fringe. I suggested that a co-ordinated approach to city food production and forestry in and around the city should be developed around a dense mixed use fabric.

The Environmental City and the Social Ecological City
Following *Chapter Six* I was in a position to define environmental (efficient) city form as medium density mixed use. In implementation I would advocate co-ordinated city wide urban forestry, focusing on mixed use development within the city and co-ordinated public transport and traffic calming initiatives. I would also advocate *development of structures* that would enable more grouped housing design, participative housing initiatives and neighbourhood participation in energy schemes. It should also be noted that the

discussions in chapters two to six enable a technological redefinition of the social ecological city from dispersed settlement of bio-regions to more dense city arrangements closely related to their productive hinterland.

Modifying Today's City

In *Chapter Seven* I noted how the city today is a political, social and economic entity based on system reliance. I noted how its form, in contrast to earlier cities, is largely a consequence of the capitalist division of labour accentuated by telecommunications and the private car. I noted that existing forms are consequently dispersed and how trends are for this dispersal to continue. I also developed social and economic criticisms of distant control processes outlined in *Chapter One* within existing cities today and noted how the physical form of the city accentuates the problems created. While the effects of such problems are most visible in poorer neighbourhoods I argued that many were present in inner cities and suburbs alike. Problems include local environmental degradation due to a lack of control, inner city decay due to continuous outward movement, dependence and consequent vulnerability. Predominant amongst these is the notion of alienation brought about by the separation of economic and social life and loss of social contact due to dispersal. These I argued can only act to accentuate the notion of society as fragmented economic interests. People are thus more dependent on economic growth dictated by fashion etc. I discussed some efforts to address the alienating character of such form such as those of Howard but noted how these efforts failed since they attempted to start again outside the city and did not attempt to address the capitalist context through anything other than architectural determinism. *In response I suggested that initiatives should focus on existing communities and build on any local economic or social co-operative actions that focus on developing more self-reliant districts.*

Simply I argued that developments based on hierarchies and economic growth are destroying the quality of life in our cities by producing fragmented and alienating forms. I thus built on the arguments developed in *Chapter One* to further advocate less system reliant cities but from a more practical standpoint. Critically however I argued that such cities would not be low density self-sufficient communities but mixed use, lively compact cities of social association not fragmentation. I suggested this form based on evidence in chapters two to six on environmental efficiency along with the need to address the existing context in piecemeal fashion and the availability of land in the city. I argued that the dense mixed use city is consistent with safe, livable, equitable and healthy cities based on current technologies. Political decentralisation does not necessarily mean spatial decentralisation but can be consistent with dense cities of confederated neighbourhoods. Such cities would help overcome our overt reliance on growth for personnel satisfaction.

After noting the efficiency benefits and some lifestyle benefits of mixed use in chapters two to six in *Chapter Seven* I noted how the mixed use city will not come about by narrow architectural imposition (determinism) it depends ultimately on appropriate economic social and political activity. This activity ranges in scale from greater national an regional self-reliance outlined in *Chapter One* to focusing on local environmental action and co-operative initiatives discussed in *Chapter Seven*. In *Chapter Seven* I also note socio/economic benefits of such local initiatives. Integrating jobs and homes on a neighbourhood basis is environmentally efficient, recognised as addressing alienation and a step towards Bookchin's more holistic individuals. Clearly however if imposed it may be inconsistent with local political control (i.e. against local wishes). People may not want to be empowered in this way. Bookchin while ideally supporting devolution postulates a role for agitators to develop new forms to fit to the objective realities of existing situations

Ultimately my point was that a radical social ecological agenda should address the existing city and its diversity. I thus redefined the social ecological vision of bioregions but built on its notion of the city as having radical roots. Critically we should tackle the existing city through local initiatives not by starting again on green field sites or imposing new masterplans. Resources should be directed through local groups with new roles for professionals and governments. I discussed suitable existing initiatives to regenerate cities from the bottom but in a more self-reliant way. In chapters eight and nine I go on to look at self-help housing specifically. There is a need for a mixed use city for efficiency and to enable self reliance but it must be developed through participation. Top down instigation would develop due to environmental benefits used for social ecological aims.

Summary

In *Chapter One* I outlined some ideological positions on the sustainable society. I noted particularly the distinction between political ecological and environmental positions. Political ecologists see radical political, economic and social change as essential to the sustainable society and are criticised as utopian. Environmentalists see a sustainable society developing within our present growth systems and are criticised as proposing inadequate measures. I concluded that the radical green criticism of environmentalism raised important issues that need to be addressed in *any* definition of sustainable architecture. In particular I noted whether purely technological approaches to design were adequate given profound criticisms of our existing hierarchical growth system. In terms of architecture such an analysis raised the question of whether the architect as part of the existing economic system could address in any way a radical or positive agenda.

In attempting to develop a radical agenda I also noted that within the political ecologist sphere a divide can be distinguished between what can be called 'social ecologists' and 'deep greens'. Social ecologists share some common ground with environmentalists in opposition to deep green views. *This common ground it seemed could enable development of a pragmatic approach in terms of city form and process that tends towards radical change but may be advocated by government.* The social ecological position is that only an anarchist society (one without hierarchy) can be a sustainable one. Critically it proposes the development of self governing confederated communities. Unlike other political ecologism the emphasis is on self-governance not productive self-sufficiency.

Based on Bookchin's notions of revolution developed around exploiting existing realities that tend to self-reliance my aim was thus to explore appropriate existing initiatives in the built environment. My investigations were thus divided into empowering environmental techniques (chapters two to six) and self-help and participative housing techniques (chapters eight and nine).

In chapters two to six I attempted also to develop an outline for the development of a social ecological city by looking at several *environmental techniques that are being discussed today* with reverence to developing sustainable cities. In line with my desire to question technological tokenism I looked at the city as a whole as opposed to individual building design. Having reviewed environmental city techniques I advocated dense mixed use form as beneficial in terms of reduced daily transport requirements, creation of low energy habitable external environments and facilitation of low energy design in the UK climate. I advocate the development of the direct relationship of the city and its hinterland on a regional basis (food production for and waste recycling from the city) as opposed to colonisation of that hinterland by low density development. Landscape and water provision using the techniques explored in *Chapter Six* could be consistent with this form. Development of such techniques may be of immediate benefits socially and economically to different groups.

Such evidence I also used to redefine the social ecological city (Kropotkin and Bookchin) from low density to 'high' density. This is based on the low energy technologies and forms discussed (preferable self-reliant form). It is based on a realistic view of the limitations of productive self-reliance and appreciation of the difference between local production and local political control. It is also based on a pragmatic approach to the existing city fabric and a positive view of city relationships and social structures (radical roots). It contrasts with a continued tendency to go 'elsewhere' in order to try new initiatives. My redefinition of the social ecological city however remains simply a means to an end since otherwise it is inconsistent with political decentralisation.

Objective Realities of Self-help Housing and Participation

Self-reliance is a feature of both the social ecological and environmental city to a greater or lesser extent. From a social ecological point of view it is essential to breaking down hierarchical relationships and from an environmental point of view may generate more efficient city form and process. In *Chapter Seven* I also note that it is suggested that increased self-reliance is a means of addressing many existing social concerns outside of the environmental agenda. Critically then I concluded that from environmental and social ecological points of view there is a need to expand the realms of self-reliance. Subsidiarity is recognised on the environmental agenda as essential to successful environmental implementation. In my review of environmental techniques in chapters two-six I have added detailed low energy architecture reasons for locally developed housing as well as low energy landscapes in establishment and maintenance. Subsidiarity is also an essential 'training ground' for more self-reliance. Self-help housing and participation would be critical points of departure in developing such an approach.

With these conclusions I went on to analyse in *Chapter Eight* forms of self-help housing in terms of financial, organisational and management structures *so that I could suggest means to facilitate further uptake*. Such an analysis also raised other social benefits of self-help housing in terms of social ecological and environmental perspectives. I distinguished forms of self-help housing in terms of tenure patterns and the initiators. I argued that common ownership co-operatives instigated by local groups were most appropriate to the development of social ecological cities. In practice however they are not appropriate to higher income groups. *Shared and private ownership forms should thus be developed for these instances.* Private ownership self-help may well involve some group association in construction that is sufficient to qualify it as a sustainable initiative. From *Chapter Five* any form of co-ownership grouped development enables more effective environmental design.

Having established the central role of greater self-reliance in environmental and social ecological definitions of the sustainable city and suggested a pro-active self-help housing policy and preferable ownership patterns in *Chapter Nine* I went on to look at forms of self-help housing in terms of design and construction (greater and lesser self-help) to investigate the role the architect played in successful completion. I aimed to focus on how the designer can enable effective participation in design and construction and facilitate the completion of houses within resource limits. *I hoped this exploration would enable me to propose ways of introducing an environmental framework to self-help and participative systems galvanising their mutual benefits.*

I noted how design and constructional methods vary depending on the political, financial and regulatory framework and how ownership is a more critical feature of control than participation in design and construction. Constructional methods however can facilitate self-help by balancing the economies of standardisation with versatility and flexibility. This has enabled me to suggest specifically targeted proposals. In conclusion, based on the notion of appropriate supports for appropriate groups, environmental and social ecological aims can both be achieved in architectural terms by:

• facilitating self-help for groups who as yet have not considered it as relevant but can achieve direct benefits from participating by developing accessible financing packages, design and construction techniques and proactive frameworks;
• developing environmental frameworks for existing self-help programs that can extend the notion of self-reliance for the committed and those for whom it is necessary by developing suitable construction techniques and literature;
• developing flexible and regional environmental frameworks as opposed to rigid universal standards;
• developing city scale supports in terms of advice centres, financial incentives, resources and planning supports that favour the forms suggested;
• developing municipal city forestry and recycling systems that local groups can 'plug into'.

Some Implications
• Environmental Cities
The environmental demands for subsidiarity are now well recognised. In this thesis I suggest that these demands require the development of appropriate housing ownership patterns and architectural techniques to facilitate effective involvement of local communities. In chapters seven, eight and nine I collected evidence to demonstrate that housing is a critical area in which to develop the relationship between people and their local environment. Local control of environments generally will be facilitated by attempts to involve people in the housing process in terms of one or all of ownership, organisation, design, construction and maintenance. Specifically in *Chapter Eight* I discussed how involvement in housing provision could increase fit and tolerance of problems, reduce alienation, enable expression and increase responsibility. In *Chapter Nine* I noted how involvement in design and construction can increase confidence and develop skills appropriate to local environmental control. Further to the general issues of subsidiarity in planning I illustrated in chapters four and five how involvement in housing is critical to the development of appropriate and efficient low energy housing. In *Chapter Six* I noted similar conclusions from participation in landscape creation. In my conclusion I have suggested which architectural techniques and ownership patterns are most appropriate and suggested how they may be developed. If fully self-reliant and self-governing communities are utopian then many practical advantages to focusing of the *architect user relationship in housing* remain in terms of an environmental and social agenda. It should be noted that:

• this does not negate imposition of regulations and planning restrictions although suggests flexibility;
• participation should also be extended to confederating groups and municipal environmental decisions.

• Social Ecological Cities
For social ecologists whose aim is a complete restructuring of society initiatives that drive change are importantly divided into:

• communes, squats, and alternative co-operative communities that are set up by groups *committed to radical change*;
• initiatives started by non-committed groups that have been developed due to some objective benefits of self-help or environmental measures (including for example most housing co-ops, local energy schemes, city farms and allotments);
• top down environmental measures that are consistent with the city form and technologies outlined here.

The first group approximate Bookchins affinity groups that he defines as collections of intimate friends who are no less concerned with their human relationships than with their social goals. Such groups are catalysts. The later two groups are those areas in the built environment that I suggest could be developed towards social ecological ends by social ecologists. Existing initiatives by non-committed groups are critical in addressing the gradual change in psyche that Bookchin expounds. *I have indicated the most appropriate initiatives on which to build. I have given environmental reasons for their development that may enable government funding.* Clearly a government is not going to fund an anarchist revolution but may support self-help techniques developed with respect to environmental aims and resource savings. They may also support the environmental city initiatives that are common between environmental and social ecological proponents. These are architecturally the 'objective realities' that Bookchin refers to that social ecologists should promote and facilitate. Neither are local communities going to accept such initiatives unless the immediate benefits are communicated effectively.

A critical problem remains the lack of a radical green debate within architecture (there are no social ecological architects). My thesis suggests such a debate may change the definition of environmental design. 'Green' architecture today tends either to be developed out of cities in idyllic escapist settlements or takes a purely technological approach within existing city structures. I have argued that green architecture must address the complexities of cities and aid the development of more politically and productively self-reliant communities through developing methods to facilitate self-help within an environmental framework. Architectural mechanisms consistent with the environmental city I described must be capable of dealing with existing city sites at medium to high densities. While from a social ecological point of few these initiatives may be so minor as to be insignificant during this thesis I also note practical benefits of developing such processes in their own right. I believe I have acquired enough evidence to suggest that the links between sustainability and local self-reliance should continue to be developed within architecture.

Final Remarks

In this thesis I attempted to focus the contributions architects and planners can make towards the development of a more sustainable society. I did this by isolating three areas of concern that are potentially ignored in defining architecture as sustainable. These are:

• the need to consider the efficiency and impact of a building within the context of the efficiency of the city system;
• the need to consider the existing social and economic context of the city, how cities may be qualitatively improved and how we can implement environmental technologies;
• the critique of social, political and economic systems offered by political ecologists who see radical change as essential to achieving a sustainable society.

My discussions in *Chapter One*, while inevitably limited, illustrated the difficulty of defining the term 'sustainable' absolutely. We cannot determine sustainable levels of resource use and pollution and thus sustainable development remains a *subjective concept*. Thus it is embraced by those who would maintain the status quo and those who are radically opposed to it. The utopian nature of much of this debate also raised the issue of existing social divisions and whether sustainability is of secondary importance. In choosing to develop the social ecological position I do not do so unquestioningly. Bookchin seems to visualises limits to growth to a capitalist growth society but not an anarchist one. He believes that change will be slow and uncertain. This argument is a careful attempt at a balance between deep green and environmentalist points of view. It does not address the problems of whether this change will come quickly enough! Here I argue it may be important to continue an *imposing environmental agenda* while empowering. Bookchin also outlines a vision of a sustainable society while maintaining that it cannot be defined today. Initiatives should tend towards it. I have attempted to redefine his form of settlement closer to the existing to make it more relevant. *Arguments between dispersed and concentrated form continues and needs further quantitative exploration. Central to the debate however is the social coherence of each form. Critically it is a debate between more isolated or more diverse and social communities.*

I believe having explored the global divisions at the heart of the environmental debate, issues relating to the efficiency of the city given current technologies, and social and economic problems of existing western cities that criticisms of low energy suburban housing estates and low energy office developments are pertinent in terms of *what agenda they really address*. Any architectural development has an environmental impact but this can be minimised by careful consideration of that building in its *city context*. For radical greens however this will not be sufficient. For radical greens be they deep greens or social ecologists a fundamental change in human relations to each other and their environment is needed. Architecture for these groups must as it were make a *positive contribution* to producing this change.

Ignoring for the moment the revolutionary nature of social ecology from *Chapter One* I would argue that several important concerns define green architectural intervention. Firstly it should consider the relationship of consumption and technology i.e. that an efficient technology may increase consumption. Individual design must thus be related to city and regional plans. Secondly design should introduce natural process into the city where possible i.e. be communicative not hidden. Thirdly it should encourage greater productive self-reliance at national level by choice of materials and the forms of technologies employed. Fourthly it should tend towards equity through redistribution.

The principal radical goal is one of dematerialisation. The question remains as to whether architecture can contribute to such a goal. The social ecological brief offers the notion of replacing materialism with control expressed in architecture through self-help design and build. I noted ideological problems of this connection and practical failures but suggested that certain methods tend towards such aims given action in other areas. Focusing on empowerment can reduce homogenisation of society and give tools of intellectual self-defence. It remains a prerequisite to radical change.

The bottom line of this thesis is that architects concerned with sustainability should be concerned with empowerment. They should be concerned critically with the architect user relationship and enabling people to control their own environments. They should attempt to introduce environmental technologies that facilitate local control and communicate process. Such an approach is practically efficient, can address social and economic problems within the city, improves the city environment and plays a small part in the breaking down of hierarchies that is a means towards de-materialisation.

Bibliography

Albrecht, G., 'Ethics, Anarchy and Sustainable Development', *Anarchist Studies*, Autumn 1994.
Alderson, J. V. and Guy, A. G., *The Monitored Behaviour of Occupied Low Energy Bungalows - Final Report*, ETSU S1003.
Alexander, C., Davis, H., Martinez, J. and Corner, D., 'The Production of Houses', in Hatch, R., *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Alexander, C., Davis, H., Martinez, J. and Corner, D., *The Production of Houses*, Oxford University Press, 1985.
Amery, C., 'Byker Housing: Criticism', *Architectural Review*, December 1974.
Anderson, B. (ed.), *Solar Building Architecture*, MIT Press, 1990.
Anderson, H., 'Appraisal', *Architects' Journal*, 18 July, 1984.
Armor, M., *Building Your Own Home*, Prism Press, 1990.
Ascehoug, O., 'Glazed Spaces - Research and Development in Norway', *ISES Conference Proceedings*, September 1987.
Ashley, S., 'Sophisticated Trombe', *RIBA Journal*, October 1983.
Aspinall, S., *Visionaries: Changing the way we live*, Channel Four Television, 1993.
Baines, C., 'Community Involvement in Creative Ecology', in Ruff, A. R., and Tregay R., (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
Baker, N. and Mulligan, H., 'Existing Housing', *Energy Saving through Landscape Planning Vol 4*, PSA, 1988.
Bakker, F. E., *3E Wonen*, Afdeling Bouwkunde Tu Eindhoven, 1993.
Balcomb, J. D., 'World Outlook for Passive Solar', *Clean and Safe Energy Forever*, Solar World Conference, 1989.
Banham. R., *The Architecture of a Well-tempered Environment*, Architectural Press, London, 1969.
Barber, R., 'Trained by Whales', *Landscape Design*, May 1989.
Bartholomew, D. M. L., 'Possibilities for passive solar house design in Scotland', in Mac Gregor, K. (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
Beazely, E., 'Sun, Shade and Shelter', *Landscape Design*, October 1990.
Beazely, E., 'Sun, Shade and Shelter', *Landscape Design*, December 1990/January 1991.
Beazely, E., 'Sun, Shade and Shelter', *Landscape Design*, November 1990.
Beazely, E., 'Sun, Shade and Shelter', *Landscape Design*, February 1990.
Beddington, N., 'Gartnerhof at Gansemdorf', *Architectural Review*, June 91.
Beisi, J., 'A Planning Process Involving Local People in Urban Renewal', *Open House International*, Vol.19 No.3, 1994.
Betts, B., 'Hydrobotanic Treatment of Eutrophic Waste Waters', *Permaculture News*, Summer 1990.
Birchall, J., *Building Communities the Cooperative Way*, Routledge and Kegan Paul, London, 1988.
Blowers, A. (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.
Blundell Jones, P., 'The Path to Lewisham', *Architects Journal*, 4 May 1988.
Blundell Jones, P., 'Student Self-Build in Stuttgart', *Architects Journal*, 27 July 1983.
Boekholt, J. T., interview, August, 1992.
Bookchin, M., *The Ecology of Freedom*, Black Rose Books, Montréal, 1991.
Bookchin, M., *The Philosophy of Social Ecology*, Black Rose Books, Montréal, 1990.
Bookchin, M., *Post Scarcity Anarchism*, Black Rose Books, Montréal, 1986.
Bookchin, M., *Remaking Society*, Black Rose Books, Montréal, 1989.
Bookchin, M., *Towards an Ecological Society*, Black Rose Books, Montréal, 1986.
Bookchin, M., *Urbanisation without Cities*, Black Rose Books, 1992.
Bookchin, M. and Foreman, D., *Defending the Earth*, South End Press, Boston, Massachusetts, 1991.
Bookchin, M., '"1984" and the Spectre of Demerorization", Hewitt, M. and Roussopoulos D. I. (eds.), *1984 and After*, Black Rose Books, Montréal, 1984.
Bos, H. J. in Laurie, I. (ed.), *Nature in Cities*, John Wiley and Sons, 1979.
Boyes-Mclauchlan, M., 'Edible Landscapes', *Landscape Design*, November 1990.
Boyle, S., *An Alternative Energy Path for the UK*, Friends of the Earth, London, 1988.
Bradshaw, A. D., 'Landscape as Ecosystems', Ruff, A. R., and Tregay R., (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
Bramwell, A., *Ecology in the 20th Century: A History*, Yale University Press, 1989.
BRE, 'Climate and Site Development Part 1: General climate of the UK', *BRE Digest 350*, Watford, February 1990.

BRE, 'Climate and Site Development Part 2: Influence of microclimate', *BRE Digest 350*, Watford, February 1990.
BRE, 'Climate and Site Development Part 3: Improving the microclimate through design', *BRE Digest 350*, Watford, April 1990.
BRE, 'The influence of trees on house foundations in clay soils', *BRE Digest 298*.
BRE, *Estate Layout for Passive Solar Housing Design*, ETSU S 1126, 1986.
BRE, *Passive stack ventilation of dwellings*, Information Paper, 21/89.
Breheny, M. and Rookwood, R., 'Planning the Sustainable City Region', in Blowers, A. (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.
Broadbent, G., 'Commentary on Lycee David', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Broadbent, G., 'A Last Word', in Hatch, R., (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Broome, J., 'The Segal Method', *Architects Journal*, 5 November 1986.
Broome, J. and Richardson, B., *the self build book*, Green Books, Bideford, 1991.
Buchanan, P., 'Byker: The Spaces Between', *Architectural Review*, December 1981.
Buchanan, P., 'City as Natural Habitat versus City as Cultural Artefact', *Architectural Review*.
Burberry, P., 'Building Regulations 1990 Revisions: Part L', *Architects Journal*, 29 February 1990.
Burgess, R., 'Self-Help Housing Advocacy: A curious form of Radicalism', Ward, P. M. (ed.), *Self-Help Housing: A Critique*, Mansell Publishing Limited, London, 1982.
Burnham, R., *Self Help Housing and Ecology*, PhD Thesis, Liverpool University, 1994.
Burnham, R., *The Natural Relationship: A Discussion of Participatory Architecture*, BArch Dissertation Liverpool University, 1990.
Cadman, D. and Payne, G., (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
Cadman, D. and Payne, G., 'Towards another city', in Cadman, D. and Payne, G. (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
Carp, J., 'Twenty Years of SAR', in Hatch, R., *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Carson, R., *Silent Spring*, Penguin Books, 1962.
Chapman, J., 'Energy Efficient Houses The Principles', *Architects Journal*, 9 November 1988.
Chomsky, N., *Year 501; The Conquest Continues*, Verso, London, 1993.
Colemam, A., *Utopia on Trial*, Shipman, London, 1985.
Commission of European Communities, 'Gifford Park', *Project Monitor Issue 1*, Commission of European Communities, June 1987.
Cope, H., *Housing Associations, Policy and Practice*, MacMillan Education Ltd, London, 1990.
Courtney, R. G., 'High insulation - scenario for the future', *International Journal of Ambient Energy*, July 1987.
Cox, G. W., 'The Linkage of Inputs to Outputs in Agroecosystems', in Lowrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.
Cregn, M., 'Open Space and the Quality of Urban Life', *Landscape Design*, June 1990.
Cullen, J., 'Mad Maurice III: metropolitans in the making', in Cadman, D. and Payne, G. (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
Daly, H. E., 'The Perils of Free Trade', *Resurgence*, March/April 1994.
Darbourne and Darke, 'Social needs and Landscape Architecture', in Mikellides, B. (ed.), *Architecture for People*, Cassell Ltd, 1980.
Davidson, J. and MacEwen, A., *The Livable City*, RIBA Publications, London, 1984.
Davidson, J., *How Green Is Your City*, Routledge and Kegan Paul, London, 1987.
Deilmann, H., Bickenbach, G. and Pfeiffer, H., *Living in Cities*, Karl Kramer Verlag, Stuttgart 1987.
Dobson, A., *Green Political Thought*, Harper Collins Academic, London, 1990.
Dodd, J. S., *Energy Saving through Landscape Planning*, PSA, Vol. 1, 1988.
Dodd, J., 'Greenscape 1 - The Place of Buildings', *Architects Journal*, 12 April 1989.
Dodd, J., 'Greenscape 2 - Climate and Form', *Architects Journal*, 19 April 1989.
Dodd, J., 'Greenscape 3 - Solar Architecture', *Architects Journal*, 26 April 1989.
Dodd, J., 'Greenscape 4 - Tempering Cold Winds', *Architects Journal*, 3 May 1989.
Dodd, J., 'Greenscape 5 - Green Cities', *Architects Journal*, 10 May 1989.
Doggart, J. and Flood, M., 'Energy form Renewables - 1 The Solar Contribution', *Architects Journal* 13 September 1989.
Edwards, D., 'Deceptive Freedom', *Resurgence*, January, February 1994.
Egelius, M., 'Housing and Human Needs: the Work of Ralph Erskine' in Mikellides, B. (ed.) *Architecture for People*, Cassell Ltd, 1980.
Ekins, P. (ed.), *The Living Economy*, Routledge and Kegan Paul, London, 1986.

Ekins, P., 'Rise of the larger lout', *Environmental Guardian*, September 25 1992.
Elkin, T., McLaren, D., Hillman, M., *Reviving the City, Towards sustainable urban development*, Friends of the Earth, 1991.
Ellis, C., 'Homes fit for Heroes', *Architectural Review*, March 1987.
Energy Technical Support Unit, 'Housing estate layout - an assessment study', *Passive Solar Design Programme Leaflet*, ETSU, 1987.
Energy Technical Support Unit, 'Housing estate layout - a design aid', *Passive Solar Design Programme Leaflet*, ETSU, 1987.
Energy Technical Support Unit, *Solar Building Study: Oak Farm Road*, ETSU S 1160/SBS/10.
Erskine, R., 'Designing between Clients and Users', in Hatch R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Finbow, M., 'The contribution of shelter planting', in Dodd, J. S. (ed.), *Energy Saving through Landscape Planning*, Vol 3, Property Services Agency, 1988.
Foley, G., 'Mumford on the City', *The Ecologist*, No 3, 1989.
Franta, G., 'Thermal Energy Distribution in Building Interiors', in Anderson, B. (ed.), *Solar Building Architecture*, MIT Press, 1990.
Fromm, D., *Collaborative communities: Cohousing, Central Living, and Other New Forms of Housing with Shared Facilities*, Van Nostrand Reinhold, 1991.
Furedy, C., 'Incidental Greening - Saving Resources in Asian Cities', Gordon, D. (ed.), *Green Cities: ecologically-sound approaches to urban space*, Montréal, 1990.
Galleano, E., 'View from the South', in Vidal, J. (ed.), 'earth', *the Guardian*, June 1992.
George. S, 'Dept', in Vidal, J. (ed.), 'earth', *the Guardian*, June 1992.
German, T., 'The hand that feeds itself', *Environmental Guardian*, Friday February 11, 1994.
Ghazi, P., 'Heat is on to stop the slow thaw', *The Observer*, 26 March 1995.
Gossop, C. and Webb, A., 'Getting Around: Public and Private Transport', in Blowers, A. (ed.), *Planning for a sustainable environment*, London, 1993.
Gordon, D. (ed.), *Green Cities: ecologically-sound approaches to urban space*, Montréal, 1990.
Gotnic, A., 'Commentary on Molenvliet', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Gott, R., 'Comment', in Vidal, J. (ed.), 'earth', *the Guardian*, June 1992.
Goulding, J. R., Lewis, J. O. and Steemers, T. C. (eds.), *Energy Conscious Design: A primer for Architects*, B. T. Batsford Ltd, 1992.
Goulding, J. R., Lewis, J. O. and Steemers, T. C., *Energy in Architecture: The European Passive Solar Handbook*, B. T. Batsford Ltd for C. E. C, 1992.
Gracie, V., 'Architect's account', *Architects Journal*, 16 May 1979.
Gracie, V., 'Pitfalls in Participation: A Cautionary Tale (of Success)', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Gustén, J., 'Energy Efficient Building: Sweden', *European Directory of Energy Efficient Building*, James and James Science Publishers, London, 1993.
Habraken, N. J., *Supports: an alternative to mass housing*, Architectural Press, 1985.
Habraken, N. J., Boekholt, J. T., Thijssen, A. P. and Dinjens, P. J. M., *Variations: The Systematic Design of Supports*, MIT Cambridge Massachusetts, 1976.
Habraken, N. J., *Transformations of the Site*, 1983, Awater Press, Cambridge Ma USA, 1983.
Hackney, R., 'Macclesfield', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Hague, B., Sewage Power, *Review*, dti, Summer 1992.
Hall, K. and Warm, P., *Greener Building*, AECB, 2nd Edition.
Hall, P., *Cities of Tomorrow*, Blackwell, Oxford 1988.
Halsall, B., 'Participatory Design and Housing Co-operatives', in CDS, *Building Democracy: housing co-operatives on Merseyside*, CDS, 1987.
Hamdi, N., 'PSSHAK: Primary Support Structures and Housing Assembly Kits', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, 1984.
Hamdi, N., 'Response to Turner', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Hanna, J., 'Feet first: Putting people at the centre of planning', in Tolley, R. (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
Harms, H., 'Historical Perspectives on the Practice and Purpose of Self-Help Housing', in Ward, P. M., *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.
Harrison, P., 'Analysis', in Vidal, J. (ed.), 'earth', *the Guardian*, June 1992.
Harrison, P., *The Third Revolution*, Penguin Books, 1992.
Hart, R., 'The City Forest', *Permaculture News*, Summer 1990.
Hatch, R., *The Scope of Social Architecture*, Van Rostrund Reinhold, 1984.

Hatch, R., 'Introduction', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Hatch, R., 'Toward a Theory of Social Architecture', in Hatch, R., *The Scope of Social Architecture*, Van Rostrund Reinhold, 1984.
Hay, D., 'On the Development of Cities', in Cadman, D. and Payne, G. (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
Hertzberger, H., 'Shaping the Environment', in Mikellides, B. (ed.), *Architecture for People*, Cassell Ltd, 1980.
Hertzberger, H., 'The Interaction of Form and Users', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Hestnes, A. G., 'Atrium Buildings for Cold Climates', *Clean and Safe Energy Forever*, Proceedings of the Solar World Conference, 1989.
Hewitt, M. and Roussopoulos D. I. (eds.), *1984 and After*, Black Rose Books, Montréal, 1984.
Higgins, S., 'The City Green', *Architects Journal*, 5 February, 1986.
Hildon, A. and Howrie, A. J., 'Buildability of highly insulated airtight structures', *International Journal of Ambient Energy*, July 1987.
Hillman, M., 'Planning for green modes: a critique of public policy and practice', in Tolley, R. (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
Hobday, R., 'Sunlight, health and energy efficient building', *International Journal of Ambient Energy*, July 1992.
Hodges, L., 'The Hodges Residence: the first ten years', *International Journal of Ambient Energy*, January 1991.
Holliday, J., 'Ecosystems and Natural Resources', in Andrew Blowers (ed.), *Planning for a sustainable environment*, Earthscan, 1993.
Holmes, J. and Steely, G., 'Town and country', in Cadman, D. and Payne, G. (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
Hough, M., *City form and natural process*, Croom Helm, 1984.
Howard, B., and Fraker, H., 'Thermal Energy Storage in Building Interiors', in Anderson, B. (ed.), *Solar Building Architecture*, MIT Press, 1990.
Howard, E,. *Garden Cities of Tomorrow*, 1970.
Hutchison, K,. *Greening British Cities*, BArch Dissertation, Liverpool University, 1991.
Irvine, S. and Ponton, A., *A Green Manifesto: Policies for a Green Future*, Macdonald Optima, London, 1988.
Jackson, W., 'Towards a Unifying Concept for an Ecological Agriculture', in Lowrence, Stinner and House (eds.) *Agricultural Ecosystems*, John Wiley and Sons, 1984.
Johnson, J., 'Establishing Ecology Parks in London, in Gordon, D. (ed.), *Green Cities*, Black Rose Books, 1990.
Johnson, M., 'Urban Forestry and the Environmental Crisis', *Landscape Design*, October 1990.
Jourda and Perraudin, 'First Prize, Category C - Single Dwelling', in Lebens, R., *Passive Solar Architecture in Europe*, Architectural Press, 1980.
Jung, C., *Memories, Dreams and Reflections*, Collins, 1971.
Kelbaugh, D. (ed.), *The Pedestrian Pocket Book: a new suburban design strategy*, Princeton Architectural Press, 1989.
Kesler, B., interview, Het Punt, Wageningen, August 1993.
Kohonen, R., 'Energy Efficient Building: Finland', *European Directory of Energy Efficient Building*, James and James Science Publishers, London, 1993.
Kourik, R., 'Edible Landscaping?', *The Mother Earth News*, May/June 1985.
Kroll, L., *Architecture of Complexity*, Batsford, 1987.
Kroon, M., 'Traffic and environmental policy in the Netherlands', in Tolley, R. (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
Laurie, I. (ed.), *Nature in Cities*, John Wiley and Sons, 1979.
Lebens, R., *Passive Solar Architecture in Europe*, Architectural Press, 1980.
Lebens, R., 'Guidelines for Passive Solar Heating Design, Appendix B', in Lebens, R. (ed.) *Passive Solar Architecture in Europe*, Architectural Press, 1980.
Leigh, D., 'Water in the Landscape', *Permaculture News*, Spring 1991.
Levin, H. and Teichman, K., 'Indoor Air Quality - for Architects', *Progressive Architecture*, March 1984.
Levine, D., *Building young lives*, NFHA, 1989.
Lewis, C. A., 'Healing in the Urban Environment', *APA Journal*, July 1979.
Lewis, M., *Green Delusions*, Duke University Press, 1992.
Lillington, C., 'Permaculture in the City', *Permaculture News*, Summer 1990.
Linn, K., 'Commentary on Mexicali', in Richard Hatch (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.

Lowe, M. D., 'Alternatives to the Automobile, Transport for Livable Cities', *Worldwatch Paper 98*, Worldwatch Institute, October 1990.
Lowrence, Stinner and House (eds.), *Agricultural Ecosystems*, John Wiley and Sons, 1984.
Lundgaard, B., First Prize, 'Category B - Clustered Housing', in Lebens, R. (ed.), *Passive Solar Architecture in Europe*, Architectural Press, 1980.
Luscombe, G., 'The Greensight Approach', in Ruff, R., and Tregay R., (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
Lynch, K. and Hack, G., *Site Planning*, MIT, 1984.
Mabey, R., *The Unofficial Countryside*, Sphere Books, 1978.
Macdonald, R., 'The European Healthy Cities Project', *Urban Design Quarterly*, April 1989.
MacGregor, K. (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
MacGregor, K., 'Potential for solar energy in northern climates', in Mac Gregor, K (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
Malpass, P., 'The other side of the Wall', *Architects Journal*, 9 May 1979.
Malpass, P., 'The politics of participation', *Architects Journal*, 16 May 1979.
Marshall, P., *Demanding the Impossible*, Fontana Press, London , 1993.
McHarg, I., *Design with Nature*, Natural History Press, 1969.
Mckibben, B., *The End of Nature*, Penguin, 1990.
Meadows, D. H., Meadows, D. L., Randers, J. and Behrens III, W., *The Limits to Growth*, Pan, London, 1983.
Mikellides, B. (ed.), *Architecture for People*, Cassell Ltd, 1980.
Milbank, N., 'Housing: The Passive Solar Approach to New and Existing Domestic Buildings', in O'Sullivan, P. (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985.
Mitchell, R., 'The Ecological Basis for Comparative Primary Production', in Lowrence, Stinner and House (eds.), *Agricultural Ecosystems*, John Wiley and Sons, 1984.
Moffat, A. and Schiler, M., *Landscape Design that Saves energy*, William Morrow and Company, 1981.
Moffat, D. and Greenwood, R., 'Techniques for an Ecological Landscape', in Ruff, A. R., and Tregay R., (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
Mollison, B., *Permaculture: A Practical Guide For a Sustainable Future*, Island Press, 1990.
Moore Lappé, F. and Collins, J., *Food First*, Abacus, London, 1982.
Monbiot, G., 'Lament for the common people'. in Vidal, J. (ed.), 'Changes', *the Guardian*, June 1994.
Murray, K., 'mixing activities and uses', paper delivered to, *Making People Friendly Towns*, Birmingham, 25 November 1993.
Mumford, L., *The City in History*, Penguin, Harmondsworth, 1961.
Newman, P. W. G., *Urban Villages: Concept for the 90's*, paper delivered at ECODesign Conference, RMIT, Melbourne, October 1991.
Newman, P. W. G., and Kenworthy, J. R,. *Cities and Automobile dependence: a sourcebook*, Gower Technical Press, Aldershot, 1989.
Nicholson-Lord, D., *The Greening of the Cities*, Routledge and Kegan Paul, 1987.
Nielson, S., 'Options on energy', *Architects Journal*, 23 May 1984.
OBOM, *Habitat sur Mesure*, Strichting Open Bouwen, Delft.
Odum, E. P., 'Properties of Agroecosystems', in Lowrence, Stinner and House (eds.), *Agricultural Ecosystems*, John Wiley and Sons, 1984.
Odum, H. T., *Environment Power and Society*, Wiley-Interscience, 1991.
Ospina, J., *Housing Ourselves*, Hilary Shipman, 1987, London.
O'Sullivan, P. (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985.
O'Sullivan, P., 'Passive Solar Techniques and their Application in Existing and New Technology', in O'Sullivan, P. (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985.
O'Sullivan, P., 'Conclusions and Recommendations', Patrick O'Sullivan (ed.), *Passive Solar Energy in Buildings*, Elsevier Science Ltd 1985.
Pacaud, D., 'Summing Up', *Architects' Journal*, 18 July, 1984.
Page, D., *Building for communities: A study of new housing association estates*, Joseph Rowntree Foundation, 1993.
Page, J. and Lebens, R. (eds.), *Climate in the United Kingdom*, HMSO, London, 1986.
Palz, W. and Steemers, T. C., *Solar Houses in Europe: How they have Worked*, Pergamon Press, Oxford, 1981.
Parkin, S., 'Market Madness', *Environmental Guardian*, September 25 1992.
Parkin, S., 'Rainforest Economy', *Resurgence*, March/April 1994.
Pascall, W. B. and Phelps, B. U., 'Passive Solar Housing for the UK mass Market', *Clean and Safe Energy Forever*, Proceedings of the Solar World Congress, Permagon Press, 1984.

Pearce, D., Markandya, A., Barbier, E., *Blueprint for a Green Economy*, Earthscan, London, 1989.
Pearson, D., *The Natural House Book*, Conran Octopus, London, 1989.
Pierce, J. T., *The Food Resource*, Longman Scientific and Technical, 1990.
Pitts, G., *Energy Efficient Housing - A Timber Frame Approach*, TRADA, Watford, 1989.
Porteous, C., 'The Potential for sunspace buffer zones in Scottish housing', in Mac Gregor, K. (ed.), *Solar Energy at High Latitudes*, Ambient Press, 1980.
Pratt, S., 'A New Water Treatment System', *Permaculture News*, Summer 1990.
Prowler, D., and Kelbaugh, D., 'Building Envelopes,' in Anderson, B. (ed.), *Solar Building Architecture*, MIT Press, 1990.
Randen, A. van, 'Consumer oriented building: in full control of and behind one's front door', in Vreedenburgh, E. (ed.), *entangled building...?*, Werkgroep OBOM, 1992.
Rajan, V. (ed.), *Rebuilding Communities*, Green Books, 1993.
Ravetz, A., 'Commentary on Byker', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Rees, W., 'The ecology of sustainable development', *The Ecologist*, 20(1): 18-23, 1990.
Rettig, S., 'The Rise of the 'Ecological Approach' to Landscape Design', *Landscape Design*, No. 6, 1983.
RIBA, 'How layout can affect solar gain', *RIBA Journal*, October 1983.
RIBA, 'Old Houses Have Energy Potential', *RIBA Journal*, October 1983.
RIBA, 'Terraced Houses Show Big Savings', *RIBA Journal*, October 1983.
RIBA, 'Design on the Private Sector Home', *RIBA Journal*, October 1983.
RIBA, 'Economic Square Plan for Semi-D's', *RIBA Journal*, October 1983.
Ridley, L., 'Site, Community and Urban Planning', in Anderson, B. (ed.), *Solar Building Architecture*, MIT Press, 1990.
Riley, P., *Economic Growth, the Allotments Campaign Guide*, Friends of the Earth, London 1979.
Roberts, J., 'The economic case for green modes', in Tolley, R. (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
Robertson, J., *The Economics of Local Recovery*, New Economics Foundation, London 1986.
Robertson, J., 'Alternative futures for cities', in Cadman, D. and Payne, G., (eds.), *The Living City, Towards a sustainable future*, Routledge, 1990.
Rooijen, H. van, interview, LCVW, Utrecht, August 1993.
Rook, A., 'Landscape Aid', *Landscape Design*, May 1989.
Rookwood, R., 'Making it Happen', in Blowers A., (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.
Ruff, A. R., *Holland and the ecological landscapes 1973-1987*, Delftse Universitaire, 1987.
Ruff, A. R., 'An Ecological Approach to Landscape Design', in Ruff, A. R., and Tregay R., (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
Ruff, A. R., and Tregay R., (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
Sale, K., *Human Scale*, Secker and Warburg, London, 1980.
Sankey, S., 'Environmental Interpretation and the Birchwood Park Ranger Service', in Ruff, A. R., and Tregay R., (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
SAR, *REISGIDS: travellers guide*, SAR, Eindhoven, 1984.
Schimmelschmidt, M., 'Our Third Skin: Hazard or Shelter', *RIBA Journal*, October 1989.
Schwarz, W., 'Anatomy of an eco-anarchist', *the Guardian*, 15 May 1992.
Seabrook, J., *The Myth of the Market: Promises and Illusions*, Green Books, Bideford, 1990.
Seabrook, J., *The Race for Riches*, Green Print, Basingstoke, 1988.
Segal, W., 'The Housing Crisis in Western Europe: Britain - assessment and options', in Byron Mikellides, B. (ed.), *Architecture for People*, Cassell Ltd, 1980.
Stead, P., *Self-build Housing Groups and Co-operatives: Ideas in practice*, Anglo-German Federation, London, 1979.
Sherlock, H., Cities *Are Good For Us: The case for high densities, friendly streets, local shops and public transport*, Transport 2000, London, 1990.
Shirley-Smith, C., 'A Patchwork View of Action involving Community Groups on ten Derelict Land Sites in Europe', *Landscape Research*, 14(2) 1989.
Shurcliff, W., *Super Insulated Houses and Air to Air Heat Exchangers*, Brick House Publishing Company, 1987.
SkillBuilding, *SkillBuilding Sponsors' Manual*, C.H.I. (SkillBuilding) Ltd, 1992.
SkillBuilding, *SkillBuilding Site Manual*, C.H.I. (SkillBuilding) Ltd, 1992.

Soil Association, *Soil Association standards for Organic Agriculture*, Soil Association, Bristol, 1989.
Sopper, W., 'Forests as Living Filters for Urban Sewage', in Gordon, D. (ed.), *Green Cities*, 1990.
Stamp, D., 'Inner City Community Gardens', *Landscape Research*, 12 (1) 1987.
Strichting Experimentele Woningbouw, 'Commentary on Diagoon Houses: Resident Interviews', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Tolley, R., 'A hard road: the problems of walking and cycling in British cities', in Tolley, R. (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
Tolley, R. (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
Tregay, R., 'Nature and an Ecological Approach to Landscape Design', in Ruff, A. R., and Tregay R., (eds.), *An Ecological Approach to Urban Landscape Design*, Occasional Paper Number 8, University of Manchester Department of Town and Country Planning, 1982.
Turner, J. F. C., 'Commentary on SAR', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Turner, J. F. C., *Housing by People: Towards Autonomy in Building Environments*, Marion Boyars, London, 1991.
Turner, J. F. C., 'Barriers, channels and community control 1', in Cadman, D. and Payne. G. (eds.), *The Living City*, Routledge, 1990.
Turner, J. F. C., 'The Community Base of Sustainable Development', in Rajan, V. (ed.), *Rebuilding Communities*, Green Books, 1993.
Turrent, D., Doggart, J. and Ferraro, R., *Passive Solar Housing in the UK*, ETSU, 1980.
Turrent, D. and Steemers, K., 'Domestic Low Energy - 4 Beyond the Regs', *Architects Journal*, 11 April 1990.
Vale, B. and R., *Green Architecture: Design for a sustainable future*, Thames and Hudson, London 1991.
Vale, B. and R., *Towards a Green Architecture*, RIBA Publications Ltd, 1991.
Vale, B. and R., 'Building the Sustainable Environment', Blowers, A. (ed.), *Planning for a sustainable environment*, Earthscan, London 1993.
Vickers, G., 'Segal's Legacy', *Architects Journal*, 4 May 1988.
Vidal, J. (ed.), 'earth', *the Guardian*, June 1992.
Vidal, J. (ed.), 'Changes', *the Guardian*, June 1994.
Vreedenburgh, E. (ed.), *entangled building...?*, Werkgroep OBOM, 1992.
Wallis, S., 'Springing the poverty trap', *Environmental Guardian*, September 25 1992.
Ward, C., *Housing: An anarchist approach*, Freedom Press, London, 1983.
Ward, C., *Welcome Thinner City: Urban Survival in the 1990's*, Bedford Square Press, London, 1989.
Ward, C., 'Giroscope', in *Freedom*, Vol. 56 No. 8, 29th April, 1995.
Ward, C., 'Participation or Control', in Ward, C., *Housing: an anarchist approach*, Freedom Press, London, 1993.
Ward, C,. 'Preface', Turner, J. F. C. *Housing by People: Towards Autonomy in Building Environments*, Marion Boyars, London, 1991.
Ward, P. M., *Self-Help Housing: A Critique*, Mansell Publishing Limited, 1982.
Webb, A. and Gossop, C., 'Towards a Sustainable Energy Policy', Blowers, A. (ed.), *Planning for a sustainable environment*, Earthscan, London, 1993.
Werf, F. van der, 'A Vital Balance', in Hatch, R. (ed.), *The Scope of Social Architecture*, Van Nostrand Reinhold, New York, 1984.
Whitelegg, J., 'The principle of environmental traffic management', in Tolley, R. (ed.), *The Greening of Urban Transport*, Belhaven Press, London, 1990.
Wilkin, D. I., 'Architects' account', *Architects' Journal*, 18 July, 1984.
World Commission on Environment and Development, *Our Common Future*, OUP, Oxford, 1987.

BLANK IN ORIGINAL

Illustrations

Chapter 7: Sustainable Development, City Form and Process

Chapter 9: Self-help Housing: Architectural Support Strategies

Chapter 10: Conclusions