

**A SYSTEMATIC METHODOLOGY TOWARD CREATING
SPATIAL QUALITY IN URBAN SETTINGS**

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**Thesis submitted in partial fulfilment of the requirements
for a Master of Arts Degree in Environmental Science,
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**A SYSTEMATIC METHODOLOGY TOWARD
CREATING SPATIAL QUALITY
IN URBAN SETTINGS**

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Masters 1989



**UNIVERSITY OF CAPE TOWN
DEPARTMENT OF ENVIRONMENTAL AND GEOGRAPHICAL SCIENCE**

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ABSTRACT

Urban settings, conceived and implemented in the climate of modern day urbanisation and technology, show undesirable trends. In the typical situation, due to the absence of the urban dweller's participation in the planning and design process, prescriptive decision-making directs and shapes the urban environment on the basis of the objectives of the trained professional or a developer.

The disciplines of architecture, urban design and urban planning, well endowed with research in terms of their philosophical, cultural and historical dimensions, traditionally overlook systematic and impartial methods in realisation of design objectives. In addition, architects generally focus within the confines of the immediate site, ignoring the wider context. Urban planners and designers tend to follow their perceptions of the urban setting and pragmatic objectives, and to overlook the elements which constitute spatial quality for others. Planning and design tasks performed in this way are prescriptive and perfunctory, and do not meet the urban dweller's perceptions of spatial quality. Although the planning and design disciplines can avail themselves of considerable intellectual resources, systematic methods to synthesise both the subjective opinion of the urban dweller and expert opinion of specialists are lacking. With current global scenarios, the need to develop methods for participation becomes even more relevant and urgent. The likelihood of high density settings is ominous without changes in planning and design approaches.

The overall objective of this thesis is to develop a methodology which meets the demands of the situations described. The data for this study are derived from a theoretical examination of the attributes which contribute to the perceptions of spatial quality in the urban setting. A thematic analysis, carried out against the background of factors, such as spatial patterning, links social well-being with characteristics of the urban environment.

Consistent and invariant spatial quality indicators are derived which are then associated with spatial performance. A spatial frame is then identified to structure the methodology into recognisable and manageable urban spatial components. Expectations of spatial performance are translated systematically into primary planning and design generators to complete the elements of the methodology. The problem of how to involve urban dwellers and specialist designers and planners for a consensus useful in the planning process is examined. The comprehensive methodology developed by Sondheim for assessing environmental impacts incorporates the necessary features for adaptation to new urban settings and resolves the problem of polling divergent priorities without requiring discussion or consensus amongst participants. The matrix procedures of the chosen methodology involve both subjective and informed qualitative evaluation without the use of environmental indices, which are found wanting as measures of quality. Post-multiplication of the matrices produces ranking of planning and design generators in order of importance, which, effectively, represents the choice of the urban dweller.

The methodology is operationalised to test the matrix and post-multiplication procedures, and the rationality of the result. For the case model presented, a rational result was obtained, which supports the adaptation of the methodology for creative purposes. The ranking is referred to a source book, which allows the systematic transformation of the primary planning and design generators into recognisable and conventional planning directives.

As a contribution to the planning and design fields, the methodology is a useful creative tool, effectively addressing the problem of the interface between planner and user in the attainment of spatial quality in the development of new urban settings. Furthermore, the procedures can be operationalised to meet an infinite range of variables, or spatial scenarios within the urban setting.

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"Quite often the Townplanner does not know that in an attempt to create order, he introduces a measure of chaos: or that he approaches some urban problems from a biased and fragmented viewpoint. With his conception highly weighted in favour of who shall approve his plan: the policy-makers, the decision-makers, and people of the planner's social status, the plan often ends up giving advantages to a few people, leaving the large majority of urban dwellers at the mercy of the ambivalent ambience.

Urban planning should therefore be framed in terms of doing the best to coordinate organisational and spatial relationships among urban dwellers who are space users within the city".

Uyanga, J., 1989: Urban Planning in Nigeria, Habitat International, 13(1), p141

A SYSTEMATIC METHODOLOGY TOWARD CREATING SPATIAL QUALITY IN URBAN SETTINGS

COMPONENTS OF THE STUDY

The environmental movement has spawned a new emphasis on environmental quality, not least in the urban context. Whereas, prior to this movement, studies were confined to the perception of physical elements common to all environments, such as scale, colour, texture and ease of mobility, the new emphasis uses the urban dweller's welfare as a starting point. In present day contexts all aspects of the total environment are holistically dealt with. This includes the concern for socio-cultural perspectives of urban dwellers relating to the quality of their environment in the urban setting. Knesl (1985, p 144) recognises this concern in terms of "non-verbal concepts which evolve from the physical embodiment of activities, social practices and interests" and which "will speak to the people who live in these physical concepts, day by day".

The task undertaken in this study is to penetrate the abstract nature of these concepts, and to determine if perceptions of environmental quality can be quantified in a manner which can then be of use in policy- and decision-making. The ability to quantify these concepts and to incorporate abstract data meaningfully into the planning and design process would be of immeasurable value to the specialist involved with shaping the urban environment. In fact, researchers agree on the need to develop a social theory of urban space, which would assist designers "to speculate in a more informed way about the possible consequences of different design strategies, while at the same time adding new creative dimension to those speculations" (Hillier, 1984, p 29).

Designers, like many other creative people, structure their activity according to how they perceive reality, and, in the process of managing information,

become regulators. "Even when trying to be impartial, designers cannot help manipulate information which is biased by their perception of reality and which may not be shared by lay participants in the design process" (Weber, 1975, p104). Individual or group perceptions of the urban setting are often consistent and as such can be useful in providing an indication of the quality of the urban setting. As Heath (1984, p 104) observes "there is plenty of evidence that, despite an element of selective attention, by and large people see what there is to be seen". From this it can be assumed that if the quality of the urban environment is good it will be recognised as good and conversely if it is poor, it will be recognised as poor. Generally, therefore, expectations and attitudes toward quality in the urban setting are largely conforming.

In the process of planning and designing the urban setting there has been in the past a tendency to neglect analysis and disregard the urban dweller's perception of what attributes constitute spatial quality. Since the urban setting contributes to the social well-being of a great number of people, the attainment of quality, should be of particular concern to all who shape the urban environment. Furthermore, the views of individual users of urban space, should be included in the planning process in a meaningful way.

To address some of the shortcomings of the normative approach to planning urban space, the primary objective of this study is to develop a methodology, which can systematically quantify specialist and community preferences, in an integrated way, in relation to identified attributes of urban space. In the proposed methodology, there are two secondary objectives. These are firstly the identification of indicators of the environmental quality which characterise social spaces in urban settings. Secondly, to identify those components of the urban spatial network which are familiar to specialists and the urban dweller alike, and which typify most urban settings.

Potential participants in this methodological procedure are the public administrators, who practise planning and design policy, and the specialists

advising in the field of urbanisation, where planning and design policy is carried out. More importantly however, is the departure from the normal approach with, in this case, the specific involvement of the urban dweller. In the proposed methodology, therefore, the opportunity is afforded the user to register preference at the point where a planning and design brief is being developed.

To satisfy the primary objective of developing a systematic methodology, this study aims to:

- Adapt Sondheim's (1977) modelling procedure for environmental impact assessment, so that it can be applied to creative activity in terms of urban development, and will involve the urban dweller in the decision-making process. The technique has the capability of enabling both the urban dweller and specialists to participate at the introductory planning stage and also allows the incorporation of a wide range of environmental attributes and planning goals. By a process of evaluation all the components are integrated in a meaningful way;
- Operationalise the model and test the procedure and efficacy for use in initiating planning and design decisions; and
- Produce a planning and design source book to show how the method can be readily applied once the planning and design axioms have been isolated on the basis of importance.

To satisfy the secondary objective of this study and in order to inform the adaptation of the methodological procedure, the aims are:

- To identify the spatial components of the urban network that both initiate and structure social interaction, and will therefore provide a frame for the methodological procedure;

- To identify those physical attributes of spatial quality which contribute to social well-being in the urban setting, and which can be attained through planning and design initiatives. The attributes sought must be universal invariants in terms of the urban dweller's perceptions of spatial quality. An understanding of the influence of socio-cultural variables in the perception of the urban dweller must also be seen in relation to the invariant attributes; and

- To select primary planning and design generators by which means spatial performance and thus spatial quality can be achieved.

In order to meet the objectives, the socio-spatial phenomena have first to be determined and are examined through the thematic analysis in Chapter 1. The appreciation of spatial quality, which is widely regarded as originating from sense impressions of the environment, requires to be understood through the examination of interrelated themes. The first chapter therefore examines the nature of social well-being and how it can be influenced by environmental factors, stressing particularly psycho-physical reactions to the urban settings.

An understanding of the social origins of urban spatial systems is developed in Chapter 2, by highlighting the differences between the deterministic and permissive nature of urban space. The physical embodiment of social preferences, demonstrated by spatial patterning in historical urban contexts, is used to provide clues as to the social origins of urban space systems. Quality of the urban setting is shown to be in a direct response to the need for privacy, physical safety and self-identity, particularly in the context of high density settings. Conversely, the spatial element of the urban setting determines the quality of social interaction, either favourably or unfavourably.

The final part of the thematic analysis involves definition of the spatial components which comprise the urban network, generally familiar to the urban dweller, and which can be a useful framework for the purposes of the methodology.

In Chapter 3, those indicators of spatial quality that are regarded as universal and invariant attributes of urban settings are identified, and presented as the spatial elements for the methodology. Before arriving at a choice of a systematic model, some existing methodologies and spatial quality rating methods are also reviewed in Chapter 3. The adaptation of the Sondheim methodology is examined for its appropriateness in meeting the objectives of this study.

Apart from the definition of spatial quality goals and planning activities to achieve them, the methodology aims to involve participants effectively in the decision-making process. The appropriate methodological procedure is described in Chapter 4, where the creation of the co-ordinating body, and the two panels of specialists and community members is discussed. Based on the spatial quality indicators emerging from the thematic analysis and the planning generators, developed in the schedule, the matrix procedures of the methodology are described. The operationalisation of the model in Chapter 4 outlines and tests the matrix manipulation procedure and the format adopted.

Finally, with preference determining the hierarchial ranking of importance for the planning and design generators, the methodology is completed by the transformation of the generators into directives, which can be easily accessed through the source book comprising Chapter 5. The methodology is supplemented in Appendix A with a stylised graphic of the urban spatial network and in Appendix B with source notes on those spatial qualities which will be identified in the study as being invariants. For operationalising the methodology, the procedures are translated into the required format by means of a schematic and evaluation sheets in Appendices C to E. These provide a guide to the user for each step in the methodology.

PART ONE

A Thematic Analysis of Socio-spatial Relations

PART ONE : A THEMATIC ANALYSIS OF SOCIO-SPATIAL RELATIONS

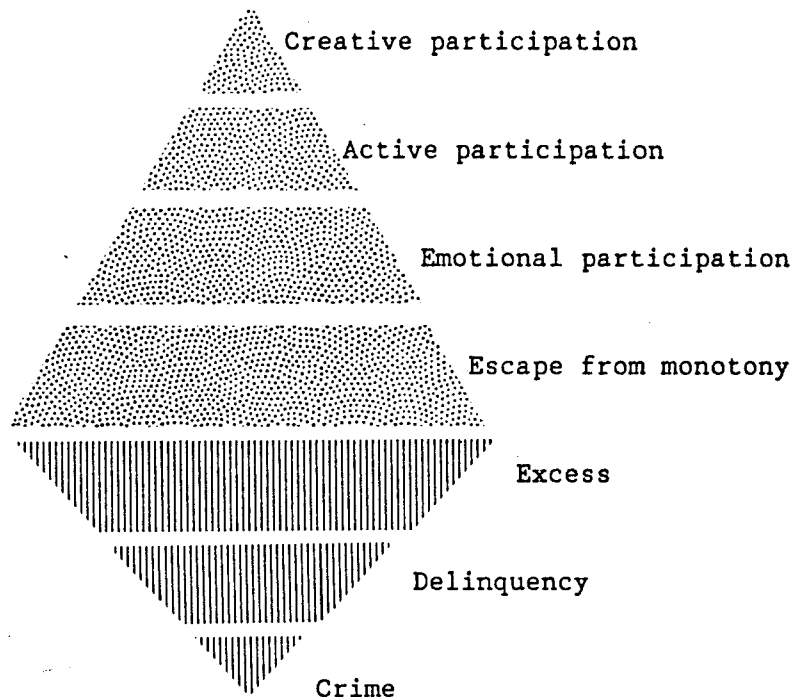
Chapter 1

Social Well-being in the Urban Context

The social sphere is represented by all those elements that influence perception selectively, such as culture, beliefs, attitudes, membership of groups, stages in life cycle, race, sex and possibly even language. In addition to the diversity of perceptions arising from these anthropocentric differences, researchers concur that "no stimulus from the biosphere as a physical entity can reach the individual without being filtered through the social sphere" (Bechtel, 1976, p 108). Going one step further researchers observe that the individual or group does not perceive the natural environment directly, since daily contacts with nature are always indirect and "filtered by the built environment" (Bechtel, 1976, p 108). Therefore, although the quality of the natural, social and built environments can be viewed independently and have complexity within themselves as spheres of activity, they also have overlapping and interdependent aspects, constituting the indirect perception referred to by Bechtel.

In the socio-cultural and productive spheres, Maslow (1943), recognising the creativity of the individual, developed a theory on the hierarchy of the individual's, and therefore the community's, needs. His theory is based on the proposition that the highest order of need, namely self-actualisation, will not be satisfied unless the lowest order, the physiological needs, are initially satisfied. In ascending order the individual's or community's needs are given as physiological; security; social; self-esteem; self-actualisation. For social well-being in urban areas therefore, the individual must be afforded opportunity which enables these needs to be satisfied.

Other researchers (Malan, 1988) into man's use of leisure, have evolved a graphic depiction of a pyramid of participation sharing a base with an inverted pyramid of indulgence: the upper pyramid represents the well-adjusted use of time to interact, as in leisure, the lower pyramid represents the maladjusted use of that leisure (see figure below).



(after Malan, 1988)

Hierarchially ascending, by far the majority of people use leisure primarily as an escape from monotony; fewer participate emotionally; fewer participate actively and finally fewer participate creatively in leisure activity. Although all levels are on the positive side of participation, surveys show that at the highest level of creative participation, generally from the standpoint of social interaction, the fewest people are involved. Attributes of the urban environment which enable, indeed encourage, the highest optimum level of participation, and therefore upliftment and the creative involvement of the individual and the community, are the most satisfactory. The converse is true for the levels of indulgence in the inverted pyramid where, surveys show, the majority use leisure to indulge in excess, fewer indulge in delinquency and finally fewer indulge in crime. Again urban environmental

attributes which do not encourage the transition into the optimum pyramid of participation from the pyramid of indulgence would, therefore, not be satisfactory in terms of the thesis described.

Ideally, living in a city should be an inspirational and an ennobling experience for the individual and the community, through the interactive vitality which it offers as an environment. It should also offer potential for aesthetics and familiar cultural symbols. The low density, socially inefficient character of suburbia in so many modern cities, does not approach the experiential characteristics of the high density traditional city, nor offer sufficient opportunity for self-actualisation as identified by Maslow, nor inspire the urban dweller to interact. What is needed is an urban setting which creates the opportunity for social interaction in an aesthetically inspiring setting.

1.1 The role of aesthetics in the urban setting

Researchers, such as Knesl (1985), have commented on the positive and negative psychophysical effects of aesthetic quality or lack of quality in the urban environment. A theme relating human well-being to the elusive nature of the aesthetic has emerged. Aesthetic attributes are traditionally associated with 'beauty', and Knesl (1985, p 142) states that "one may conceive of the essence of the 'aesthetic' proper as the suspension and relaxation of normal restraints of the forces limiting the unfolding of human life". He argues further that surely this is a state which can be induced by the quality of the environment, and by the creation of opportunities to "re-encounter nature and one's cohabitants of the city in relaxed and amicable spirit".

Legacies of the past empires form an integral part of present social environs through religion, language, cultural values, systems of law, manners and pastimes. A great deal of the past is also expressed in the material form of buildings, layout of and cities, towns and villages environments. Art and

architecture in the past combined with inspired city planning to produce urban settings, which are timeless in their ability to still serve the modern urban dweller, largely due to the enobling and enabling qualities of their spatial dimension and the durability of their aesthetic appeal. Aestheticism, expressing the cultural environment of individuals and communities with honesty, would be an important factor in the attainment of quality in social spaces. In low-density contexts, the symbols of the cultural environment is sparse and most often invisible. It is argued that much of the great material legacies of past cultures were produced under relatively high density urban conditions, before the advent of modern-day low-density urban sprawl.

Apart from the influence of aesthetics on the urban dweller's experiential involvement with the urban setting, other constructs of a highly subjective kind, influence the individual and the community's perceptions of spatial quality. Among the most significant of the socio-cultural factors included in the individual's perceptions of quality is privacy and a sense of identity and belonging to a wider community. The selective attainment of privacy not only influences the urban dweller's perception of spatial quality, but is also considered important in terms of social equilibrium within an urban community. The demand for privacy can be expressed morphically, as is evident from many traditional urban settings which have responded organically to social need. The correlation between physical form and the social need for privacy is highlighted in the review of socio-spatial patterning in a following chapter.

1.2 The importance of privacy in social equilibrium

Researchers have noted, for instance, the need for privacy in many forms of social and anti-social behaviour. An understanding of the importance of privacy in the emergence of social spaces, is as necessary as understanding the preferred degree of social encounter in a given situation. The two constructs appear to represent opposite poles in a spectrum, but in fact they are not, since social encounter can, for instance, be take place privately or

publicly.

It has been proposed that privacy be seen as being a "cultural universal" (Altman, 1985) and that the spatial dimension of this need includes at least two boundary regulating processes, namely the maintaining of personal space and territoriality, which function in the service of privacy needs. "The experience of too little privacy may result in a feeling of crowdedness, whereas the experience of too much privacy could evoke feelings of isolation; both characterised as conditions of stress" (Viljoen, 1988, p 87).

Privacy as an area of interest for psychologists, still lacks a comprehensive definition. Margulis (1977, p 101) claims that one reason for the many existing views on privacy is the disagreement amongst theorists as to the whether privacy is either a "behavioural act, an attitude, a need, a process, a goal, a phenomenal condition or existential experience". Types of privacy have been analysed systematically by Westin (1967) and identified as solitude, intimacy, reserve and anonymity, which form a hierarchy. Viljoen (1988) describes these four types further:

- Solitude is a state chosen by a person who wishes to be alone and free from the observation of other people;
- Intimacy, the second level of privacy, refers to the shared need for privacy on the part of two or more people who seek to separate themselves from outsiders, as in the case of a married couple, a family or a peer group;
- Reserve constitutes a third level of privacy, that of establishing a psychological barrier against undesired intrusion. This occurs when, in the presence of another person or group of people, a person distances himself from the other; and

- Anonymity, the fourth and most impersonal level of privacy, involves the need to merge in a crowd, but free from identification or surveillance in a public place. Typical situations will be sitting in the park or standing in a queue.

The four types of privacy will find different expression in spatial patterning, and would depend on community and private preference as to which type would predominate in given urban situations.

Another dimension of privacy is its subjectivity. The regulation of personal space boundaries, to protect the individual from unwanted intrusion will "fluctuate according to varying physiological, psychological, social and situational conditions" (Viljoen, 1988, p 87). Hall (1966, p 119) an anthropologist, has identified personal space as a "small protective sphere or bubble that an organism maintains between itself and others".

Studies, reported on by Viljoen (1988, p 119), which have been carried out in enclosed and outdoor settings to determine the relationship between the attributes of a setting and interpersonal spacing have found that:

- There is an inverse relation between personal space and room size. Personal space zones tend to increase the smaller the room size;
- Personal space zones tend to increase in rooms with lower ceilings;
- Personal space zones tend to decrease when subjects are situated in a wide or long room;
- People require more personal space in an unfamiliar setting than in a familiar location; and

- A person's position in a room appears to affect their personal space boundaries. In a corner situation people tend to need more personal space than those positioned in the centre of the room.

Although these findings relate to indoor situations they are significant in that they are symptomatic of the operation of self and self-identity in the individual and the subjective determination of what is acceptable spatial proximity. Findings by researchers in relation to outdoor settings suggest that people exhibit smaller personal space zones. Other factors, such as socio-cultural values, condition peoples' perceptions of what are acceptable space limits. The relevance of these findings to this study is that spatial availability has an inverse relation to personal space in determining an acceptable level of privacy. A feeling of crowdedness leads to stress which motivates a person's subconscious mechanism in a negative way.

Rules governing man's positioning in space, the distances maintained from others, and the degree of non-verbal communication are constructs based on expectations which suggest spatial form. In high density urban settings, considerations of privacy present a particular challenge in the attainment of perceived spatial quality. In a similar way to privacy, the identity of a place and a sense of belonging to that place will influence the manner in which a particular place might be used or abused.

1.3 Identity as the characterisation of place and self

The importance of identity in the urban setting is bound up with two constructs. In the form of territorial attachment, it is the regulating mechanism in the development of self-identity, and in the physical form it gives rise to an emotive sense of place, arising from familiarity with the surroundings.

The practice of territoriality is instrumental in the development of group and place identity, through the mechanism of enabling a distinction between self/non-self and group/non-group to be made (Van Staden, 1985). Although Ittelson, (1974, p 143) sees territoriality "as a descriptive term rather than empirically demonstrated behaviour", it is, nevertheless, sometimes manifest in urban form. A cursory look at neighbourhoods in cities shows that territorial behaviour is a way of reducing conflict and of heightening a sense of belonging. For example, ethnic enclaves offer a spontaneous solution, expressing a search for identity where social values are unfamiliar, and are ways of dealing with the enormity and complexity of urban life. The territorial attachment to a physical place and the sense of belonging to a group where social values are familiar, are interdependent and find their expression in spatial form. Significantly, many traditional high density urban patterns such as walled cities and the courtyard house, display characteristics which would satisfy the identity needs of the urban dweller.

To establish the individual's identity needs and, therefore, what is perceived as spatial quality, it should be considered that place identity bound is up with what Proshansky (1978, p155) describes as 'cognitive-descriptive', 'affective-evaluative' and 'role-related' dimensions. These dimensions will dictate: how a person will behave; subjective feelings about the setting; and where role enactment is associated with particular settings, placing expectations on spatial performance.

On place-identity, Lynch (1981, p 131) sees the notion as the extent to which people recognise or recall a place as being distinct from other places - "as having a vivid, unique, or at least a particular character of its own". He cites intense form as creating a sense of place and "when form and familiarity work together the emotional result is powerful". To project an environmental solution to expectations of the urban dweller about place, such as having "at least a particular character of its own" involves essentially the creation of a distinct spatial character.

Addressing the problems of spatial character, Alexander (1977, p 311) criticises the "architects and planners who build plazas that are too large. They look good on drawings; but in real life they end up desolate and dead". Apart from considerations of scale, the meaning of social space for too many planners means "only an empty area in the city about which traffic circulates, its rigid shape determined by the blocks that hem it in and its spatial qualities by the fortuitous buildings of its four sides" (Kidder-Smith, 1956, p 45). These observations raise questions of scale, proportion, texture, and other aesthetic attributes which facilitate character identity in urban settings.

The aesthetic appeal of a setting will assist in creating the identity for that space. However, an exclusive identity can be given to a space by prescriptive use, and even incidental use, for specific activities. Examples of the latter abound, but a short resume would include the identity through use of in Cape Town, Greenmarket Square for flea markets and the original street steps in District Six, as a meeting place for the community; Downing Street in London, the home of the Head of State; the Piazza Duomo in Milan, the functions of which include being the starting point of national cycle tours, apart from its more stately functions as a cathedral square.

Although in many instances such spaces have become identified with specific social functions, others have become associated with excessive vehicular traffic. The association of traffic with open spaces is frequent in Western cities and detracts from their character and usefulness as social spaces. The pedestrianisation of streets in many cities planned for the motor vehicle, such those in America and indeed some in South Africa, substantiates this change of identity. The shared use by pedestrians and traffic of a street or square is both achievable and commonplace, as can be observed in many Western cities and indeed traditional villages.

In order to test place-identity, some researchers utilize cognitive mapping as a technique. Lynch (1981, p 131) refers to analyses based on recognition,

recall and description used in cognitive mapping. The use of cognitive mapping can be extended to elicit drawn maps of a particular spatial environment from respondents in a research programme, and give essentially subjective results. However, technique underscores the fact that people perceive spatial dimension in an individual way, and can assimilate features on a personal selective basis. A measure of familiarity and security emerges from association with an environment, which has character and aesthetic appeal. Socio-cultural differences have been central to a number of studies (Strelitz, 1979, p78) clearly with cognitive mapping. The general finding is that groups of a lower education level "will have more limited and restrictive cognitive maps of their neighbourhoods and cities". On the other hand, this difference in mapping could be largely due to the predominantly bland social spaces to which these people have access near their places of living. Identity of place, therefore, can be directly linked with quality of space.

The developed Western city form, characterised by urban sprawl, in which residential, commercial, recreational and shopping functions are zoned in separate areas, positively disperses feelings of territorial attachment and dissipates any sense of place. The concept of suburbia maximises privacy to the detriment of other perceived spatial quality attributes. The basic measure of spatial performance is the range of opportunities, experiences and activities to which inhabitants of a settlement have easy access. "Diversity and intensity form the hall-mark of positively functioning urban environments" (Dewar, 1984, p 28). A tighter urban fabric, as suggested by some of the traditional settlement forms which are more intensive spatially and offer social opportunity through the integration of activities, tends to generate vitality and character.

It is therefore necessary to look to the validity and potency of high density settings where people may more frequently experience a sense of belonging and a sense of place.

1.4 The Notion of High Density

What all people have to face is the growing reality of dwindling land resources and, therefore, the need for more efficient, socio-culturally sound, conservation-focussed urban settlement. In view of the burgeoning global housing demand, the present major challenge to mankind is two-fold:

- reconciling housing demand with available physical space; and
- ensuring that private and public space actively contribute to the quality of life of the urban dweller.

The reality of the accelerating population growth rate is the pressing need for a housing solution for existing and future population numbers, in order that as urban dwellers they can participate in productive and meaningful urban living. The World Commission on Environment and Development focussed on people as a "resource" and added that "population policies must have a broader focus than controlling numbers. Measures to improve the quality of human resources in terms of health, education and social development are as important".

Infrastructural costs, costs per household for such services as fire protection, police and waste removal, all encourage the trend toward more efficient and denser settlement. Rising costs of transportation increase the demand for housing closer to the workplace and other social facilities. Higher density addresses all these monetary cost issues as well as facilitating improved social interaction.

The concept of high density should not be confused with that of overcrowding, which "occurs only if, by economic necessity of the occupants or design of the housing project, the amount of space allocated per person is less than an acceptable amount" (Ferahian, 1976). The question of what density levels constitute optimum conditions, must be based on human response to density-related factors. Marans and Wellman (1976), have identified three particular

human needs related to dense housing situations, which determine the well-being of the individual. They are the need to escape from stressful conditions; the need to experience natural stimuli and the need for privacy. On the other hand researchers have shown that "dense concentrations of people are one of the generators of flourishing city diversity" (Ferahian, 1976). In view of the diverse needs of the individual and the city as a flourishing organism, there are no absolute indicators about what the optimum densities for city dwellers or the city are likely to be. Optimum densities are set, not only by the physical and economic vitality of a setting, but also by critical upper bounds of psychological, social and cultural factors.

High density settlement has been largely exonerated as the cause of social morbidity. Instead, the "degree to which different types of social morbidity rates occur is more dependent on (successful) network patterns than on population densities or design components" (Cooperman, 1974, p 87). In studying urban patterning, Alexander (1977) has observed that 'the city is not a tree', which is recognition that perceived morphological form, perhaps a network, is an expression of the desire for identity and better social communication. This need has been answered in practice by experienced housing agencies, such as the Israeli ministry of housing, which has developed the potential of the neighbourhood as part of a wider social network. There is some consensus that the root cause of social morbidity is to be found rather in the morphological arrangements within the urban situation. Baum et al (1978, p 267) conclude that " while urban density seemed to affect people already stressed by other conditions, it did not represent the overwhelming negative state of affairs that many had assumed".

By enlightened application of high density principles, social production through the integration of social functions is facilitated. At the opposite end of the density scale, Danzig and Saaty (1973, p 8) in their study the 'Compact City' have analysed the destructive effect of the flight of the citizens to the suburbs. Their conclusion is that, with departure to suburbia interest in civic affairs has waned, financial resources and richness of life

have been drained from the inner city. The reality is that the creep of suburbia has systematically destroyed valuable agricultural land that may be needed in the long-term to sustain life. The application of high density norms in the urban setting may be seen as a two-pronged response to both social and ecological concerns. Acceptable applications of the concept of higher density would significantly assist conservation policy aims, simply by liberating more potential natural resources from development and by reducing infrastructural demands and energy-consuming transportation needs and pollution. At the same time environmental concern in planning high density urban settings can result in richness and quality in the social environment.

1.5 The ecological parameter

Determining the level that constitutes optimum high density in urban settings will, due to socio-cultural variables, have to be based on preference-polling among urban dwellers. However, another major capacity consideration in the urban setting, is the limit up to which the ecological base can be sustained as a resource. Alexander Pope in the 18th century advised that planners should consult the 'genius of the place', which is a reference to the potential of a natural setting, and by implication, also its ecological resources. The profile of the ecological base underlying the urban setting has hitherto not been given sufficient meaning in the planning of urban settings, where in fact it should be developed for aesthetic and cultural enrichment. In this way the ecological characteristics of the setting could contribute significantly to social well-being.

All re-shapers of the natural environment, are accountable for the diminishing ecological base. There is a great deal of scope for mitigating the impact on the ecological base with responsible management of natural resources, wherever it is possible to do so. The problem is one of "moving from micro-analysis to macro-analysis of complex systems" (Orians, 1980, p 79). With a view to improved quality in urban settings, an holistic understanding of natural

systems involving ecologists and other specialists is essential, so that integrated environmental management policy for urban situations can be formulated.

In the United States, the Multiple-Use/Sustained Yield Act of 1960, kindled a renaissance in ecological planning. These mandated activities represented an agency-centred application of the McHargian method of ecological planning and although originally related to the National Forest System, they can be transferred to the urban environment.

A further inescapable by-product of urbanisation, impacting seriously on ecosystems and quality of life within the urban context, stems from the fact that "Cities consume enormous quantities of water, energy, petroleum and other fuels, but reprocess little of their waste products" (Dantzig and Saarty, 1973, p 14). Not only does this place stress on ecosystems but the matter of its disposal becomes a space problem, removing available space from other uses, which could improve social well-being.

Some researchers conceptualise the problem as finding an appropriate fit of people to their environment, and the use of ecological principles to help achieve that fit. Steiner et al (1988, p 38) observe that "recognising, and acting upon, the need to reconnect and integrate - to plan ecologically - is a challenge in the daily lives of all people everywhere" in order to achieve a sustainable fit between humans and environment. In this respect the ecological parameter in the planning of urban settings can contribute toward the daily contact of the urban dweller with natural systems. A policy of 'greening' or intensive landscaping of urban environments can assist the urban dweller to 'reconnect and integrate' and provide the ingredients for an enhanced way of life.

In the discussion presented so far relating to the attainment of social well-being, a common theme emerges, namely, that the physical environment will assist toward or detract from the experiential quality of urban living.

Therefore it can be concluded that the dimensions of the urban environment which respond to the orders of social need identified above, and those identified by Maslow (1943) and Malan (1988), have physical form. These dimensions have been referred to as the sensual dimensions of man's environment. Tuan (1977, p 34) observes that "the body responds, as it has always done, to such basic features of design as enclosure and exposure, verticality and horizontality, mass, volume, interior spaciousness, and light". In consideration of the above subtle human responsiveness to settings, the profoundness of the effects of urban environments on the urban dweller becomes apparent. Precisely what physical form emerges from social need requires further examination. In the next chapter, the socio-spatial phenomenon is examined to establish the dialectic between social well-being and physical form.

Socio-spatial theory

There is evidence that urban spatial structure and relationships are the material form of social structure and relations. In other words, "social life is both space-forming and space contingent" (Soja, 1985, p 98). The Massachusetts Institute of Technology has published work with the thematic aim of demonstrating how differences in the organisation of urban space relate to and influence social life. Working in a similar area of research, Hillier (1977, p) observes that the most fundamental fact of space is that "through its ordering of space the man-made physical world is already a social behaviour". The finding that the character attributes of the different spatial components are essentially the physical expression of social activities, demands that a "socio-spatial dialectic" should inform the creators of urban settings. It appears therefore that although the arrangement of people in space and the arrangement of space itself can be shown to be the product of society working and reproducing itself, spatial quality in the urban setting remains to be properly understood if it is to become integral part of planning strategy.

It is now being realised that the human experience of positive qualities in urban settings are not dependent upon material means or education alone. Instead, the experience derives from a favourable human response to private and public spaces and the extent to which these urban spaces enable social initiative, thereby enriching urban life.

Social spaces are essentially the 'voids' in the urban fabric where social interaction can take place. Trancik (1986, p 103) describes such 'urban voids', as needing to be "carved out of and pushed into the solids to provide functional and visual continuities, thereby creating an integrated, humane city in which architecture and exterior space are inextricably fused". This

can only be achieved if a taxonomy of spaces can be envisioned which ranges hierarchially from residential interiors to dwelling units and through to micro-neighbourhoods, macro-neighbourhoods, counties and regions (Craik and Zube, 1973). Such interaction as exists between man and space will depend on physical, social and cultural dimensions of space in urban settings, and people's psychological response to these in a holistic way.

It is in the sphere of both private and public external social spaces that environmental impoverishment or enrichment is experienced. The quality of social spaces therefore is an important material reference for the degree of quality of urban life. For instance, on seeking a new perspective of environment and behaviour, some observers define ideal urban spaces as permissive, allowing people to do in it what they wish, but within limits which make it difficult or even impossible the performance of certain activities under certain circumstances (Ittelson, 1974). Researchers in socio-psychological aspects of environment, for example Gregory and Urry (1985), have identified an induced negative syndrome in people's attitudes, essentially aroused by the inescapable blandness and limitation of certain contemporary urban environments.

The possibility that either deterministic or permissive spaces, or degrees of both, affect the urban dweller's well-being, must be considered as well as the extent to which these two characteristics align with or detract from spatial quality. To complete the study it is also necessary to understand to what extent the link between deterministic, alternatively permissive environments and behaviour, are influenced by perceptions and preferences.

2.1 Spatial determinism and permissive social spaces

Winston Churchill's statement upon the re-opening of the Houses of Commons after its wartime destruction : "We shape our buildings and afterwards our buildings shape us", suggests a high degree of spatial determinism. In fact

in the urban setting the urban dweller experiences a multitude of spatial interactions daily, and may be induced to behave either actively or passively, positively or negatively, depending on the character of the environment. There is point of view, however, that "a dynamic link must be made between sheer social intention on the one hand and design functionalism and determinism on the other" (Michelson, 1977, p 24).

Building interiors in particular are likely to be deterministic. Here encounters and functions are structured, and the cultural and spatial demarcation of the household determines the rules by which social encounter takes place. By contrast, the social spaces external to buildings develop through accumulation into a continuous system, which is richer in its potential as more people have access to it than to a household, and fewer physical constraints are imposed on its use. "We might even say, without too much exaggeration, that interiors tend to define more of an ideological space... whereas exteriors define a transactional or even a political space, in that they construct a more fluid system of encounters and avoidances, which is constantly re-negotiated by use" (Hillier, 1984, p 20). External social spaces are, therefore, less deterministic than building interiors, and can facilitate greater social opportunity.

This distinction applies equally to the extent to which influence can be exerted on spatial quality. Whereas people are generally able to control the standards of quality of their private social space, they are not able, without power or influence, to dictate the acceptability and/or potential of the public social spaces. Vital functions, such as traffic routes and infrastructural technology, since they are planned for efficiency, will inevitably play a deterministic part. Urban chaos would ensue if the population were not, for instance, to utilize predetermined traffic routes in a disciplined manner. Negatively deterministic spatial ordering of activities generally arises from policies of over-regulation and poorly informed planning decisions. For example, regulating entrepreneurial activity is space linked and can be found in the zoning practices of local authority planners. Applying

zoning practice indiscriminately as a discipline or planning tool, spreads the diversity of urban functions, thereby reducing complexity and intensity of interactions. This experiential impoverishment of the physical environment, will "actually impede the tenuous processes of social and community formation" (Dewar, 1984, p 27). Where strict zoning on the basis of function exists and while zoning practice persists, informal production and trade initiative may be inhibited, travel time may be increased and accessibility to opportunity and amenities reduced. Zoning as a practice is therefore potentially deterministic.

On the other hand, attributes of urban social spaces which permit or enable social interaction and promote opportunity are highly favourable. Clearly such social spaces must also be perceived by the urban dweller to be aligned with opportunity, in order that social processes are promoted in a positive way. Other social factors, however, such as preference, tend to complicate the task of the planner and designer even further. In considering whether to plan for greater social contact, the issue of avoidance, rather than encounter, is also important. Ginsberg (1985, p 50) in examining women's responses to neighbourhood planning, observes that "people differ in the scope and character of the contact they wish to have with their neighbours". Some people choose the type of neighbour they can count on for assistance, or as a friend while others prefer a neighbour who leaves them alone. Planners, typically, plan without hesitation to foster relations among neighbours, thereby producing deterministic environments, which are not necessarily preferred by the occupants. Recognising the social possibilities of urban living coupled with the benefits of well-designed social spaces, but having insight into the preferences of the urban dweller, will equip the urban planner more effectively in his task. For this reason, therefore, participation by the urban dweller in the processes guiding the planning of the urban habitat is becoming not only increasingly more desirable, but essential.

In high density urban circumstances, it is unlikely that the family's entire needs can be accommodated within the locus of the family house, whatever their means. Dewar (1984, p 28) observes that "in positive environments, it is the public spaces which are the focus of community resources, which act both as the locus of community life and, as extensions to the private unit, they are places where children play, lovers court and the old meet". However, Mills (1988, p 35) warns that "without the correct spatial relations (in buildings between rooms, passages and courtyards; and in towns between streets, squares and entrances to buildings, the intended use and social encounter patterns will simply not materialise and the environment will fail - even though the aesthetic ingenuity might be high". In order for the experience of the urban environment to effectively enrich the lives of the all urban dwellers, therefore, not only should the social spaces permit social opportunity, but the spatial relations must be supportive of social needs. It is constructive to turn to traditional spatial patterning in the urban fabric, which offers useful clues to understanding of spatial organisation as a spontaneous response to social need.

The historical phenomenon of spatial patterning in the urban fabric, created organically by social purpose, is too significant to be ignored by the urban planner. In the search for more reliable systematic attainment of spatial quality, particularly in high density urban settings, the characteristics of spatial patterning must be examined for relevance and the morphological message conveyed to the planners and decision-makers.

2.2 Socio-spatial patterning

Early in this century, researchers set out to identify the environmental properties that are available to the perceiver. Probably the best known work dealing with the perceptions of environmental order is that of the Gestaltists. Gestalt theory argues that the underlying principles of organisation form part of the perception process. These principles enable the

observer to perceive discrete stimuli as holistic patterns rather than as separate stimuli (Viljoen et al, 1988). The perception of organised patterning seems to underly the urban dweller's appreciation of spatial quality in built environment. Therefore, perceptions of quality appear to be best served by the ordering of elements in relationships, which suggest patterning.

Historically, urban spatial pattern is the physical embodiment of social preference and need. It is too often encountered in past settlement configurations not to add to the relevance of a socio-spatial interdependency. Investigating the elements of spatial patterns in architecture, Alexander (1977, p.x) examines the problems of human needs as expressed in pattern, which occur repetitiously in the built environment, present and historic. In two volumes of research written by Alexander et al (1977), the authors have linked a "timeless way of living" with a "pattern language" and conclude that "towns and buildings will not be able to come alive, unless they are made by all the people in society, and unless these people share a common pattern language..." Depending on the degree of intervention of formal planning, societies arrange people in space locating them in relation to each other, "with greater or lesser degree of aggregation and separation, engendering patterns of movement or encounter that may be dense or sparse within or between different groupings. Second, it arranges space itself by means of buildings, boundaries, paths, markers, zones, and so on, so that the physical milieu of that society also takes on a definite pattern" (Hillier 1984, p 27). Other researchers reverse the order of their interest in the phenomenon of spatial patterning and study social and mental processes through, what they term, the crystallised external projections of the processes. Their findings acknowledge that patterning should not be depicted as a superficial by-product of social habit or custom, but as the product of socio-spatial processes.

Other researchers in spatial archaeology (Hillier, 1984 and Mills, 1987) have also identified the pattern-forming dimension of society. Material patterning, which is manifest in indigenous or organic rather than physically planned settings, produces probably the most useful clues to socio-spatial

interdependence. Urban form, being in a direct response to social need, is complex by nature, ranging across wide variations and structural divergences, such as from very closed to very open patterns. According to Hillier (1984), the theory of space must also account for "systems which vary from order to non-order and from non-meaning to meaning".

The notions 'non-order' and 'non-meaning' cannot be accepted at face value and would negate the accepted thesis that organic settlement systems, responding to social interaction, receive discernible spatial order or spatial meaning. Therefore, the use of the terms 'non-order' and 'non-meaning' by Hillier, is inconsistent with socio-spatial theory unless they mean 'apparent randomness'. Randomness can often appear to mask order or meaning, and in fact Hillier, in spatial studies of some traditional villages of France, has identified the order underlying the apparent randomness of spatial patterning. Randomness, with underlying order, contributes to spatial complexity and is itself, therefore, a valued attribute. It can reasonably be stated that, in spontaneous settlement, order and meaning characterise the spatial product of social processes, and randomness is the latitude allowed by a system of order. On the other hand, urban settings created through indiscriminate application of rigid planning principles, lack apparent randomness and can be prejudiced by a further imposition, namely, 'orderliness'.

Whereas 'order' in the built environment can be regarded as favourable, 'orderliness' implies regimentation - a spatial over-discipline which is aptly demonstrated by environments imposed for social engineering purposes, for example, that of Soweto (Morris, 1981). This satellite city is the manifestation of an ideological social system, and is characterised by rigid orderliness. It is an environment imposed on one cultural group by another, without community participation. Its pattern is orderly, deterministic, and its ambience recognised to be sterile.

Dewar et al (1977, p 14) hold that an "inevitable characteristic of orderliness, and the quality which ensures sterility, is simplicity". Linking

simplicity with sterility is stating an absolute position which is difficult to support. A space, which is the essence of simplicity, could offer a range of opportunity and not be regarded by the users as sterile. For example, a simple square space surrounded by buildings, open to the sky and of appropriate scale, could be construed as the embodiment of simplicity. Yet such a space offers scope for a diversity of informal social functions such as to sit, walk, play ball, skate, set up a flea market, to list but a few alternatives. The criterion for quality in urban social spaces, therefore, is not how far they are removed from simplicity but the scope, and not least the appeal, they offer for the diversity of human social needs.

Manifestations of spatial patterning are diverse. Some vivid examples of patterning occur in the layout of older cities and the house types to be found in them. A high degree of commonality often characterises the society through the dynamics of a homogeneous culture or constraints imposed by resources. Two typical examples of such indigenous cities are the Walled City of Old Delhi, and the old city of Baghdad, both of which demonstrate the attributes of spatial patterning in high density contexts, and reflect the socio-economic and the pre-technology capabilities of the inhabitants. These two cities embody qualities of spatial design, which are durable and worthy of emulation.

Other physical forms of patterning can be more subtle, less obvious and yet equally significant due to the social origins of the morphological properties. Examples have been identified in work on the spatial patterning of the Vaucluse villages of France, using a technique which represents, quantifies and interprets the social origins of spatial design (Hillier, 1984). In traditional African villages, spatial patterning has been shown to originate from 'philosophical thought' and the 'laws of nature' (Hull, 1976).

Understanding how the socio-cultural demands of established urban communities transform into identifiable forms of spatial patterning supports the phenomenon of the social need/spatial form interdependency. The examination of examples of urban texture, which have provided communities with an

enriching lasting habitat, offer useful and essential insights into organic settlement. The discussion is limited to spatial expressions of traditional Middle Eastern, African and European cultures, described by Levi-Strauss (1968) as the 'authentic' societies in his search for "a form that is common to the various manifestations of social life".

2.2.1 Walled cities and the courtyard house

The indigenous Walled City, is an attractive and working example of a high-density, "self-contained community deriving its great strength from the fact that its spatial structure is a logical outgrowth of viable sets of social and economic rules governing group and individual behaviour" (Fonseca, 1969 p106). The casual observer could be lead to condemn the concept of the traditional walled city as an anachronism, yet the form works and functions today as a vital indigenous institution. Although, the walled city of Delhi is in a state of disrepair, this should not be equated with the spirit of the community living there.

In the Mohalla (or residential quarter) of Old Delhi, spatial pattern is expressed in what appears to an outside observer as dark voids between buildings. This belies the real quality of the environment. Beyond the dark narrow lanes bounded by blank walls are sunny courtyards where private activity takes place. This urban pattern protects the resident by two spatial envelopes before a public space is entered, and behaviour adjusts from first degree privacy, the interior courtyard, to second degree privacy, the lane outside the door, to third degree privacy in the courtyard itself. Returning, privacy is regained in accretions. The spatial continuum in the traditional walled city expresses the social preference of the inhabitants. The organisation is the embodiment of spatial qualities rated important by the urban dweller, such as:

- degrees of opportunity for social encounter from public place to private space;
- a sense of place and a sense of belonging;
- privacy, by allowing complete withdrawal;
- security from proximity of neighbours and private enclosure;
- ready access to market activity and the workplace;
- ready access to amenities for recreation;

Apart from the qualities as perceived by the user, the compact form of historic walled cities offers the advantages of integrated, functional living.

Patterning is also evident in Baghdad, where the courtyard house is an undisputed institution and preferred by many to the Western-style urban counterpart. The courtyard house has not become obsolete in Iraq, although in some developments its appropriateness in response to religious-social demands was ignored in favour of other house forms. Its basic feature is that the rooms open out to the privacy of the internal space, and present a blank wall to the exterior, excluding the distractions of the outside. Inside the enclosure, relations can flourish without the intrusion of the outside world. The old city of Baghdad has a definite hierarchial order in the formation of alleyways, with main alleyways enclosing large blocks of houses, which through a system of narrower alleyways lead to a closure or cul-de-sac. "These closed alleyways provide more security for their inhabitants because they exclude nearly all strangers and passers-by" (Al-Azzawi, 1969, p 98).

The spatial patterns which are evident in these traditional environments express superbly the creative force by which people meet their socio-cultural needs.

2.2.2 Traditional African settlement patterns

Architects working in southern Africa have become increasingly interested in the design of traditional settlement, however, these investigations have dealt with architecture as an artefact. Anthropological and archaeological studies in southern Africa, on the other hand, have "focussed on the symbolic aspects settlement patterns", such as in work being done by Hullman (1981) and Kuper (1980). None of these focussed studies have contributed useful data for the planner, but instead have "diverted attention away from the functional aspects such as the day-to-day requirements for living.....there is a need for a new approach" (Mills, 1985, p 47).

Through enquiry into the 'structure and function of settlement' space in Ovamboland northern Namibia, and the forces that shape settlement and architectural space, Mills (1985) notes certain societal and functional invariants, which have evolved as patterns over time, are adhered to in the creation of settlements. The generators of settlement form are symbolic, such as the significance and "idea of centre" of the sacred fire, and territorial in as much as the garden gate and the front door are one and same. Many of the tribal requirements are cultural and symbolic of origin. Functional zones do play a part in the spatial organisation, for instance, the east/public/front and the west/private/back, however, practical considerations appear to be incidental to the provision of private social spaces for symbolic needs. One Ovambo settlement will therefore have discernible similarities to other Ovambo settlements.

Degrees of social encounter and security in public social spaces, on the one hand, and the attribute of privacy on the other, are clearly discernible in traditional settlement forms, and are not the exclusive preserve of Western urban forms or affluent societies. An interesting African example of high density spatial patterning is the village of Seripe on the Black Volta. Due to the successful development of flat roof construction, members of the Seripe tribe were able to "group themselves together in one large dwelling unit as

a method of defence, and they have maintained this way of living ever since" (Mumtaz, 1969, p 88). Grouped into compounds of about fifteen households at ground level, public circulation and access is from the roof by means of a ladder into the courtyard space of the compound. The roof is also a place for the drying of grain, peppers and cloth and is a place where the children can play without wandering too far. The courtyards are used for cooking under a covered extension, and communal eating and generally form the centre of a household's life.

Hull (1976, p 74) writing about African cities and towns before the European conquest argues that "human and structural contours of African towns and cities were dictated by a wide variety of factors, including geography, kinship of organisation, and political and occupational orientation. The basic unit of African society, the extended family, was reflected in the overall pattern of urban living". Again, it appears that the use of space is the physical reflection of social networks.

While making maximum use of urban space, "precolonial African towns and cities minimised urbanism and the feeling of congestion". In this regard, Hull (1976, p 48) identifies patterns, common to African cities:

- Passageways "formed the most basic units of public space" which were broken occasionally by pleasant community plazas;
- Small open spaces, comprising plazas, public wells and washing areas were dispersed throughout the city;
- Traditional towns and cities achieved a vital neutrality between urban and rural through concentrated urban settlement despite low densities;
- Large spaces, comprising vegetable gardens were located on the periphery;

- Central open spaces, such as parade grounds and market places, emerged near important buildings; and
- Particularly Sudanic and Swahili city layouts revealed patterns of tight compound clustering especially in Sudanic and Swahili cities.

A distinction must be drawn between socio-spatial patterning of the Western world and those of the traditional African and Middle Eastern high density settings. On the other hand, it has to be recognised that today, Western-style dynamics underlie the processes of intensive urbanisation. The new mobility of the private and public motor vehicle will impact on African custom so that traditional socio-spatial patterning will be forced to adopt Western configurations. There is, nevertheless, scope for re-examination of traditional patterning of the social spaces and to appreciate their usefulness in the planning of high density urban environments.

2.2.3 Traditional villages in Europe

Apart from the spatial patterning of traditional walled cities and the courtyard house of the Middle East and Africa, attempts have been made to link spatial response to social purpose in more Western-style settings by graphical and syntactical description.

The villages of the Vaucluse region of France are the subject of a study of 'space syntax', in order to analyse the morphological properties of spatial design. Hillier and Hanson (1984) have developed this syntactical language for describing and analysing space in settlements by which means "the spatial pattern, or configuration in settlements and buildings can be represented, quantified and interpreted" (Mills, 1988). The technique is useful because it

brings into focus the underlying order, or pattern, in the spatial design of the traditional village, which on the surface appears to be random.

From an interpretation of the outcome of the analysis, relevant data can be drawn, such as the extent to which social functions dictate spatial form. Hillier's thesis centres around the observation that spatial patterns in the villages emerge from two functions based on the generation and control of social encounter. They are the relations among the inhabitants, and the relations between inhabitants and strangers. The technique used analyses the physical axiality on the one hand and "convex" organisation of social spaces on the other. The convex form of social space is seen to arise from the desire for more static encounter by the inhabitants and the axial linkage is seen to ensure more mobility for the stranger, although "they are speeded into the square but once there they are slowed down". Hillier cites the example of the market places of European settlements which "are nearly always axially shallow from the outside and have the curious though intelligible property that the axial lines in their vicinity lead to the square but never through it". He observes that the system applies in a different way to a large town or city like London, indiscernible now that the original "villages" of London have been absorbed into the city fabric.

The relevance of this method of analysis to this study, lies in its ability to underscore the fact that, from an interpretation of the spatial configuration of the villages, more informed insights into the social preference can be made. For lessons learned from the technique to be of any value, the reverse procedure of first establishing social preference and then applying knowledge thus gained to the planning process must be achieved. Only then will decision-making be better informed.

There is a tendency in many countries which are accelerating in their economic and technological development, to adopt all things western, including immense blocks of steel, concrete and glass as symbols of their achievement. So far, there is little evidence that these new developments have contributed to the

sum of human happiness. It would seem self-evident that a better understanding of the settlement patterns of vernacular communities would help substantially in the better application of Western technology to building. This would apply particularly to transitional indigenous cultures participating in the process of urbanisation, where high density conditions are experienced.

2.3 Social encounter as a spatial pattern generator

A common thread through the idiosyncracies of traditional urban form described above is the message that spatial patterning has a great deal to do with desired levels of social encounter. Hillier (1984, p 18) even makes the deduction that "if this were so, we could reasonably expect it to be the deepest level at which society generated urban form". From examination, it can be construed that:

- the issue of social encounter is bound up with the urban dweller's perception of spatial quality and is in turn determined by morphological patterning; and
- understanding the phenomenon of spatial patterning and its relationship with social life, is at the crux of holistic planning of successful urban settings.

Traditional urban settings evolved organically to provide the urban dweller with outdoor settings which provided an extension to their homes and social amenity value. In response to community preference, interaction and social encounter centred intensively around trading nodes, with lessening degrees of intensity into the residential domain. These patterns of usage were expressed in the spatial network of traditional towns and villages.

Environments planned for varying degrees of social encounter to suit the urban dweller may be perceived to be satisfactory, but also require efficient movement to facilitate social encounter. Quality in the urban spatial network depends as much on the functional efficiency of the urban movement system as it does on considerations of, for example, aesthetic appeal and other identified socio-cultural needs of the individual and community. The efficient flow of goods and people physically is a prerequisite for socio-cultural organisation and opportunity to evolve effectively, apart from being an economic necessity. The city's dynamic operation or physiology reveals an interdependency with the city's structure or anatomy, which can be examined as a spatial entity.

In abstract terms, a recurring factor resisting the attainment of efficiency is the matter of distance. Johnstone (1973) has identified four characteristics of distance, which influence the efficiency of locations and routes. These are:

- Overcoming distance incurs costs;
- Covering distance involves time;
- Distance constrains available information; and
- Distance constrains opportunities.

As distance has physical dimension, it follows that social well-being and perceptions of quality for the urban dweller are inextricably bound up with the effective reduction of the distance factor. In the Western city, financial and temporal means are usually available to the individual to take advantage of modern transport technology and communications to overcome the constraints imposed by distance. In most Third World situations, however, private means are not commonly adequate to overcome the problems of distance, so that spontaneous settlement often shows a natural diversity and integration of functions, which offset transport dependency.

Therefore, for the low-income sector in Western city settings, where the costs of energy related to transport extend far beyond utility, either an alternative technology must be explored more seriously or settlements must be planned to integrate social and productive functions in closer proximity. Since quality in the urban settings is synonymous with perceived social opportunity, which is in turn dependent on the efficient functioning of the urban spatial or communications network, the assembly of components of that network must be explored as a frame for possible utilization.

2.4 The urban spatial network as a methodological frame

In physical terms, the urban movement systems represent a fabric of communication comprising a network of spatial corridors, which segment the urban form. "A city's structure is the spatial pattern of its differentiated parts and functions, and its physiology is the interchange that occurs between these specialised units. Without the circulatory system, there would be no city, for crowding would obstruct rather than facilitate economic intercourse" (Douglas, 1983 p 9-10). It follows that social spaces are essentially integral, nodal and interfacial within the circulatory system of the urban setting. It is thus useful to conceptualise social spaces using the discipline of an urban spatial network as a frame.

The major spatial components of the urban network represent the continuum which expresses the physical embodiment of social custom and functional need. Each of these components, due to its distinctive characteristics, is both familiar and meaningful to the urban dweller, who forms a cognitive image from regular association with that kind of space. Broadly on an ascending order of scale and, in the built environment, intensity of use, the spatial network components are identified as follows:

- Private social space;

- Open space between buildings;
- Building-street relationship;
- The neighbourhood street and square;
- The street corner;
- The main street;
- The primary street system; and
- Natural features.

By employing familiar components such as these as a frame, the urban dweller's conceptual ability will be enhanced for two primary requirements of the selected methodology, namely, participation in the procedure and the evaluation of spatial quality attributes. The spatial character and dimensions of these urban network components must therefore be further defined.

2.4.1 Private Social Space

These exclusive spaces offer restricted access to the public, form the home environment, or the shared social space of a residential grouping. Varying degrees of privacy are possible.

2.4.2 Open Spaces between Buildings

These external spaces form an uninterrupted continuum of space within the urban fabric. This residual space can significantly detract from the

quality of the other spatial components if ignored in planning and design terms. Such spaces, representing the interface between neighbours, are equally important, as for instance the street, as places for spontaneous communication between people.

2.4.3 Building-Street relationship

The quality of social spaces is largely dependent on the contribution of the 'building edge', which can take many forms such as arcaded pavements, canopies, awnings or simply recessed facades. The care taken with the relationship of a building to its open space setting, will determine the potential social usage of the immediate environs. The aesthetic appeal of an urban setting is dependent on the visual attractiveness of the building frontages onto the open space. The amenity value of such frontages should not be understated.

2.4.4 The Neighbourhood Street and Square

These spatial components are important elements in the urban fabric, and serve not only as circulation links but also as part of a system of orientation in the neighbourhood. They provide the neighbourhood with its place-identity and the community with self-identity. The street has a defined, protected and 'urban' form, with the facades of the buildings constituting the 'walls' of the street. Entries into properties are directly from the street or from squares.

2.4.5 The Street Corner

As a confluence of both vehicle and pedestrian movement, such social spaces are usually more intensively trafficked than others and are

characterised by the unusual opportunity provided in terms of social encounter and amenity value. At each road junction there is a well-defined 'place'. Its form and potential function would depend on the location of the streets in the urban hierarchy. At secondary level a corner can invite relaxation and meeting (bench or tree) as well as economic opportunity for informal traders; at primary level it can develop into a central square surrounded by public institutions, or become a commercial trading node in the town.

2.4.6 The Main Street

The main street is traditionally recognised for its distinctive social role in neighbourhoods or small town life. As a meeting place and potential source of neighbourhood pride, this street constitutes a centre of activity, of culture, education, social intercourse and commerce. With the opportunity for social encounter which it offers and strong identity that it presents, it would heighten the sense of attachment and thus a sense of belonging in the community. It should mainly be for pedestrians but a high degree of access for vehicles, particularly public transport is congruent to its functionality.

2.4.7 The Primary Street System

The urban infrastructure usually provides for a major movement system to serve neighbourhoods and as a link with the wider network of the city or town. Primary streets are capable of sustaining both the flow of vehicles and providing cross-urban interaction. Their scale and facilities are related to the needs of vehicles rather than people. For the movement of goods and people, they require to be functionally efficient, but may contribute to the quality of the urban spatial network through the choice of appropriate design parameters.

2.4.8 Natural Features

Natural features, at a variety of scales, lend meaningful character to many urban settings and add to the quality of life of the urban dweller, through contact with natural stimuli. They can enable the creation of 'habitat islands' with potential for recreation, either by being of sufficient scale or by effective linkage with surrounding rural areas. Linkages, such as verges on motorways, can act as corridors of open space along which animals and plants move to urban habitat islands.

This frame of spatial network components, based on observed patterns in the conventional urban setting, is presented in conceptual form and the components are not absolute in terms of their boundaries or definition. For this study, they are regarded as sufficiently comprehensive to describe the component types of social spaces familiar to all urban dwellers, so that they may participate in the planning and designing of an urban setting in a meaningful way. A stylised representation of these urban spatial network components is provided in Appendix A.

To further the aims of this study it is necessary to first identify invariants affecting perceptions of spatial quality, and to express them succinctly as perceived spatial quality indicators, so that they can be understood by specialist and layman alike. Once this has been achieved, a methodology can then be sought that might assist toward creating spatial quality in urban settings.

PART TWO

The Methodology

Chapter 3

The socio-spatial themes synthesised with a new approach to urban design

Acknowledged failures of the past suggest a need for a new approach to create spatial quality in urban settings. Pronounced differences have been found between architect and non-architect groups with regard to studies done "support the notion that architects view the world in a substantially different way than laymen.." (Herschberger, 1974, p 119). There is every likelihood that the same differences amongst other shapers of the urban environment could be substantiated, since a great deal of planning is founded on prediction.

From the thematic analysis it appears that, without the intervention of formal planning, there is a natural tendency for social spaces to become structured in response to social needs. There is also a strong tendency toward spatial patterning, where social needs are being served and which occurs with such regularity that it cannot be ignored. This factor leads to the conclusion that the phenomenon of spatial patterning is the spontaneous manifestation of the urban dweller's preference for social encounter in various forms. These patterns vary but form an interconnected network which, in itself, is the frame for the operation of the urban system.

Commencing with micro-scale urban environments, based on people's preferences and developing into planning decisions on a macro-scale, based on settlement patterning, the urban human habitat could, through a new approach, receive congruence in a more holistic way. Such a new approach can be broadened to accept the fact that higher density settings are a potential opportunity to intensify social interaction. The effect of high density would also be to

reduce the onslaught on dwindling natural resources, which could conceivably contribute to quality in the urban setting.

Sociologists, urban psychologists and other researchers tend to subscribe to the viewpoint that it is not high density per se which creates pathological problems and social morbidity, it is instead overcrowding. Therefore, even with higher population density levels it is possible to evoke positive responses and feelings of satisfaction, subject to all other spatial quality factors in the urban setting being successfully implemented. Inevitably, in high density settings, the question of loss of spaciousness becomes an issue. Researchers, in analysing urban open areas, hold that while spaciousness is desirable, perceived quality is not related to size (Talbot & Kaplan, 1986), and perceptions of spaciousness can be achieved in other ways than size.

The whole approach to planning new urban settings would be less uncertain for planners if invariant spatial quality indicators based directly on people's cognitive experience of social spaces were derived and utilized in planning briefs. At the same time, socio-cultural and other operative factors would always be expected to intervene as variables and would be able to shape preference and be an integral part of any analytical deduction.

3.1 Spatial invariants influencing perceptions of quality in urban settings

To develop a useful synthesis of the findings of the themes presented earlier and to assist in the search for invariants of spatial quality, the following are presented as emergent characteristics influencing perceptions of spatial quality:

- Social spaces are derived from a continuum of openness around buildings and infrastructure and form an urban spatial network. They are not meaningless voids;

- Social spaces can be deterministic or permissive, either constraining or enabling social encounter and opportunity;
- Social spaces are associated with opportunity and options available to the urban dweller, therefore the social amenity value, economic opportunity and recreation options offered influence perceptions of spatial quality. High density settings have the potential to contribute to the enhancement of social opportunity at both individual and community levels;
- Social spaces in the urban setting can vary in quality and, as with other features, have a significant contribution to make in the satisfactory attainment of a sense of place and belonging, choice of privacy, and feelings of security for the individual and the community alike.
- Social spaces that facilitate the essential contact between the urban and natural features further contribute to the spatial quality of the setting and feeling of fulfilment in the urban dweller;
- Social encounter is an important factor in the discernible underlying spatial patterning of the urban setting;
- Spatial patterning is the logical physical manifestation of social practices and interests; and
- Social need determines the urban movement system which develops into a fabric of communication corridors providing the setting for social interaction on a micro- as well as macro-scale.

Each of the above emergent characteristics need to be recognised as essential background to planning. As functions of spatial quality they are highly interrelated and difficult to separate. However, if spatial quality is to be created, they must be defined in some useful form toward the creation of spatial quality, which is perceptible to the specialist and layman alike.

After consideration of the above emergent characteristics, independently and interdependently, within the frame of the urban spatial network, the invariants of spatial quality are identified as those offering:

- Social encounter;
- Aesthetic appeal;
- Place- and self-identity;
- Functional efficiency;
- Social amenity;
- Privacy;
- Safety;
- Economic opportunity;
- Recreation options; and
- Ecological diversity.

Although these invariants do not allow precise definition they are easy to conceptualise, can be represented as performance goals, and are meaningful

constructs to both specialist and layman in attempting to create spatial quality in the urban setting; these invariants can be added to or reduced. Furthermore, socio-cultural and operative variables will influence perception of their relative importance. As such it is necessary to poll the perceived level of importance of these invariants to the urban dweller.

3.2 Socio-cultural variables in the perception of spatial quality indicators

Cultural differences tend to determine perceptions by cognitive association. These differences are an important factor, which must be acknowledged in any procedures focussed on planning and design objectives. Variables likely to affect priorities in socio-cultural preference modelling and emergent design and planning directives would be influenced by the subjectivity of the individuals and communities arising from:

- Psychological, social and cultural factors, which recognise life-cycle nuances, and priorities relating to age and sex;
- Economic and physical context factors generally;
- Prevailing environmental attitudes such as in the Third World, African context; and
- The political mechanisms by which decisions are made with, for or on behalf of an urban population.

Whether modelling specialist or lay opinion, it is important to recognise that cultural differences determine perceptions of environmental quality. It is therefore essential to develop procedures which enable these cultural differences to influence the design in a constructive and directly responsive way.

3.3 Planning and design generators co-ordinated with the identified invariants of spatial quality

By nature, planning and design activities develop from a spectrum of primary generators ranging between functional requirements, to abstractions of human need, qualitative considerations, ethical goals, statutory policy, and physical and economic constraints. Therefore, the interactive planning and design constructs of the methodology will of necessity range between abstract, esoteric and pragmatic definitions, for example, Rapoport (1977) in Human Aspects of Urban Form discusses a range of similar constructs. Primary generators are highly interrelated and difficult to separate, and are all essential in the creation of the urban setting. Synthesised into that material form, they express characteristics which influence the urban dweller's perception of spatial quality. For instance, in aiming to create an urban setting which is aesthetically appealing, the urban planner/ designer must consider the importance of the 'building edge', 'colour and texture', 'proportion' and 'scale'. A further potential contribution to an aesthetic appealing public space is that it is seen to be pollution-free. Therefore, even though 'pollution-free' as a planning construct is primarily a health consideration it is nevertheless important to the perception of aesthetic appeal in the urban setting.

For a creative tool to be useful to operatives in the planning and design fields, certain planning activities must also be isolated as constructs for their role in the attainment of spatial quality. Invariants have already been developed from the socio-spatial themes and linked with spatial quality. Through the cognitive perspective of the urban dweller, who perceives quality through fulfilled expectations of the urban setting, a link can be developed between expectations and planning goals which are the primary generators of certain planning and design activities. These planning and design generators will be recognised by the planner and designer as conventional parameters and normal to any planning procedure.

3.4 The need for a practical methodology and the application of the socio-spatial analysis

Emerging from the thematic analysis of Chapter 2 are those qualities which characterise the built environment and which contribute to or detract from social well-being. In the analysis, urban settings have also been categorised as either deterministic or permissive or degrees of either. Over-structured environments are seen to be deterministic, and therefore prescriptive thus placing unnecessary social and socio-economic constraints on the urban dweller. These environments are regarded as unsatisfactory in terms of quality constraints on social and spatial activity patterns usually arising from the practice of zoning of functions (Dantzig & Saaty, 1973). Zoning, applied rigidly as a function of planning, allocates and fragments the operations of urban environments. As a tool in the hands of the decision-makers, zoning assists the paternalistic approach to creating urban space without reference to the people who are the end-users of that space.

Although planners of urban settings are faced with planning for uncertainty and risk failure, this fact is rarely acknowledged. "Risk is becoming a vital term in the lexicon of urban decision-makers" (Apgar, 1976, p 99), not only due to economic uncertainties and financial restraint in the face of burgeoning urban populations, but also due to the variable behaviour patterns of people in the urban environment. In accepting the challenge to produce better quality environments, in practice under more pressured circumstances, the solution for planners, could lie in the concept of 'enabling' environments. To create successful 'enabling' settings, planning decisions should be made with the participation of the end-user, in this instance the urban dweller, in order to respond to the invariants and therefore minimise uncertainty as far as possible.

With the focus thus established, a useful form of psychometric evaluation procedure has to be developed as part of a systematic methodology for planners and designers. This requirement is supported by Herschberger (1974, p 118) who

notes that "a research instrument is needed which architects can employ directly in practice to learn to predict how specific client/users will respond to buildings they design".

The ideal procedure should involve a matching of the perceived spatial quality indicators or invariants, such as have already been determined, with the primary generators of the planner who actively plans and designs the urban environment. Both the urban dweller and specialists are required to be participants in the procedure if the objectives of the study are to be fulfilled. In selecting an appropriate methodology then one must aim for a useful synthesis of the evaluations of both expert and laymen and for impartiality so that, amongst the divergent interests represented, there will be satisfaction with the outcome.

3.5 A review of existing methodologies and rating methods involving the participation of communities and specialists

There is therefore a need for a procedure which enables community participation and which moves away from paternalistic and prescriptive planning decisions. The outcome of the thematic analysis indicates that such a procedure is necessary to ensure that planning and design decisions affecting the quality of life, of high density urban communities in particular, are properly informed. The object, therefore, is to achieve the eventual transformation of what are locally perceived as spatial quality indicators, into useful directives for planners, designers and decision-makers who shape the urban environment.

One approach is to utilize environmental quality indices together with community preferences, synthesised in some way with specialist opinion. Procedures are being developed to examine environmental quality in existing settings and these studies, such as those conducted by Batelle Columbus Laboratories (Dee, 1972) and Kreisel (1983) depend primarily on the use of

indices. The term index is usually employed "in reference to an aggregation of ... measurements which collectively convey information about the quality of some complex aspect or component of a condition, property or phenomenon" (Craik & Zube, 1976, p 3). For example, social well-being is often measured in terms of unemployment rates, average income levels, and years of education, to name a few. When these indicators are transformed into indices, subjective weighting procedures are often used to designate the relative importance of each indicator to the aggregated qualitative evaluation. Theoretically the use of these indices overcomes the problem of comparing a great variety of indicators from different components, for which there is no common unit of measurement.

In this regard the Kreisel (1983, pp 15-33) model was developed for the representation of the environmental quality profile of existing metropolitan areas. The approach "is based on the principles of benefit analysis, and consists of a number of logical steps including the selection, the measurement and determination...and the normalisation (scaling) of the selected environmental indicators". The transformation of indicators into indices in Kreisel's model provides a contribution to the search for a standard reliable measure of quality. The model demonstrates that environmental indices are "readily comprehensible...and contribute to a practical, useful assessment of complex environmental problems". However, researchers are cautioning that their usefulness in "describing the status of the existing environment"; "forecasting trends in environmental quality" and "identifying existing environmental impacts" (Kreisel, 1983, p 16) must be treated with circumspection.

Although indices are useful in determining preference, Craik and Zube (1976, p8) advise that "unfortunately few, if any, perceptions of environmental quality indices have achieved the status of standard reliable measures". They suggest that "the attainment of adequate and practical indices may be feasible within the context of current methodology", where preliminary work has been done, for example, on perceptions of existing urban residential quality,

landscape and scenic resources, and outdoor recreation facilities. On the other hand, their limited application in the evaluation of existing environments, and not at all in the creation of potential environments, renders their general use, at this stage, an unrealised goal.

In the light of the above, the use of indices would, therefore, be premature as a basis for achieving the objectives of the proposed preference modelling of this study. An appropriate methodology without dependence on indices, is consequently needed. The ideal approach requires a methodology by which a listing of perceived spatial quality indicators can be related to planning and design generators. In the first instance community preference must be polled, effectively by evaluation and by comparison of the identified quality indicators, on the basis of perceived benefit. Thereafter a procedure must be adopted which allows the spatial quality indicators to be systematically translated into planning and design generators which in turn can finally transformed into planning directives.

The absence of such modelling procedure, which can be applied to new settings in particular, represents a deficiency in existing planning procedure, since research has tended to focus mainly on the evaluating perceptions of environmental quality in existing settings, and not aimed at the creation of new settings.

3.6 The choice of a systematic modelling procedure : the Sondheim methodology

Using empirically derived environmental quality indicators, analysis of perceived benefit within existing environments has been carried out by researchers, for example, Craik et al (1976) and Ladd (1985). With a shift of emphasis, it is possible for this type of approach to be transferred to new situations. However, the task would necessitate using environmental (spatial)

quality indicators and translating them into planning and design directives which would enable the creation of spatial quality in new environments.

In the past approaches to the planning of new settlements found that the logistics of including the bio-physical and socio-economic parameters on the rating scale of importance a complex task. Further complexity is introduced by current thinking which advocates that it is in the public interest to promote participation of the urban dweller in the planning process. Research-based data regarding the attainment of quality in urban settings are also lacking so that it becomes rational for the planning authority to involve the urban dweller in decisions relating to what attributes are important in the urban setting.

From consideration of the weaknesses of existing environmental assessment techniques to present a useful framework of goals and activities, and then management of the resultant data from polling of participants, Sondheim developed a methodology, which was first published in 1978, in the Journal of Environmental Management, Vol. 6, pp 27 - 42. Sondheim's methodology was designed "in response to a problem involving whether a dam should be constructed at a given site" required the polling of community and specialist opinion on that specific project. Although developed for the assessment of environmental impact, notably the effects of construction activities on water resources, "the methodology is applicable to a wide variety of situations" (Sondheim, 1978). The advantages offered by the methodology to synthesise community and specialist preference suggest it would be ideal for application within a different frame of environmental quality issues in the planning and design of new settlements. The affinity between forecasting environmental impacts arising from certain activities on the one hand, and projecting spatial quality goals, which can be achieved from better informed planning activities on the other, is relatively close. In both instances there is a necessity for conceptualisation of the environmental setting in qualitative terms, and for taking into account the likely effects of an activity (creative/destructive) and for the participation of both community members and

specialists when evaluating the importance of the effects. These characteristics confirm that the Sondheim methodology is capable of adaptation in the early part of planning procedure.

The distinction between a methodology which is designed for the man-in-the-street to exert influence on planning decisions and other methodologies which do not, is at the crux of the decision to adopt the Sondheim methodology.

Other advantages of the Sondheim methodology are that it has the ability to:

- present systematically and simultaneously a series of goals defining spatial quality in relation to specific settings, on the one hand, and recognised planning activities on the other. The goals relate to the creation of spatial quality in urban settings and the activities, the means by which those goals can be realised in planning terms;
- initially segregate the above empirically derived components of the method for evaluation;
- incorporate direct specialist and community participation in an evaluation process;
- systematically model preference scores based on perceived spatial quality indicators and their relationship with primary planning and design generators evolved in a schedule;
- normalise the specialist "rating" and community "weighting" of quality indicators onto a uniform scale;

- obtain a preference listing of planning activities on the basis of their importance hierarchially; and

- minimise the time as well as expense of the project.

On the above grounds the Sondheim methodology clearly provides an appropriate procedure which can be used as the basis for creating spatial quality in new urban settings. Adaptations can be readily incorporated to suit the objectives of this particular case study.

The Planning and Design Methodology

Central to the methodology is the creation of three entities, the Co-ordinating Body, a Rating Panel of specialists and a Weighting Panel of community representatives. In addition the methodology involves identification and compilation of a schedule of Perceived Spatial Quality Indicators, hereinafter called PSQIs, which incorporate quality goals and their related spatial performance expectations. and are directly linked to sets of primary Planning and Design Generators, hereinafter called PDGs. The method requires an evaluation procedure in which, relative to each of the specific spatial components of the urban network (Main Street, etc.), the spatial quality goals themselves and each primary generator are evaluated according to perceived importance in assuring quality in the built environment. The data matrix resulting from the evaluation procedure is then manipulated mathematically to arrive at a preference ranking for planning use. In order of preference the individual PDGs are used to predicate planning and design as they are transformed using the ideas and references outlined in The Source Book in Chapter 5.

4.1 Creation of participating panels

4.1.1 The Co-ordinating Body

The co-ordinating role is managed by a public agency, a private corporation or educational institution, which are legally constituted or appointed in a consultative capacity. These bodies are either provincial or local government departments charged with housing, a national housing trust or a university

department equipped to facilitate the modelling. It may be necessary for such a body to solicit advice from outside groups or individuals.

As the name implies, the Co-ordinating Body initiates and oversees the tasks of the methodology, one of which is the identification of the PSQIs and the interrelated PDGs. The invariant PSQIs, identified in this study through the synthesis of the thematic analysis, can be supplemented by the Co-ordinating Body, depending on circumstances of particular urban settings. Other listings of PSQIs and PDGs in no way alter the methodological procedure.

A further task of the Co-ordinating Body is to choose a Rating Panel of specialists, and a Weighting Panel of representatives of community interests. The Rating Panel is composed of specialists with collective expertise covering all PSQIs and the PDGs identified by the Co-ordinating Body. The Weighting Panel includes members of community service organisations, individuals and groups potentially affected by the outcome, and public representatives. The Co-ordinating Body ensures that community interests are represented by choosing a Weighting Panel of persons or bodies knowledgeable about the objectives of the project. The members of the Rating and Weighting Panels are not picked by any statistically valid sampling method. Sondheim (1978, p32) advises that "In order to minimise any dissatisfaction with the results, the Weighting Panel must find the membership of the Rating Panel acceptable. Additionally, the individuals on both panels must be willing to agree to the listings" (of the spatial performance indicators). To assist toward consensus with the outcome, the members of the Weighting Panel should also be acceptable to the Rating Panel.

Part of the procedure inevitably involves a high degree of conceptualisation by the Co-ordinating Body, which improves the participants' understanding as to what the goals of the survey are and what alternative attributes they are being asked to evaluate. Conceptualisation, or idea presentation, involves effective communication by the Co-ordinating Body possibly by graphic means or scale models. The mode of communication depends upon socio-cultural

background of the constituent members of the community weighting panel, and on the depth of technical expertise expected from the specialist rating panel.

4.1.2 The Rating Panel

The task of the Rating Panel is to supply specialist expertise to the modelling procedure, to evaluate the importance of specific planning activities in the attainment of spatial quality goals. The specialists must be chosen from disciplines which are able to articulate the significance of the relationships between the PSQIs and PDGs.

The modus operandi of the specialists would depend on the available data, time and money constraints, the size of the group and their individual and collective abilities. The Rating Panel decides, for instance, whether a working model is necessary, or other procedures for data collection or analysis be engaged. Sondheim states that whatever methods are used, they should be explained as fully as possible. For example, Grieve (1988, p 195) records that in a study of attitudes toward houses and settlement patterns in Botswana, Hardie and Hart (1982) used three-dimensional models of street patterns and houses to evaluate preferences. The choice arose from the fact that with little exposure to the printed medium, people would find it "difficult to comprehend depth and perspective from pictorial simulations". According to Grieve, "the models elicited rich and varied responses" and it was possible to obtain useful insights into socio-cultural values, which, if translated responsibly, should influence planning decisions.

Sondheim (1978) states that there could be a low replicability with different rating panels. This is caused by different experts assigning different values to the primary planning generators, depending on the data available. Hence, the degree of replicability could be improved if the data available to the specialists at the outset of the procedure were adequate.

4.1.3 The Weighting Panel

The major advantage of the Sondheim methodology is the formation of a Weighting Panel from community representatives. This means that local opinion is represented at an early stage in the planning procedure and is directly incorporated in the decision-making. Community leaders, charged with the responsibility of the community's interests, will be able to express societal thinking about priorities. Panel members should be sufficiently knowledgeable about the objectives of the project, and about any statutory development or other constraints likely to influence the realisation in practice of their evaluation.

Sondheim (1978) makes the point that the outcome will generally be strongly influenced by the composition of the Weighting Panel, however, as long as the weightings are truly subjective they are likely to be consistent, and thus form the desired representative basis for all the planning decisions which follow. It is therefore also of paramount importance that the members of the Rating Panel be acceptable to the members of the Weighting Panel, since they are vesting trust in the Rating Panel to evaluate the matrix listings with creative expertise on the basis of whatever data are available to them.

4.2 The Modelling

4.2.1 The identification of PSQIs and the PDGs and their interdependency

In order for the perceived spatial quality indicators (PSQIs) to be presented for evaluation in the methodology, they must first be identified and listed. In this instance, the invariant PSQIs have emerged from a synthesis of the social and spatial themes. These are further elaborated below as to their function as properties of spatial quality. The manner in which the characteristics of the PSQIs are made known to the participants so that they all have similar connotations, is provided in Appendix B. The order in which

the PSQIs are dealt with is not necessarily based on their importance. A non-hierarchical listing is consistent with the objectives of the methodology, which depends on the involvement of community representatives and specialists to decide on the order the importance of the PSQIs.

I

SOCIAL ENCOUNTER

From the thematic analysis, it emerges that opportunities for social encounter, in varying degrees, play a large interactive role in the ordering of urban space. Generally, spatial patterning expresses the preferred degree of social encounter. Levi-Strauss (1968) and Hillier (1984) turned to the 'authentic' societies of the past in their research and concluded that spatial patterning has a great deal to do with desired levels of social encounter.

Surveying the social life of small urban spaces in downtown New York, Whyte (1981) found that there were indeed patterns of use based on desired social encounter, and the spaces either worked because the spatial attributes allowed optional degrees of social contact or failed because the attributes were not congruent to the needs of the users.

Social encounter is bound up with the urban dweller's perception of spatial quality and invariably determines the morphological patterning of urban space along with other factors originated by social preference.

II

AESTHETIC APPEAL

Urban dwellers respond positively, and quite consistently, to the aesthetics of space and perceive spatial quality through aesthetic quality. It is

important to include aesthetic appeal in any evaluation of spatial quality attributes.

The fact is that aesthetic quality of social spaces, or lack thereof, enhances the experience of living in a city or demeans it. Perceptions of spatial quality are dependent as much on the positive visual experience of a space as on its amenity value. Aesthetics can even adopt a more assertive role by evoking 'drive-arousal or reduction' reactions in the observer.

Environmental descriptors such as 'drive-arousal' and 'drive-reducing', and varying degrees thereof, day or night, are useful for evaluation purposes, and are created by the strategic use of, for example, colour and lighting, natural or artificial. Human related scale, and aesthetic character through unambiguous organisation of the spatial whole, are important characteristics of aesthetically pleasing spaces.

III

IDENTITY AND CULTURAL VALUE

The practice of territoriality is instrumental in the development of group and place identity, and since territoriality can be expressed in terms of physical space, it is congruent to perceptions of spatial quality. Borne out by cognitive mapping, identity of place helps people to orientate themselves in the urban environment. The extent to which a setting can be mentally perceived and differentiated is a clue to meaningful identity. Identity of place is therefore important in spatial characterisation, influencing the perception of spatial quality.

The construct of self-identity is of similar significance in the perception of spatial quality. Physical manifestations of cultures and subcultures in a city are a clue to the desire of people to feel a sense of belonging. For example, the ethnic enclaves express a search for identity, in a city where

makers are faced with planning for uncertainty. A great deal more use could be made of the outdoors for normal social activities. Urban environments, distinctive mainly because of their disabling blandness, raise the issue of enabling spaces for social activity. Community preference relating to the potential amenity value of social spaces needs to be evaluated, and is essentially bound up with perceptions of spatial quality. Building frontages, which do not, in an architectural way, invite the public to enjoy the amenity of their interface with a social space, influence perceptions of the spatial quality of that urban place.

VI

PRIVACY

Researchers see the need for privacy as a 'cultural universal'. The need can be registered in terms of a spectrum identified as solitude, intimacy, reserve and anonymity, all of which can be accommodated in different configurations of physical space. The encroachment on personal space boundaries will influence perceptions of spatial quality. In a similar way to individuals, communities have subjective boundaries of privacy, which are bound up with perceptions of spatial quality. The issue of degrees of privacy qualifies for inclusion as a quality indicator due to the individual and community expectations of specific spatial performance.

VII

SAFETY

Two aspects of personal safety can be identified: safe utilization of social spaces and health related to pollution-free urban environments. In the thematic analysis, traditional walled city and house forms were examined for their responsiveness to the fundamental human desire for a safe habitat. In all cases, the proximity of neighbours and the presence of others, enabled

social values are unfamiliar (Rapoport, 1977). Spatially, a neighbourhood, which is conducive to a sense of belonging, will be perceived as embodying the attributes of quality. Therefore, the need for self-identity becomes an important performance consideration in the perception of space.

IV

FUNCTIONALITY

Functionality implies the efficient use of urban space, which can be achieved by ordering space in a number of ways. On the one hand, multifunctionary utilization of normal trafficways, instead of the monofunctionary use for high-speed mobility, could be perceived as affording quality, and could be space-enhancing. On the other hand, as distance has physical dimension, social well-being and perceptions of spatial quality are inextricably bound up with the effective reduction of the distance factor. Mobility versus other amenity uses of trafficways, therefore, has to be evaluated in the light of community preferences.

The whole question of functional efficiency in the use of urban space, suggests that density norms be evaluated for optimum levels. Socio-economic pressure works to accelerate urban sprawl and sap the vitality of the urban centre. Higher density concentrations can effectively enrich urban living, but the capacity of the urban dweller for high density living is closely associated with spatial quality. Since functionality relates to spatial trade-offs, the compromise which it offers is relevant perceptions of spatial quality.

V

SOCIAL AMENITY VALUE

The urban open space system represents a spatial communication fabric. Behaviour patterns of people are variable, therefore, planners and decision-

more care-free utilization of social spaces. The perception of safety is beneficial when related to social spaces for it encourages interaction. Spatial quality is closely related to perceptions of safety.

Public health is inextricably bound up with a pollution-free environment. Perceptions of pollution arising from urban activities influence perceptions of spatial quality by prejudicing associations with that place.

VIII

ECONOMIC OPPORTUNITY

In the thematic analysis, economic activity is an underlying factor in the attainment of social well-being. The creep of suburbia has, in many instances, systematically dissipated the productive activities of urban life and sapped the economic potential inherent in more interactive settings. Informal and spontaneous trading, for example, is recognised by researchers as viably one of the most important developments to emerge in Third World urban settings (Rudman, 1988). Social spaces which enable informal trading and jobs influence perceptions of quality in those spaces.

IX

ENTERTAINMENT AND RECREATION OPTIONS

Social spaces are capable of enriching the lifestyle of the urban-dweller, not only in the way in which they enable social activity, but also to the extent that they facilitate relaxation. As was observed in the thematic analysis, work has been done on man's use of leisure, and has shown that people use leisure time differently. Participating in leisure time activity provides escape from monotony, emotional release and creative opportunity. Physical attributes of social spaces, which facilitate the entertainment and

recreational options of the urban dweller influence perceptions of opportunity and therefore of spatial quality.

X

ECOLOGICAL DIVERSITY

Fragmentation of the natural landscapes in the urban environment has resulted in residual islands of vegetated areas, in sea of a highly modified setting. Apart from the opportunity to strengthen the ecological base on which the urban setting is founded, the psycho-physical effect of green spaces is an important objective. Particularly in Third World development, people have become familiar with the total annihilation of the original landscape in favour the "urban heat island". By conceptualising the benefits of enriching urban life by the application of biogeographical principles in the planning of social spaces, the benefit will become comprehensible to the average urban-dweller. As a result, enrichment of urban life by strengthening rather than weakening the ecological base, will contribute to the enhancement of social spaces in the urban setting.

The above ten PSQIs are the invariants indentified as directly related to perceptions of spatial quality. As a group they present a holistic picture of what is desirable in the urban setting, but they are not necessarily the only ones that are relevant in all situations. In any event they must be logically linked with the PDGs. This process can be achieved by first describing the PSQIs individually as goals and then linking each one with expectations of spatial performance in an explicit manner. The expectations of spatial performance are then to be translated into primary generators, the PDGs. All planners and designers working within the context of urban settings will be familiar with the thirty PDGs listed in the last column of The Schedule depicted in the next subsection.

4.2.2 The Schedule of Perceived Spatial Quality Indicators (PSQIs) and Planning and Design Generators (PDGs)

The first step in the procedure involves compiling The Schedule of Perceived Spatial Quality Indicators (PSQIs) and primary Planning and Design Generators (PDGs) for evaluation.

The purpose of The Schedule is to first present a listing of PSQIs I - X, so that their direct association with expected spatial performance can be established in the middle column. By extending the associated spatial performance attributes into planning parameters, the interdependence of the PDGs and the PSQIs can be systematically achieved. In this way it will be seen that the PDGs owe their origins directly to some PSQIs on the one hand but in varying degrees to others. This is due to the fact that planning and design generators are holistic interpretations of comprehensive and overlapping parameters. The PDGs will have a connection with all the PSQIs in varying degrees, so that for example, PDG (4): Places to linger away from cars, could have been extended from PSQI, VII Safety, even though it was originally derived from PSQI, I Social Encounter.

The Schedule is constant for each of the Urban Spatial Network Components identified in Chapter 2.4. Not all Components however are relevant or applicable to all urban planning situations. This does not affect the outcome of the methodology. Depending on circumstance, it is possible to supplement the detail or adapt the proposed entries in the listing, which is a further advantageous feature of the methodology.

VII SAFETY	Health Security Safe transit	23 Pollution-free social spaces 24 Security provided by the presence of others
VIII ECONOMIC OPPORTUNITY	Increased income options Economic vitality Ready access to market	25 Space options for informal marketing and jobs 26 Concentrations of activity
IX ENTERTAINMENT AND RECREATION OPTIONS	Choice of active/passive recreation Choice of organised/spontaneous recreation	27 Planned outdoor amenities
X ECOLOGICAL DIVERSITY	Strengthening of ecological base Psycho-physical effect of green spaces Enrichment of urban setting	28 Integration of natural regimes 29 Employ biogeographical principles 30 Offset geomorphic impacts
*y entries for Weighting Matrix *x entries for Rating Matrix		**y entries for Rating Matrix

4.2.3 The Evaluation Procedure: Rating and Weighting Panels

The use of the matrix technique based on Sondheim's methodology, effectively gives evaluations by preference for the PDGs on the basis of the PSQIs in the context of social spaces. The procedure involves both the 'rating' on the basis of importance by specialists in a matrix on the one hand, and the simple subjective 'weighting' of importance by the affected users in a separate matrix, on the other. The two matrices encompass the same scaling exercise and, by manipulation, lead to an eventual preference rating of planning and design generators (PDGs).

The physical boundaries of the urban social space under evaluation are those of the eight components of the urban spatial network identified in subsection 2.4. The evaluation procedure can then be repeated for as many each of the network components as required for the final plan. In summary the components are:

- Private social space;
- Open space between buildings;
- Building-street relationship;
- The neighbourhood street and square;
- The street corner;
- The main street;
- The primary street system; and
- Natural features.

In the methodology each perceived spatial quality indicator (PSQI) is assigned for evaluation to a different member of the Rating Panel, who has expertise in that particular field. The Panel specialists rate each of the PDGs in relation to the assigned PSQIs on the basis of importance using any scaling system (See Appendix E). This produces an unstandardised rating matrix.

These values are then normalised into standard units or z-scores, so that direct comparisons can be made between the different rating schemes used by the rating panel members. The standardisation is done by using the z-equation, $z = (x - \mu) / \sigma$,

where

z = value on the (new) standardised scale
 x = value on the (old) unstandardised scale
 μ = mean value of the unstandardised scores
 σ = standard deviation of the unstandardised scores
 $= \frac{\sum (x - \mu)^2}{n}$ x = each individual value
 μ = mean of x values
 x - μ = difference of each x from mean
 n = number of x's

A Standardised Rating Matrix, in which there is complete equivalence between the PDG ratings for each PSQI, is thus derived.

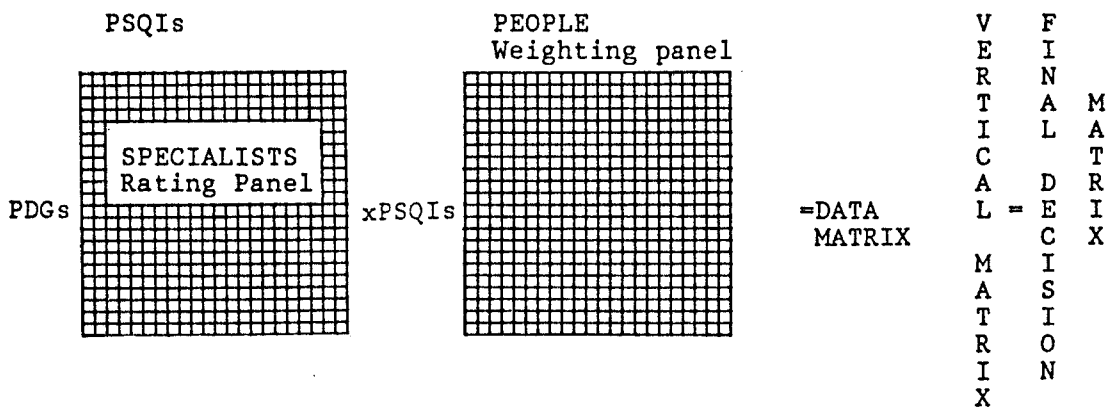
To form a separate matrix, each member of the Weighting Panel evaluates all the PSQIs on the basis of importance using a non-negative, interval scale, which must be of his or her own devising. Such judgements would be expected to be of a more personal and philosophical nature than that of the specialist. The evaluations cannot claim to have been reached through scientific distillation. Each panel member's weighting of importance of each PSQI of conceptual model is included to produce a Weighting Matrix.

4.2.4 Matrix manipulation procedure

The standardised Rating Matrix and the unstandardised Weighting Matrix are post-multiplied in a column by column fashion in order to incorporate the PSQI weightings of each member of the Weighting Panel into the rating matrix, in order to produce the Data Matrix. Again using the z-equation, the standardised Data Matrix is derived.

Schematically the manipulation of the matrices is depicted in the figure below. A detailed schematic of the procedure is provided in Appendix C

PSQIs = Perceived Spatial Quality Indicators PDGs = Planning and Design Generators



The values of the standardised Data Matrix are then summed for each of the different planning and design generators (PDGs), to give a Vertical Matrix, the values of which are then re-arranged in terms of decreasing numerical importance.

After consideration by the Co-ordinating Body of any other external parameters, such as economic constraints, which have not been presented as part of the evaluation procedure, but which could re-order the priorities of the matrix evaluation, the Final Decision Matrix is produced. It is essential that the members of both the Rating and the Weighting Panel approve any adjustment to the original rankings represented by the Vertical Matrix.

The final part of the procedure involves the transformation, by means of ideas presented in The Source Book, of these planning generators into planning and design directives for experts, who would effectively, therefore, be directed by people's preference.

The same methodology should be applied systematically to each of the Urban Spatial Network Components and be exclusive to each. As with the employment of any assessment methodology, it must be borne in mind that any organisation employing the methodology, should use the process less as an ultimate decision algorithm than as a guideline.

4.3 Operationalising the Model

In order to test the theoretical objectives and refine the practicability of the methodology using the listings for the PSQIs and the PDGs given in the previous section, the model was operationalised in the following manner.

Adopting the role of the Co-ordinating Body, the author first examined the mechanics of communicating the aims of the exercise to seven professional level, and to ten non-professional panelists. The former became the Rating

Panel, which consisted of three architects, two civil engineers, a zoologist and geographer. The latter group, the Weighting Panel, were made up of assistants in an architect's office, a school teacher and two students.

In order to improve communication, clear representation of the procedure was achieved through a detailed matrix schematic (Appendix C). Two different sheets were prepared for polling preference and to record values from each panel respectively (Appendices D & E). These sheets incorporated a stylised graphic representing a cognitive map of each of the Urban Spatial Network Components (in this case The Main Street) so as to communicate graphically the physical context of the particular exercise. The sequence to be adopted for normalising the scores was demonstrated by means of the schematic. Each participant was then free to choose any independent interval scale for evaluating importance, with highest value being attached to the most important variable. The panelists were simply asked to fill in their evaluations in the spaces provided on the polling sheets. Rating values were focussed on the thirty PDGs in the context of each PSQI. Weighting values were obtained for all ten PSQIs only and their level of importance in the opinion of each panelist. The result from each participant was co-ordinated to form the matrices after the values had been polled.

The standardisation procedure was then carried out with the assistance of a Lotus computer programme to obtain standard units or z-scores, still within the matrix format. The final part of the procedure, requires the post-multiplication of the matrices, to manipulate the z-scores into the Data Matrix, which is summed for each of the PDGs to give a hierarchial listing of importance (Appendix F).

The outcome of the matrix exercise yielded a number of minus scores, however, this is consistent with some results experienced by Sondheim in other applications. Unstandardised ratings derived from individually devised interval scales, may produce a plethora of minus scores, when transformed by

the standard deviation equation to a new standardised scale. The z-scores thus derived do not however distort the hierarchial rating of importance.

In the operationalising of this case model, specifically for the Main Street, the final ordering of PDGs appears to be rational and, in the main, appropriate to the setting. It is of particular interest that the specialists, given the choice independently to decide on the ranking for particularly the The Main Street situation, would have been unlikely to have achieved the ordered preference reflected in the Vertical Matrix. This fact highlights the relative significance given to the community input by the methodology. It also strongly supports the use of the methodology as a tool to synthesise both specialist and community preference in a meaningful way. It must be remembered that as the subjective values and the composition of the Weighting Panel influence the outcome, each situation will yield a different ordering of preference to the case model presented. Also, for a comprehensive result, the whole procedure must be repeated for each component of the urban spatial network.

4.4 Transformation of the data into Planning and Design Directives

To conclude the procedure the PDGs, now hierarchially ranked, must be transformed into planning and design directives. This is achieved by reference to The Source Book in Chapter 5. This is a researched document representing a summary of practical urban planning and design principles. Access to The Source Book is facilitated by an index.

By relating the output for each spatial network component which has been manipulated separately, a pattern of planning directives will emerge ranked in accordance with the Vertical Matrix. While utilizing The Source Book for the transformation of generators into directives, the planner must constantly bear in mind the ranking of importance of the PDGs as well as their related goals in terms of spatial quality and performance. Once transformed these

directives will be of value to all those concerned with achieving spatial quality in the urban setting, since they are reliable evaluations derived democratically through community involvement and specialist participation.

4.5 Conclusions

The fundamental failure of urban settings is that in the shift from agrarian society to industrial and high technology societies, from handcrafts to the machine and the computer, from single manual to machine mass production, in trying to produce better quality of life for people, the people themselves got left out. This study has been concerned with the shortcomings of the normative approach to planning in so far as it has attempted to ensure involvement of the urban dweller in the planning process.

Without the opinion of specialists and the preference of the eventual users being taken into account, planning objectives remain unrepresentative and as prescriptive as the current normative approach to creating urban settings. What is required is the identification of interdependent variables associated with spatial quality, and a methodology which provides effectively for a synthesis of the educated evaluations of specialists and the subjective preferences of the community based on the importance of the variables presented. With the process of urbanisation providing pressure on available land resources, high density solutions constitute the most likely option for future urban settings. The methodology has to be appropriate in the context of that modern-day reality. Furthermore, to be useful, the outcome of any modelling procedure has to give direction for a planning and design brief related to specific circumstances.

The Sondheim methodology was selected on the basis of its potential for incorporating both specialist and layman opinion and for its adaptability to urban planning situations. The methodology was operationalised and found to achieve the primary objectives, since it was possible to produce rational

results within the set parameters. The application of the results to real situations is thereafter the concern of the planners, designers and other shapers of the urban environment, using aids such as the The Source Book, which is a ready reference, capable of being supplemented by further planning guidelines and limited only by the scope and depth of the user's earnestness to achieve spatial quality.

An integral part of the methodological development is reflected in the secondary objectives of this study which consisted of three aims. The first was to present the urban spatial network in a form that would enable operationalising the methodology. For this purpose the urban movement/interaction system was rationalised into interrelated spatial components. Although an urban setting is spatially complex, identification of recognisable components whose spatial quality could be evaluated as independent units is essential so that the meaning of the exercise would be comprehensible to the layman. It has been shown that common urban spatial components can be identified in human settlements. A major contribution therefore lies in recognising this characteristic and showing how it can be used to form the basis of communication between communities and specialist planners and designers in future scenarios.

The second aim was to identify those physical attributes of spatial quality which contribute to perceptions of social well-being in the urban setting. The thematic analysis produced useful insights into human responses to the physical aspects of the built environment, and highlighted the interdependency of socio-spatial factors and their linkages with the quality of life.

From observations of the existence of socio-spatial patterning in the built environment, it becomes possible to recognise invariants associated with spatial quality. These universal invariants are of value to the planning and design disciplines. Summarised, two findings provided the frame for the methodological procedure:

- The urban spatial network is comprised of distinct spatial components, which have clear identity and are recognisable to the urban dweller and specialist alike; and
- There are perceived spatial quality indicators which are invariant and attainment of high levels of spatial quality depends on the extent to which anthropocentric needs can be successfully transformed into responsive physical settings.

All that remained then was the identification of the primary planning generators which could be directly related to spatial performance and perceived attributes of spatial quality. The aim was fulfilled by selecting the planning and design generators systematically from their individual relationship with expectations of spatial performance.

The field of urban planning and design is richly endowed with philosophic discussion about the identifiable phenomena and idiosyncracies of human settlement, such as the work of Lynch (1981), Rapoport (1977) and Trancik (1986). Few have attempted to transform the sum of their considerable research into practical goals or even a language of communication, useful to laymen, specialists and decision-makers alike. Partially excepted are Alexander (1977), Bentley et al (1985) and Hillier (1984), all of whom have embraced some form of pattern syntax, and in individual ways have attempted to provide a useful creative tool for planners and designers. However, none of the researchers considered have confronted the challenge of facilitating the dialogue needed between the urban dweller and those who prescribe the urban environment. In that respect a void exists which this study has, I believe, successfully addressed with the methodology proposed. For the kind of problem it attempts to solve, it is essential that until the time of creative implementation of a planning and design brief, the procedure must be systematic, democratic and fair to those who decide and those who are affected. The features of the Sondheim methodology allow this to happen,

enabling objectivity on the one hand and subjectivity on the other to be synthesised into guidelines for the shaper of the urban setting.

A modern day global scenario includes burgeoning population numbers, diminishing natural resources, rapid urbanisation and housing shortages set against the contrasting contexts of the developed and the undeveloped sectors grouped broadly into First and Third World situations. All the features of this global scenario suggest better utilization of the land resource as part of the solution and require urban settlement with a spatially tighter fabric inevitably comprised of higher density settings. This must be achieved with the urban dweller's participation and without the urban dweller's well-being and urban spatial quality being compromised in any way.

Whereas development expertise in the First World is endowed with considerable planning experience and has evolved to the point of great technological sophistication, it is still faced with the problem of involving the participation of the urban dweller in the decision-making process which predetermines quality of life. The situation in the Third World, without either expertise nor technological sophistication, is even more problematical so that for the time being prescriptive planning from abroad is the norm. In many cases planning and design expertise come from external sources without reference to local and social and cultural preferences, but with the persuasiveness of impressive financial assistance. Since this dependency is likely to obtain for some time, paternalistic and prescriptive First World expediency will shape the urban environment for the Third World urban dweller, unless a means of incorporating local socio-cultural needs can be found. Only with the application of procedures such as the methodology developed in this thesis can such a challenge be met successfully and divergent priorities be reconciled in a responsible way. As a contribution it is therefore of immeasurable consequence to the urban dweller, the planning and design disciplines, and the private and public agencies who invest substantial resources into processes of urbanisation in the undeveloped world.

PART THREE

The Planning and Design Source Book

Chapter 5

5.1 Introduction : Broad classification of identifiable Design Types

Despite the apparent complexity of environmental design, created by the interaction of many goals and roles, the introduction of discreet classification, and where possible the quantification of perceived qualitative elements, can greatly facilitate the designer's task.

For the designer of high density urban settings to approach the task of finalising a planning and design brief, before committing conceptions to paper, there must be some comprehension of general classification of design goals and types of design. Once this is achieved, it is then appropriate to undertake the transformation of the planning and design generators, which have emerged from the modelling in the methodology into familiar directives. The ordering of priorities achieved through the modelling will guide the choice of planning and design parameters, however, insights into universal patterns in design expression will deepen the interpretation and application of the design directives.

Heath (1984, p 116) elaborating on work done by Berlyne, distinguishes "two broad classes of goal or objective", namely, goals of specific activity, which are "places to which we go to do something: to work, to eat, to play, to sleep and goals of diversive exploration which are places to which people go "to seek an arousal increment (or decrement)".

In the process of translation from diagram to physical form, Broadbent (1966) argues, after a study of architectural history, that one of four types of design must be accomplished. The four "pure" types are:

- Pragmatic design : The use of available materials and methods, by trial and error, to establish building form.
- Iconic design : The literal repetition of a tried and accepted form, such as a Greek temple.
- Analogical design : "the central mechanism of creativity" : the transfer of ideas from one context to another.
- Canonic design : Involving the use of a geometric grid or proportional system.

Broadbent considers these four types of methods to be of "uneven usefulness in present day design". The principles implicit in these fundamental approaches in a design programme are not only applicable to architecture but apply equally to related design fields in the built environment. The specialist, charged with planning and design of new environments should seek a synthesis between the choice of a design type and the planning and design directives to be derived from this part of the systematic methodology.

5.2 Transformation of the Planning and Design Generators into Directives

The layout of the Planning and Design Generators (PDGs) is sequential and follows that of The Schedule. The numerical index (page 82) of the PDGs is cross-referenced, with the Rating and Weighting Matrices (Appendices C, D, E & F) of the methodology. The transformation of the PDGs, on the basis of

their hierarchial ordering, into planning and design directives is a matter for the trained planner and designer. If, for example, the procedures had been applied to the Main Street and the highest rating afforded to PDG 23 - Pollution free space - as the most important primary design generator it would take precedence as a design objective for that social space. The directives thus derived, represent the final stage of the methodology, toward the development of a responsive brief for facilitating and promoting a more informed planning and design approach.

The PDGs are all interrelated and collective planning considerations by which means, spatial quality in the urban setting can be achieved if applied correctly. They do not represent spatial quality per se, for example, PDG2, 'Pedestrian density in a public area', does not imply that pedestrian density is a requirement for the attainment of spatial quality in a public area. Instead it is a matter for consideration, and should be applied in a manner related to the outcome of the methodology, where it is ranked on the basis of importance.

For details regarding the Perceived Spatial Quality Indicators (PSQIs) with which the Planning and Design Generators (PDGs) are associated refer to the Notes in Appendix B. For further reading refer to the Reference listing.

THE TRANSFORMATION of the Planning and Design Generators (PDGs) into Directives

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THE TRANSFORMATION

GENERATORS PDGs DIRECTIVES

1

Open space
which
is continuous

Modern Movement design features related to the social and commercial role of cities, have meant that streets are losing their function as gathering places. "As a consequence individual attitudes to urban space have therefore been radically altered....Functionalism, which laid the groundwork for our loss of traditional space, became obsessed with efficiency.." (Trancik, 1986, p10).

In the attempt to create a public space which enables social encounter, there are two types of relations to be considered; among the between inhabitants and strangers, and among the inhabitants themselves. Social spaces are defined by some urban researchers, such as Alexander (1977) and Hillier et al (1984), as either 'convex' or 'concave', the former being achieved if a line connecting any two points around the perimeter of an open space does not go outside that perimeter.

The development of this concept of convex zones creates a potential 'field' of social encounters which when linked axially, creates a matrix of interconnections. This structuring matrix will then "show which segments of the open space system are more integrating and which are segregating" (Mills, 1988, p35). By using these data "new urban designs can be rigorously assessed in terms of the social encounter/movement patterns they will generate" (Mills, 1988, p 37).

Since the layout of a neighbourhood virtually controls the formation of play groups, it therefore has a critical effect on the development of the children of that neighbourhood. The typical suburb with the

conventional layout of streets represents a hazard to the child and therefore is an inhibiting factor in the child's developmental scope. Lantz (1956, pp 107-8) researched the correlation between the incidence of neurotic and psychotic levels in a sample group of 1 000 men, and the number of friends numbering five and over at the ages of four to ten years. The results are astounding and indicate a relationship between the two, with a higher incidence of neurosis and psychosis where friends at the given age were fewer than five. The indispensable need for connected play amongst children justifies proper consideration be given to interconnected social spaces in settlements to promote the child's spontaneous bonding with his peers in relative safety.

Developing a mathematical model on the basis of Lantz' findings, Alexander (1977, pp 345-6) shows that optimum 'connected play' can be achieved where "at least 64 households are connected by a swath of land that does not cross traffic". This can be achieved by connecting several house clusters.

Related to the findings of the survey conducted by Whyte (1981), certain invariants in the behaviour pattern of people in small urban spaces were established. These should be regarded as planning generators for social spaces, which generate social encounter and vitality. Apart from a continuous spatial system to promote social interaction, wide streets or pedestrian squares need supports for Bentley et al, (1985, p 73). A partial solution is to provide seating and other amenities such standing space for mobile vendors and open air exhibitions.

2
Pedestrian
Density
in a
public area

According to Alexander (1977), at 15m² per person an area is considered lively, at 50m² per person a public square can be regarded as dead. He suggests therefore that for public squares, courts, pedestrian streets,

any place where crowds are drawn together, estimate the mean number of people in the place at any given moment (P), and make the area of the place between 150P and 300P square feet (approx 15P and 30P square metres).

It should be remembered that a square of 30 by 30 metres will begin to seem deserted if there are less than 30 people in it and there are not many places in an urban context where there will always be 30 people. On the basis of the thesis that it is possible to recognise a person's face and to be heard across a spatial width of 23 metres, Alexander proposes that a public square, except where it serves as a centre to a great city, should be no more than 15 to 20 metres across. This applies only to the width; in the length there would be no constraint necessary. With the aim of either encouraging or discouraging social encounter, the issue of appropriate pedestrian density levels is matter requiring to be addressed.

3

Pedestrians-only streets

Standing and conversing or simple social intercourse are promoted where pedestrian streets can be incorporated into the urban setting. Alexander (1977, p 490) holds that for pedestrian streets to function properly two special properties are needed. First, vehicular traffic must be excluded, and second, "the buildings along the pedestrian street must be planned in a way which is nearly as possible eliminates indoor staircases, corridors, and lobbies, and leaves most circulation outdoors". Finally, the most comfortable pedestrian streets are those where the "width of the street does not exceed the height of the surrounding buildings".

In locations where public activity is sufficiently intense, watching other people becomes in itself one of the most common activities. Bentley et al (1985) hold that this mostly happens at the edge of the space, which offers a sense of refuge as well as a good prospect of what is going on. They also hold that the prospect could be enhanced if the seating is at a

slightly higher level than the space itself. The width of the pedestrian movement zone must be appropriate to the level of pedestrian traffic involved. In some public spaces, social encounter might be regarded as important, in which case the choice of either pedestrian-only streets or integrated public spaces indicates that a decision is required. Between the movement zone and the vehicular space, allow a zone for amenities such as street trees, seating, bus shelters, telephone kiosk and cycle tracks, wherever the need is demonstrated.

Parked cars are themselves one of the most effective barriers between pedestrians and moving vehicles.

4

Places to linger

The observation of the Whyte (1981) survey of small New York plazas that most downtown squares were not used much except for crossing to the other side, is confirmation of the conclusion drawn by urban design commentators, that streets are 'centrifugal' not 'centripetal' and tend to drive people out instead of attracting them in (Alexander, 1977) unless the amenity value of the place holds some attraction for them. Both Whyte and Alexander proceed from the standpoint that social encounter is a desirable goal.

The suggestion is then made that this can be accomplished by shaping the pedestrian streets convex on plan, with well-sited seating and shelter around the perimeter. People like well-defined places and tend to gravitate toward the edge of a public square. If the building edge does not provide them with places where they can linger, the place will become a thoroughfare than a social space (Alexander, 1977).

Another pattern identified by Alexander, 1977, is the custom that people have of facing the view or toward whatever there is which comes nearest to a view. People feel most comfortable in spaces which have a 'back' and a 'view into a larger space'. This axiom would apply at all scales from a seat in a garden to a town square with a vista into a larger space.

initial correlations were not sustained. The progress of the seasons, and hence the degree of penetration of the sun, correlated with the preference to sit or not to sit in the sun. Therefore, social spaces should not be simply sun-traps but also have shade and be places where people could decide for themselves on the 'quality of the experience'.

Sunlight is important since people tend to follow the sun across a space; seeking or avoiding it according to the climate. The levels of sunlight and shade can be altered by design adjustments at a variety of scales; building mass, open space width, level changes, trees or other features within the space.

It was also found that the absence of wind and draughts was as critical a factor as the opportunity to enjoy the sun. Air movements around new buildings can radically alter comfort standards by creating gusting and eddying. Mitigation of the unwanted effects of winds can be achieved by the provision of recesses and similar manipulation of the vertical planes enclosing the public space. Desirable micro-effects of such manipulation are however, more reliably achieved through wind-tunnel testing on models of surrounding buildings and building texture beforehand.

Having discounted shape and scale as the major determinants in what constitute popular social spaces, the Whyte survey team examined the amount of 'sittable' space. Their findings were that the most popular plazas tend to have more sitting space than the less well-used ones, which would promote the opportunity for social encounter. Qualitative factors in the design of the seat were not a consideration, as a ledge or a step would serve as a sitting space equally as well as seat designed for the purpose. Ideally, seats should be comfortable for the user, preferably with backrests and well-contoured. Socially comfortable sitting choices should be built into the design allowing people to sit facing another person, or to the side, or back-to-back, in the sun, in the shade, or in groups, or alone. Whyte concluded that seating area to total area of open space should ideally be in the ratio of 1:10 for the circumstances of the case study.

Bentley et al (1985) identify microclimate as an important factor, particularly windspeed and sunlight, in the range of activities possible and therefore the 'robustness' (the enabling quality) of a public space.

Windspeed is important because it affects temperature. For example, a 50 kph wind at minus one degree C has six times the cooling effect of still air at minus twelve degrees C. The implication is that when urban public spaces are being considered in the design of the buildings on the periphery the following factors taken into account:

- Adverse ground level wind conditions are most frequently associated with buildings significantly taller than their surroundings;
- Use wind tunnel experiments with possible improvements before massing is finalised. Tests can yield useful pointers as to improvements which ameliorate the impacts on open spaces.

6

The exciting use
of colour and
texture

Psychological effects of colour

Colours affect people emotionally (Reekie, 1972, p 19). While such mental reactions are individual and subjective, Reekie states that there is evidence that, in general, "certain colours are likely to produce certain feelings and this aspect should receive consideration in regard to external design as well as internal design."

Considering the importance of colour in the attainment of aesthetic appeal in urban settings, the goal at all times is the enhancement of aesthetics of the place and never the reverse. Toward that goal, there is however a great deal of scope as to the character expression desired, to which end certain human responses to particular colours needs to be looked at. Examples

given by Reekie on the basis of empirical observation of generally accepted colour responses are:

Blue	:	Soothing effect if not too strong;
Green	:	Similar in effect to blue;
Yellow	:	Cheering and stimulating ;
Red	:	Exciting ;
Purple	:	In small areas, rich and comforting - in large areas, disturbing;
Browns	:	Restful and comforting; and
White	:	Cheering and stimulating.

Principles involved in designing with colour

Writing in Der Kunstwart about colour in architecture, Schumacher, (1981, p10) promotes the axiom that forms should be simplified if colour effects are to be successful, and as a corollary, that colour should be employed "wherever the opportunity to create effects by means of formal articulation has been denied....". He points out that John Ruskin first advanced the theory that "form and colour were enemies and should therefore be set on essentially different paths....The highest intensity of colour, in his view, should never coincide with the highest complexity of form" (Schumacher, 1981, p10). These are rules which should be taken as general and but not absolute, in view of cultural trends and changing norms of acceptability.

In practice colourist theories assist the understanding of the colour spectrum and the principles governing successful employment of colour to evoke expected responses in the viewer. To venture into the realm of colour, with a view to using colour to enhance environmental quality, presupposes a working knowledge of the nature of colour and chromatic terminology.

Colour quality is the specific character of colour that arises from the attributes of hue (chromatic colours) degree of lightness (or value), purity (or saturation), intensity and emotional effect. Hue is that attribute of a colour by which it can be distinguished from another of the same lightness and purity. Often, based on the arrangement of the colours on a wheel and in analogy to the compass, a colour's hue is termed its 'direction'. Lightness refers to the degree of difference of the colour from black, as the darkest, and white at the lightest end of the spectrum. Colour purity (or saturation) is that attribute which determines the degree of difference between a certain tone and neutral grey. Colour intensity is the strength or 'power' of a colour; the saturated colours of the colour wheel are perceived as being the most intense. Both intensity and saturation are diminished by the addition to a colour of white, black or grey. This means that each colour reaches its highest point of intensity and saturation at a different degree of lightness eg. yellow at a higher degree of lightness than blue. Nor do all saturated colours affect the eye with equal strength ; no saturated green, for example can approach the intensity of saturated red. The emotional value of a colour arises from the psychophysical effect it has on us, which is partly at least the result of a certain inherent expressiveness unique to each colour (Lexicon der Kunst, 1968).

- Directional colour contrast : When two colours on opposite sides of the colour wheel (eg blue and orange) largely determine the overall composition, this is known as a directional colour contrast.
- Light-dark contrast : If the central contrast in the composition is light-dark, the values of the colours used will come particularly into play and have a great influence on the overall effect. Here the hues play a secondary role, being merely accessory to the light-dark contrast.
- Pure and greyed hues contrast : If the composition is carried out largely in one range of value (or lightness), its effects will rest on the contrasts between pure and greyed hues.

- Cold-warm colour contrast : If the colours belong to the accepted cold or warm part of the spectrum the predominance of one over the other will create the contrast.
- Single hue compositions : Variations of a single hue with accents picked out by contrasting degrees of lightness or and darkness.

Colour systems

Colour systems are an essential aid to the designer as they represent classifications devised with great care to include as many variations of colour as possible in a sequence of colours neatly listed by hue, saturation, lightness and interval. Some go further such as that published by Schuitema, for example, which provides a number of suggested colour combinations, to assist the designer's decision. Colour systems are fine aids to composition as they bring order into the confusion of the colour range. That published by Schuitema, for example, provides a number of suggested colour combinations that make the designer's decision that much easier. The following colour systems are referred to Colour in Townscape (1981, p 60-83):

Newton's Colour Wheel
 Mayer's Colour Scheme
 Lambert's Colour Pyramid
 Runge's Colour Sphere
 Benson's Colour Cube
 Ostwald's Colour Norm Atlas

The modifying properties of texture

Reekie (1972, p 23) states that "Texture modifies colour. If two surfaces are both of the same hue and intensity, but are of different textures, they will not look alike. Texture can be regarded as the impression through sight of what can be experienced by touch ... the same words eg. rough, smooth, etc. are used to describe texture whether a surface is seen or felt".

The decorative application of colour and texture is carried out with a definite aim in mind, whether aesthetic or functional. In such instances, colours and textures are used to articulate, distinguish and enliven surfaces and objects, so help to create truly social spaces.

In urban design it is important that there should be textural harmony in a building or in a group of associated buildings. An important contribution of texture other than aesthetic, is that if used selectively, texture can reduce reflectivity and therefore unwanted glare on horizontal as well as vertical surfaces.

7

Enrichment spaces
by induced
sensory stimuli

Richness is not purely a visual matter: other senses also have design implications. It is important with regard to creating social spaces, to look at what makes a stimulus rewarding, in terms of a building or an environment. Heath (1984; p 112) concludes that "some insights have been provided by research on arousal. Behavioural and neurological evidence has accumulated which suggests that the hedonic or rewarding value of a stimulus depends on how arousing or de-arousing it is. There appear to be two distinct mechanisms involved, one of which produces reward when stimulation is decreased after it has risen to the point of being unpleasant or painful, while the other comes into play when arousal is raised to a moderate extent".

Rapoport (1977) holds that the notion of 'noticeable differences' is critical to design, and that cues also become noticeable through meaningful design - they become messages. A list of cues has been identified among which people choose:

- Physical differences:
Vision : shape, size, height, colour, materials,
texture, details;

Space : size, shape, barriers, links, merging,
transitions;
Light and shade : levels, temporal changes in
light;
Greenery : man-made versus natural, type of
planting;
Conformity versus variety;
Well-maintained versus neglected;
Scale and urban grain;
Road pattern;
Topography;
Location : prominence, at junctions.

- Kinesthetics:
Changes of level, curves, speed of movement;
- Sound:
Noisy versus quiet;
Man-made sounds, versus natural sounds;
Dead versus reverberant;
Temporal changes in sound.
- Smells:
Man-made versus natural.
- Air movement:
- Tactile:
- Social differences:
Activities : type and intensity; uniform or mixed;
cars or pedestrians; movement or quietude;
Objects : signs, advertisements; fences;
decorations;
Street use or non-use; front/back distinctions;
private/public distinctions; introverted versus
extroverted;
Hierarchy or symbolism.
- Temporal differences;
Long term versus short term.

Nowhere do mathematics, science and philosophy permeate one another so intimately as in the problem of space.

Although what presents itself as harmonious to one may not necessarily be similarly described by another, the character of a space will inevitably be endowed by its own scale, proportion and form as well as the quality of the architectural elements involved with its definition as a space or enclosure.

Harmonious proportion and the Golden Section

'Man is the measure of all things', according to Protagoras, the Greek philosopher of the fifth century B.C. Although the art forms of the West and East are vastly different, they do reveal a common human unity beyond the surface diversity. This can be substantiated by constructions of harmonious relationships in Hellenic sculpture, and the studies by Vitruvius, the Roman architect and writer of the first century, who demonstrated "that the ancient Greeks even laid out their temples according to human proportions" (Doczi, 1985, p 106).

Doczi has demonstrated that proportional harmonies have for centuries been fundamental to spatial philosophy in Japan. For example in the Zen Monastery Temple garden, near Kyoto, which dates from the beginning of the fifteenth century, five groups of rocks are placed on a rectangular field of coarse, raked, white sand. This outdoor space is designed to be seen from the verandah of the monastery and from paved walkways around it. In his words "The field of sand has proportions corresponding to two reciprocal golden rectangles ... multiple constructions of the golden section show how the distances between the rocks within the field share proportional relationships correspond to the root harmonies of music. Thus the rocks and field become one" (Doczi, 1985, p 118).

Toward meaningful proportion in terms of aesthetics

Although it can be shown that subjectivity underlies the appreciation of good proportion and comfortable scale, it can also be shown that visual harmony of proportion has mathematical roots. The mathematical roots of proportion have been studied scientifically since the time of Vitruvius in the first century and up to modern times with the development of the golden section concept at the turn of the century. Unity in the manifold diversities of nature, brought about by the sharing the same simple harmonious proportional limitations occurs too frequently to be ignored in the determination of ideal proportions in space. A formula has been derived for the celebrated golden section, which Doczi (1985, p 2) describes as a "uniquely reciprocal relationship between two unequal parts of a whole, in which the small part stands in the same proportion to the large part as the large part stands to the whole ... The complete reciprocity of this proportion strikes us as particularly harmonious and pleasing, a fact that has been proven by many scientific experiments..."

The golden section should therefore be regarded by those who create social space as a useful design maxim for quality

An approximation of the golden section is a rectangle of 5x8 proportions (Doczi pp 2 -3). It can be defined geometrically as a line that is divided such that the lesser portion 'a' is to the greater 'b' as the greater 'b' is to the whole 'a+b'. This can be expressed algebraically by the equation of two ratios :

$$a/b = b/a+b.$$

The subjective appreciation of what constitutes an ideal proportion for a given application means that it is difficult to predict ideal proportions for space. The contribution of proportion to aesthetic appeal is generally understood by designers even though its definition and application can be elusive in the design process.

It is possible to develop quite simple proportioning systems which are useful in the design of social spaces, inasmuch as this can be done in architectural design. There would be two objectives, namely to create pleasing aesthetics through harmonious proportion; to create a sense of order among the elements in a visual construction. Euclid holds, according to Ching, (1979, p 292), that "a ratio refers to the quantitative comparison of two similar things, while proportion refers to the equality of ratios". The relationships which are generated by the application of ratios create visual order and can be sensed, accepted and even give a specific identity to space.

Viewing distances

Appropriate decisions about proportion must take three factors into account:

- the range of distances from which the various parts of the space can be seen;
- the speed of movement at which the space can be seen;
- to relative numbers of people likely to see the building from each different viewing position;
- the length of time which each view will be experienced; and
- The visibility of the elements has to be assured to contribute to the visual richness.

9

Human-related
scale

As in architecture, so also in open space, questions of scale centre mainly around two considerations, namely, the size of the space relative to the human body, which includes other human scaled elements, such as furniture; and the size of the building elements or controlled forms either constituting the enclosure of

that space, or standing in that space. Generally, people have to rely on visual rather than the tactile experience of space, and their perceptions are largely based on familiarity.

Of an open space's three dimensions, the vertical scale contributes more effectively to the sense of scale, as the human eye perceives a change in height more readily than a change in plan dimension. This ready appreciation of the vertical scale would not, however, be without visual reference to the other dimensions. For instance, a change in height would not be easily appreciated in a space with a tight enclosed ground plan, as the visual effect would be foreshortened which would influence the ability to perceive any change. These are the texture and colour of enclosing surfaces. The effects of foreshortening of perspective and distance, and indeed cultural bias, complicate the picture.

In architecture and urban design, scale is a concept used in connection with the comparison of sizes, for example, mass, area, distance, in relation to other normally recognised and accepted sizes. As both are primarily concerned with the needs and activities of humans, the standards are mostly those derived from anthropometrics and ergonomics. "A design or part of a design can be described as "in scale" if it conforms with human norms, or as "large in scale" or "small in scale" according to its departure from these norms" (Reekie, 1972, p 23).

Reekie concludes that in urban design, the question of scale not only arises in regard to the planning and design of a building, but also to the juxtaposition of buildings and other structures, the scales of which could be so dissimilar as to produce discordant and objectionable visual effects. The solution is not necessarily to impose a standard facade, but to require that a satisfactory relationship exists between them, including a scale common to them all.

Appropriate decisions about visual richness must take three main factors into account (Bentley et al, 1985):

- the range of distances from which the various parts of the scheme can be seen;
- the length of time during which each view will be experienced; and
- the relative number of people likely to see the building from each different viewing position, whether from a travelling vehicle or on foot.

Different levels of movement, complexity, and scale

On the matter of scale, driving in a vehicle leaves no time at all and diminishes a person's capacity to absorb detail in the environment. Pedestrians have a better awareness of place than drivers or users of public transport. Therefore, in the urban network, where the motor vehicle determines the speed of movement, different levels of complexity and scale, other than the human scale require to be employed.

Rapoport (1977, p240) holds that an environment that is comfortably stimulating from a car becomes monotonously boring on foot. As speed increases, the concentration increases and several other things happen (Tunnard & Pushkarev, 1963) :

- The point of concentration (or focus) recedes from 600 ft at 25 mph to 2 000 ft at 65 mph. As a result elements in the environment must become larger to be noticed or appreciated at all. Also while objects perpendicular to the road become prominent those parallel to it lose prominence;
- Peripheral vision diminishes so that while at 25 mph the horizontal angle is 100 degrees, it reduces to less than 40 degrees at 60 mph. One result is 'tunnel vision' which may induce hypnosis or sleep. Side elements need to be quiet and subdued and perceived subconsciously in the blurred field of peripheral vision, with main features on the axis of vision and the point of

concentration periodically moved laterally to maintain attention;

- Foreground detail begins to fade, due to the rapid movement of close objects. The earliest point of clear view recedes from 30 ft at 40 mph to 110 ft at 60 mph. At the same time detail behind 1 400 ft cannot be seen as it is too small, so that the range is between 110 to 1 400 ft - and that is traversed in 15 seconds. Elaborate detail is thus both useless and undesirable; and
- Space perception becomes impaired so that near objects are seen, get close and disappear very quickly. They thus tend to 'loom', which is extremely stressful (Coss, 1973) and elements too close to the edge or overhead, and sudden curves should be avoided.

Elements along a road should therefore provide information at an intermediate rate with gradual transitions - sudden contrasts should be avoided.

10
Spatial
character
through
visual order

The elements of scale, proportion, colour and texture do not only play a part severally, but also holistically. Other research early in the century, of which probably the best known is that of the Gestaltites, set out to identify environmental properties that are available to the perceiver.

The Gestalt theory argues that the underlying principles of organisation form part of the perception process. These principles enable the perceiver to perceive discreet stimuli holistically as patterns rather than as separate stimuli (Viljoen et al, 1988).

Four principles of organisation are distinguished. These are proximity, similarity, continuity and

closure. Thus objects in a perceived scene would form a group when they are close to one another (principle of proximity) or when they look the same (principle of similarity). Gibson (1979) argued for a holistic perception of the environment, and that the perceiver receives patterns of stimulation which are intrinsically meaningful. For example, information about spatial depth is available to the perceiver in the gradient of the textured surface, which seems less coarse or rough as it stretches away from the perceiver. In this way, a holistic perception about spatial depth is built up.

The character of public squares evolves from certain disciplines

Camillo Sitte wrote 100 years ago of the meagre and unimaginative character of modern city plans, and put forward his proposals for creating visual order to attain character in public squares :

- The centre of public squares should be kept free of clutter;
- Public squares should be enclosed entities;
- The size and shape of public squares is critical;
- Irregularity is acceptable in the configuration of a public square, and does not necessarily negate visual order;
- A continuum of interlinked social spaces enhances the parts as well as the whole; and
- The ideal street must form a completely enclosed unit visually.

After a lifetime of observing city spatial relationships and the successful embodiment of the aesthetic in physical form, Sitte's conclusions, although questionable as absolute principles,

nevertheless point to some useful, tested conventions, to give visual order to urban open space planning.

The centre of the public square should be kept free of buildings

Of a survey conducted by Sitte of 255 churches in the city of Rome, only 6 were found to be free-standing. This is of great importance for buildings because they "achieve their full effect only when they can be viewed from an adequate distance on a plaza that is not too large" and integration with the site is made possible (Sitte, 1965, p 26).

Examples abound of the successful placement of important buildings on a square with one or more sides related to the perimeter, for example in Italy, Piazza del Duomo, Piacenza and Vicenza; San Cita, Palermo; Piazza del Santo, Padua. In all cases successful perspective is achieved without having deeper space, "so that the facade of the building could be viewed as the backdrop to a stage". (Sitte, 1965, p 28).

Public squares should be enclosed entities

In medieval towns, the street intersection in a public square, as is well-known in modern town planning, was the exception rather than the rule, since this would prevent "any coherent total effect". The concept of planning the streets to enter the public square from the corners and even at varying angles, approximates the patterns followed in many mediaeval towns. Sitte identifies the cathedral square of Ravenna as the "purest type of this ingenious system". A spatial network which evolves from a system of open spaces would provide visual order on the basis of its perhaps less visible organisation.

The size and shape of the public square is critical

"For the purpose of analysing the relationship that exists between the size and shape of plazas and of the major structures on them", Sitte (1965, p 39) identifies two types of square; the "deep type and the wide type". The position of the observer in relation to a major building and a good proportion between the size of the public square and that of its buildings are determinants in the search for the ideal resolution.

Irregularity is acceptable in the configuration of the public square

Sitte (1965, p 50) states that "strict symmetry and geometric exactitude" are unnecessary to the "creation of pictorial and architectonic effects..". Old public squares were not conceived on the drawing board "but instead developed gradually in natura". Sienna, Italy, has numerous examples of public squares which are irregular on plan and create fine settings for churches. The aim was to "carve out a deep plaza in front of the church facade and to ensure good vantage points for viewing this major structure".

The purposeful design of irregular public spaces must be liberated from mechanical conception on the drawing board. The worst effects of imposed geometry, such as triangular-shaped public squares or residues of space, which have no functional nor aesthetic advantage should be avoided. To liberate planning from imposed geometry in no way negates the importance of visual order in planning urban settings. Irregularity is compatible with goals of visual order, as attested to by the examples referred to by Sitte, namely the public squares of Siena, Italy, which epitomise desirable urban settings.

The ideal street must be enclosed visually

Not only the public squares of the old towns merit study. There is benefit in the scrutiny of the disposition of its streets for the spatial order they present. Sitte (1965, p 61) states that "the ideal street must form a completely enclosed unit! The more one's impressions are confined within it, the more perfect will be its tableau: one feels at ease in a space where the gaze cannot be lost in infinity". "Straight roads are necessary today and are often of very imposing effect. What we condemn is their mechanical employment, a priori, without concerning oneself with the configuration of the terrain or other local circumstances. If the meandering line is more picturesque, the straight one is more monumental; but we cannot subsist from monumentality alone, and it would be desirable that the builders of modern cities do not abuse the one or the other, but make use of them both as appropriate, in order to give to each district which they lay out an aspect in conformity with its purpose.

Principles of visual order which allow diversity without monotony and assert spatial character and identity, are a useful tool to those concerned with the quality of social spaces. Ching (1979) identifies these 'ordering principles' as axial, symmetrical, hierarchial, rhythmic/repetitive, transformative and characterised by a 'datum' line, plane or volume. All these characteristics would be visible to the beholder, and be evidence of an underlying visual ordering of elements.

Synoptically, the contribution of principles toward spatial character is as follows:

- An axis can be established by a symmetrical or asymmetrical arrangement of forms and spaces
- There are two types of symmetry; bilateral symmetry which is the balanced arrangements of two equivalent elements about a common axis; and radial symmetry which consists of equivalent

elements balanced about two or more axes that intersect at a central point.

- A form or space can be made significant by being made visibly unique, by endowing the shape either with exceptional size, shape or location or a composite form of these principles.
- Rhythm employs the fundamental principle of repetition, of which the simplest form is linear. Alternatives include grouping of elements by size, shape or detail.
- Transformation allows the systematic manipulation of a typical, appropriate architectural model, geometric form or shape, through a discreet evolution to respond to the specific context of the design at hand.
- A datum is a device in the form of a line, plane or volume which has the property of organising a random pattern of elements through its regularity, continuity and constant presence. As a device, a datum must have sufficient scale to perform its function effectively.

11

Familiar
spatial
character

For the endowment of familiarity to the neighbourhood social space

Before the twentieth century, places that looked important, were important, and places of public relevance could easily be identified. Some urban designers link the notion of familiarity with legibility, "which is the quality which makes a place graspable.." Furthermore, "legibility is important at two levels: physical form and activity patterns"

Important critical factors in the "legibility" of public space:

- The biggest open spaces should be related to the most important public facilities;
- The point of a legible layout is that people are able to form clear, accurate images of it. Note that it is the user rather than the designer, who forms the image;
- Lynch, who pioneered the topic of image maps in the 1960s, has suggested that there are overlapping features amongst people's images of places, namely, nodes, edges, paths, districts and landmarks. It would be wrong to assume that every area contains all these features.

The terms 'hard' and 'soft' spaces are sometimes used by planners (Trancik, 1986, p 61). Both have a useful function and contribute to identity of place in the urban situation:

- Hard spaces are those principally bounded by architectural walls; often these are intended to function as major gathering places for social activity;
- Soft spaces are those dominated by the natural environment, whether inside or outside the city

Architecture and landscape architecture must respond to and, if possible, enhance environmental identity and sense of place.

Cognoscenti of the city social space environment, such as Lynch (1981) comment on the notion of place and the associations of continuity that people have with places:

- Part of the presence of any good place is the feeling of it embodying and being surrounded by a field of its own sort of space with its special limits and potentials. It is this field that is only interesting today if it implies connection:

roads with buildings, buildings with buildings, with trees, with the seasons, with decorations, with events, with other people in other times ;

- Just as each locality should seem continuous with the recent past, so it should seem continuous with the near future; and
- A place is a space which has a distinct character. Since ancient times the genius loci, or spirit of place has been recognised as the concrete reality man has to face and come to terms with in his daily life.

These associations of people make demands of timelessness on the urban spaces of their experience, which places a particular obligation on the urban planner and designer to enable the bonding of the urban dweller with the urban environment.

Trancik (1968, p 112) observes that the character of a place consists of both the concrete substance having shape, texture and colour and the more intangible cultural associations, a certain patina given by human use over time. The need to have a stable system of places in which to develop themselves, their social lives and their culture gives space an emotional content. Trancik (1968, p 112) urges the urban designer "to create truly unique contextual places" and to "explore the local history, the feelings and the needs of the populace, the traditions of craftsmanship and indigenous materials, and the political and economic realities of the community".

12

Urban open space
which is both
structured, and
meaningful

Trancik (1986, p 97) provides three theories of urban spatial design, on the basis of his research into the evolution of modern space, and the analysis of historic precedents:

- The Figure-ground Theory: Founded on the relative land coverage of buildings as solid mass (figure) to open voids (ground). The object is to manipulate the relationships by adding to or subtracting from, or changing the physical geometry of the pattern. The Figure-ground theory is a graphic tool for illustrating mass-void relationships; it is a two-dimensional abstraction in plan view that clarifies the structure and order of urban spaces.
- The Linkage Theory: Derived from lines formed by streets, pedestrian-ways, linear open spaces and connecting one element to another. Movement systems and efficiency of the infrastructure take precedence over patterns of defined outdoor space.
- The Place Theory: Goes beyond the previous two theories in that it adds the components of human needs within their cultural, historical and natural contexts. The unique forms and details of a place's indigenous setting add richness.

Trancik (1986, p 98) states that each of these approaches has its value, but the optimum is one that draws on all three, giving structure to solids and voids, organising links between parts, and responding to the human needs and indigenous setting.

13
Sense of
neighbourhood
or social
network

To ensure a sense of belonging in an ideal neighbourhood

Population thresholds are important in effective social bonding. Evidence so far suggests that :

- People identify with neighbourhoods which have extremely small populations;
- Such neighbourhoods are small in area; and

- A major road through a neighbourhood destroys it.

The Western experience is that a human group cannot coordinate itself to reach decisions about what affects their interests if the population is over 1 500. Some set the figure as low as 500.

In research in the USA (Herman, 1964) the optimum physical area of a neighbourhood was considered to be from one up to three blocks around their own house. A more significant factor however, is that a "neighbourhood can only have a strong identity if it is protected from heavy traffic" (Alexander, 1977, 82). In his chapter on the Identifiable Neighbourhood, Alexander argues that neighbourhoods should not be more than 300 metres across with a population of no more than 400 to 500 people, and major roads must be kept out.

Clusters

"People will not feel comfortable in their houses unless a group of houses forms a cluster, with the public land between them jointly owned by all the householders" (Alexander, 1977, 198)

Gans (1967) found in a survey of 149 people in Levittown, New York, that all of them were engaged in some pattern of regular visiting with their neighbours. This visiting pattern is interesting in that it underscores the fact that people want to be part of a neighbourhood cluster. The extent to which the opportunity to visit would be utilized in the neighbourhood would depend on cultural and socio-economic factors. On a typical block each home is at the centre of its own cluster, demonstrating that the social patterning continues even when the block layout and neighbourhood plan do not encourage social cluster units and promote anonymity. Further, Alexander (1977, 198) states that "the cluster of land and homes immediately around one's own home is of special

importance ... and it is the natural focus of neighbourly interaction".

To replace a gridlike array of houses on a street, Alexander (1977) proposes that a new type of layout of houses, more personal in nature, which gives people immediate and effective control over their common land. Such a layout responds to the spontaneous preference of people to form a cluster. This is borne out even in the conventional house on street situation, where it has been shown that the "homes immediately around one's own home are the most important" and form an "obvious and tribal-like cluster" (Alexander, 1977, p 198). He continues that "A cluster is a dynamic social structure, which takes physical shape, and is governed, above all by the common land at its heart, and by the fluidity of the relations between the individual families and this common land". Therefore, control over the common land, reinforces the community and is a worthwhile objective for residential settings.

Even on the conventional street pattern, the concept of clustering emerges. Alexander (1977, p 200) has identified the following criteria on the basis of keeping in touch, and meeting for decision-making:

- The clusters seem to work best if they have between them eight to twelve houses each;
- More than twelve houses and the balance is strained;
- In all cases common land which is shared by the cluster is an essential ingredient; and
- Ownership is essential for the clustering pattern to take hold, and shared ownership of the social space reinforces the common interest.

Alexander recommends that houses should therefore be arranged from very rough, but identifiable clusters of eight to twelve households around some common land and paths. Clusters should also be arranged so that anyone

can walk through them without feeling like a trespasser.

Clustering in residential contexts is a spatial patterning phenomenon observed throughout history where there is no interference. Rapoport (1977, p 254) observes that it is a process which "tends to occur in cities based on perceived homogeneity, differing interpretations of environmental quality, lifestyles, symbol systems, and defences against overload and stress". In Africa there is a long tradition of identifying territory with ethnic groups. Clustering also occurs in squatter settlements (Butterworth 1970; Mangin, 1970).

Urban researchers have shown that universally in city areas, a division into quite distinct and separate areas on the basis of place and origin, age, occupation, house ownership, recency of arrival and tribal origin (Pettonet, 1972) is discernible. The reason for clustering, according to Rapoport (1977, p 249) and others, is that with greater facility, it enables mutual help, assimilation and urbanisation and the preservation of certain institutions. Clustering helps maintain and recreate networks, use familiar controls and cultural patterns.

In fact, Rapoport holds that "people who are already under great stress need the support of familiar and even "prosthetic" environments, so that groups who have lowered competence, or are in a state of cultural docility, are more vulnerable".

Gateways

A feature not common in modern town planning practice is the introduction of a main gate to a housing precinct, to heighten the distinctiveness of the area and its identity. Alexander (1977, p 278) proposes that "every boundary in the city which has important human meaning - the boundary of a building cluster, a neighbourhood, a precinct" be marked by "great gateways where the major entering paths cross the boundary".

Common land

Common land should be provided as a social necessity, first to "make it possible for people to feel comfortable outside their buildings and their private territory" and second, "common land acts as a meeting place for people" (Alexander, 1977, p 337).

There should be enough common land to be useful and to accommodate children's games and small gatherings. Alexander holds that "the amount of common land needed in a neighbourhood is on the order of twenty-five per cent of the land held privately". The automobile should on no account be allowed to dominate this land.

14

Culturally
permissive
spaces

Goffman, in his book The Presentation of Self in Everyday Life (1959), and his subsequent development of this theme, discussed use of environments as stage sets and props to assist people both in enacting their social roles and escaping from them.

African colonial cities show varied cultural landscapes. Rapoport (1977, p 353) describes such cultural landscapes as "European suburbs and central areas, workers' camps, Indian and Arab areas, African elements of great variety, depending on origin and culture and using different materials, but all somewhat village-like, dispersed, animated, noisy, colourful with commerce everywhere: a profusion of shops, markets, stalls, stands and workshops, so that no lane or street was without them. At the same time activity shifts among areas - at dawn it is the central market, in the afternoon the small local outdoor markets in each quarter, then shifting markets as itinerant merchants stop on any piece of open land".

It follows that if urban form is an expression of culture, then as Rapoport (1986) states "the city is ideally a series of areas of varied culture and

subculture character", then a number of design consequences follow:

- It is necessary to understand the cultures of the various groups involved and the influences on form of their values, lifestyle, activity systems;
- The goal is conflict resolution on an urban scale;
- Use open-ended design with some frameworks which link and relate them. Open ended design ideally creates environments which allow more degrees of cultural expression; and
- Forcing people to modify and evolve is as bad as the inability to do so.

Urban social spaces should permit freedom of action, involvement, active-creative adaption and modification.

Spaces with cultural symbolism

In older cities of the western world, squares are far more than square metres of open space. In Italy, for example, they are truly social spaces and represent a way of life, a concept of living. Not only is the piazza in Italy the extension of the Italians' living space, but it also expresses either "the medieaval concept of highly enclosed space of picturesque rather than emotional charm" or "the sophisticated and mathematical centralism of the static Renaissance" or "the dynamic feeling of mass movement in space of the Baroque" (Kidder-Smith, 1954, p 44). In most instances the spatial forms express the dignity of man with strong cultural symbolism. There is thus also a timelessness and therefore a secure feeling of continuity in the social space settings.

The Greek view of man's relationship to the world is most readily seen in concrete form, especially in the architectural structures. In describing the Parthenon

in its setting on the Acropolis, for instance, Wheeler (1964, p 12) noted that:

Neither the building nor its decoration had any inner life; it was a perfect exterior, a perfect piece of man-made geology...

Just as the sacred ceremonies occurred outside the buildings, so did the structures themselves turn outward with their pedimental sculpture.... In this way the Greek culture was expressed in social spaces which offered opportunity in a responsive way.

Rapoport (1968, p356) refers to open-ended design as "a form of design which determines certain parts of the system, allowing other parts, including unforeseen ones, to happen spontaneously". Enabling environments thus allow a level of meaning to be given through personalisation and through the opportunity for expressing different values, needs and lifestyles. This approach overcomes the problem of a 'tight fit'. Open-endedness and cultural landscapes imply an active role of people in the urban environment. Rapoport (1968, p 368) argues that given an opportunity, people will choose an appropriate environment for themselves and that "this is the most important way in which people assert a sense of mastery and control over their environment and that is an important factor in their well-being".

15

Mobility/time
versus
other factors

The Two Dimensional Configuration of Movement Systems

The setting down of such possibilities begins largely with the movement patterns which could be of the following configurations, either in pure or composite form:

- Linear configurations which are a primary organising element catering for cars, cycles, people and services. As part of a movement system they are not confined to a straight line, but

could be slow or tight curvilinear, also segmented depending on whether planned strictly for cars or people;

- Grid systems create nodes at regular intersections, and yield square or rectangular fields of space;

A useful case study of the influence of topography on the grid configuration of streets is San Francisco, where the attributes of the topography have been synthesised with the public transportation needs of the city and produced an efficient grid movement system for that city sited as it is on a difficult terrain.

- Network configuration is in essence a random system connecting specific important points in urban space;
- Radial systems are capable of providing efficient circulation, providing they are supplemented by concentric circulation and depending on other factors including topography;
- Spiral configurations, are continuous systems originating from a central point and becoming increasingly distant from it. Unless planned to create a specific spatial experience, the choice of such a system would probably be dictated by topography. Italian hillside towns provide precedents for the spiral path systems.
- Composite configurations are more common than the pure forms preceding, and the movement systems of most towns evolve from dynamic growth transposed into socially and economically determined desire-lines.

The resultant richness of spatial diversity at the intersections of a composite configuration can be well exploited for social and economic vitality.

Three Dimensional Relationships : Movement systems and urban space

Dependent on the type of mobility, such as motor vehicle, cycles or pedestrians, it is important that the movement system does not destroy the integrity of the public space with which it links and through which it passes. Planning can employ devices such as a mediating space, to avoid the bisection of a space by a movement system. Alternatively, a movement system could pass through axially, obliquely or along the edge of a space. A movement system can also be planned to terminate in a space.

Essentially, the three dimensional form of a movement system is constituted of attributes which relate to:

- the expected performance of the path of movement as part of a system of circulation. The width and height of a circulation space is a function of the type and amount of traffic it must handle;
- the form of the spaces through which it passes;
- the entrances which open onto it;
- considerations of scale, proportion, light and vistas;
- the degree of enclosure, either completely, open on one side or open on both sides; and
- the manner in which changes in level are handled.

16

Integrated
use of social
spaces

Informality yet user-discipline

To achieve safe, convenient and rewarding social spaces which function independently, collectively, formally or informally, post-Radburn developments have lead to attempts to provide street users, particularly children with a more informal human-scale environment. Baker, Thompson and Bowers (1985, p 248) have observed that there has been conscious planning to create in the driver "the feeling of an intruder in a pedestrian domain. In order to accomplish this, careful attention has to be given to the road layout of an estate". The following countermeasures are features have been identified by them and are central to the success of the concept and safety of the pedestrian:

- a road hierarchy in the neighbourhood eliminating through-traffic;
- narrow, even circuitous carriageways;
- materials and textures more associated with pedestrian areas, ie cobbles, brick paving and less conventional road surfaces;
- shared pedestrian/vehicle access ways or 'shared spaces' and absence of pavements which, as a form of zoning, might suggest separate provision for pedestrians and vehicles and signal vehicle priority to a driver;
- reduced visibility;
- short vistas;
- rumble strips.

Not only do the post-Radburn layouts offer more safety and flexibility of trafficways to all users, particularly children, and as part of the social space system, they also enable designers to create higher quality residential environments by the avoidance of a disproportionate amount of hard surfaces.

Another development toward the successful integration of functions in a street, is the application of the

"woonerf" concept to existing street settings typical of part of Holland and Germany. It is a concept which combines traffic management by physical constraints in the residential street, with increased space to play, to socialise and for leisure. The livability of existing neighbourhoods is thereby enhanced. The concept can be applied to new settings. The impact of woonerven on leisure activities has been studied and showed that children's play was the chief activity.

"Although verbal communication among grown-ups did not increase with the redesign of the streets, the latter did have an effect on areas where communication took place" (Eubank-Ahrens, 1987, p 63). On the other hand, because of increases in the length of stay on the streets, the amount of interaction observed by Eubank-Ahrens increased correspondingly. Also, "children (and, indirectly, their parents) seemed to feel more secure, allowing for a proliferation of types of play" and "children gained more contact with adults, which would not have been possible in playgrounds or other isolated play facilities". Woonerven clearly provide more behavioural options for children at their home base, and thus contribute to social space quality. The integration of functions in a form similar to woonerven can potentially improve the functionality of the urban spatial system by the enhancement of its efficiency as a movement corridor and a social space simultaneously.

Some negative contacts also occurred: " In changing neighbourhoods, conflicts invariably arise between the established older order and newly arrived residents" as well as by " the different behaviour of various age groups, which have an impact on the usability of public open space" (Eubank-Ahrens, 1987, p 76).

Optimum norms applying to shared street spaces after Bentley, Alcock et al (1985, p 72).

Shared spaces are only possible where traffic flows are less than 250 vehicles per hour, and the majority of the traffic has its destination in the area itself. No area of streets designed on the 'shared space'

principle should be more than 500 metres from a 'normal' vehicular street. Also:

- Each street in the area should have directional changes every 50 to 60 metres, but additional changes could be necessary;
- Two-way traffic should be encouraged throughout the area, to reduce vehicle speed;
- The section should be kept narrow with occasional widening; and
- Raised objects should be lower than 750mm, to allow good visibility to motorists in case of play activity on the street; and
- Adequate parking of the on-street type for residents and visitors must be provided. This demands greater attention from drivers, and provides better play spaces in the absence of parked cars.

Busy vehicular streets and pedestrians

In a busy vehicular street the pedestrian movement zone must be given special consideration appropriate to the level of pedestrian traffic involved. In subtle ways a zone for amenities can be created such as street trees, seating, bus shelters, telephone kiosks and cycle racks. Not all these can be justified in all situations, but space should be left for others to be added later.

In Woodstock, it was found (Dewar et al, 1977) that private outside spaces in general is extremely limited. Because backyard spaces are small and usually perform the function of surplus storage areas, family activities usually spill over into the public space and thus into the community life of the area. In the Woodstock situation specifically, the tightness of the private open space fabric is relieved by the provision of two green open spaces, "located along the highest activity route in the area". It can be demonstrated how

these two open spaces form part of the continuum of external space of the neighbourhood.

In noisy heavily trafficked streets, seclusion and quiet can be achieved by providing relatively small spaces, set back from the building line. These spaces should be located in the areas of high pedestrian activity. To reduce vandalism at night, these setbacks should be brightly lit, and ideally surrounded by buildings which are used in the night time. To maintain a good relationship with the street, these setback spaces should be raised above street level.

17

Optimise

Density options

Integrated design, less zoning

Sharing of facilities, such as the multifunctional utilization of school sports facilities, warrants closer inspection. Significant enhancement of opportunity in the residential environment can be achieved, according to Morkel (1988) by:

- the integrated design of residential environments for the more productive use of space. Through careful design, greater proportions of streets can, for example be integrated into the housing environment as community social space;
- local shopping and commercial facilities could equally, through more open-ended zoning practices, be integrated into the residential environment in order to obviate the need for setting aside specific sites for these facilities. The practice of including shopping at ground level with housing could be encouraged as a further option;
- alternative housing options should be explored. Research conducted into residential densities in cities across the world indicate that distinct pattern emerges regarding the relationship of high density residential environments and the use of the courtyard house form. More recently this house

form has received increasing attention in contemporary contexts such as Alexander's housing in Lima, Peru; research at Cambridge led by Martin and March; recent housing projects in parts of Manhattan and Los Angeles; and many housing estates in Britain, the Netherlands and Sweden.

The Courtyard House

Examination of an alternative housing option in the form of the courtyard house, demonstrates the merits of perimeter development of a site implicit in the Fresnel square. Morkel (1988, p 18) refers to the "mathematically derived relationship of areas constituting the Fresnel Square" which is particularly important and "is the principle that tends to make the courtyard configuration a particularly efficient housing option". The context of this observation relates to the configuration of large scale housing complexes, however, the Fresnel square principle can also be applied to individual dwelling units on individual sites

Merits of the courtyard house and perimeter development are:

- high densities can be achieved while still affording ready access to outdoor space;
- the spaces encapsulated within the built form lend themselves to being easily integrated into the community thus promoting community interaction, privacy, defensibility and surveillance by residents.

Small Stands

Layouts comprising very small stands should project the long-term comprehensive extension of all the house units and a system for ensuring that overlooking, overshadowing and the misuse of the stand's limited size are avoided.

According to Morkel (1988, p 21) the following principles should be observed with prototypical small stand layouts:

- The stand is generally narrow on its street frontage and deep in its extent back from the street. This reduces the length of the service infrastructure along the street frontage corresponding to each stand, thereby liberating financial and land resources for other capital works from which the quality of urban amenities could benefit;
- the road system is designed to minimise through traffic in residential areas, thereby allowing for a large reduction in the width of local access residential streets. This reduces the amount of land and road infrastructure corresponding to each stand;
- the house is placed close to the street to consolidate the unbuilt-on area of the stand into a single usable (for example, for subletting) area rather than a fragmented patchwork of unusable space. The house extends across the street frontage and promotes the area consolidated to the rear of the house as a secure, private household space. The frontage onto the public environment is thus reduced and maintenance thus minimised;
- extensions to the rear of the house are kept to the perimeter of the stand to ensure the integrity of the rear private social space;
- panhandle sites become a possibility with concomitant efficiency in the layout of the infrastructure.

Density Option Frameworks

According to Goethert (1985, p 279) practical experience indicates that "at the early stages of a design, three simple parameters may be used as critical indicators, to avoid wasteful use of scarce resources

resulting in unnecessary expense and a continuing burden to the user and the public service agencies.

These elements are land utilization, network length/area ratio and density. Used together the three indices of land utilization, network length/area and density become a useful tool for early design and evaluation of layout plans.

Goethert and Caminos (1978) define the Land Utilization Index as a "qualification of the land around a dwelling in relation to user, physical controls and responsibility. In this context, four types of land are identified : public, semipublic, private and semiprivate". It incorporates three separate parameters:

- the actual user, from the individual in a private lot to undefined groups in public streets;
- the responsible agent, like the public sector in streets and the individual user in a lot; and
- the type and means of control, ranging from legal and social controls to physical barriers like fences.

To illustrate the application of the third parameter, for example, the addition of a fence increases control and may change the actual use of a piece of land to semipublic status from that of purely public.

The Network Length/Area Index is defined as "the ratio of the length of the network to the area(s) contained within, or tangent to it" (Goethert 1985, p 282). The index is determined by measuring the total area served by a network, and the length of the network itself. Units are expressed in length per unit area, such as metres per hectare.

In addition to being an indication of access functions, this index provides a direct reference for utilities costs; street paving, water distribution networks, sewage disposal networks and electrical lines. The

ratio is also a reference for non-physical services, such as refuse collection. In general terms, the lower the value of the ratio the more cost effective the network, assuming that the basic service functions of it are still maintained.

Density is defined (Goethert & Caminos, 1978) as the ratio between the population of a given area and the area itself. It can be either:

- Gross density; and
- Nett density which refers to the residential land only and does not include land for other uses.

Density is a commonly accepted indicator and provides a reference for the amount of land needed for supporting facilities with regard to a given population and also indicates the type of physical development.

In the application of the indices to the planning exercise, there must be some discreet definition or judgement of what constitute 'appropriate' values for the three parameters. This would inevitably vary with the circumstances of the setting being planned. The Goethert and Caminos system is a tool, which when translated into simple graphics, allow quick visual comparisons among several layout alternatives. The method allows planners to conduct initial studies with a view to optimising densities, so that land use options become clearer at an earlier stage without heavy expenditure in terms of finance and time.

18

Building edge of
spaces

Interface between Public and Private Settings

Buildings which do not create the possibility of a connection with the world outside, do not invite the public near and present an image of being aloof and essentially private territory exclusively for the people who are inside (Alexander, 1977). Such buildings add nothing to the quality of life of the urban

dweller. An attempt must be made to enhance the social amenity value of the periphery of an urban space by attention to the building frontage and the extent to which it can enhance the inviting and enabling qualities.

As there is often no strong connection between the internal functions of the building and the public setting outside. This could be at the root of the problem. The classic solution is the arcade provided, according to Alexander (1977), that:

- the public path to the building itself becomes a place which contains the character of the inside;
- it covered and becomes an extension to the building and is at least two metres;
- the edges of the ceiling are not too high;
- in some situations where it can be achieved, an arcade passes right through a building.

Arcades fronting onto spaces where spontaneous and informal trading can take place should be planned to utilize this opportunity to fullest advantage.

Interface in the Residential Domain

In their comparative analysis of urbanism in Cape Town, Dewar et al (1977) explore the concept of interface and its application in a representative area, namely Woodstock. Amongst others they identify one factor of critical importance for the quality of the area as a whole, which is the relationship between public and private space. Dewar et al (1977) hold that the "public and private spaces are interdependent, each affecting the quality and usage of the other. The interface between these spaces contributes substantially to the positive nature of this interdependence and plays a number of roles". Its characteristics are represented as follows:

- the clarity of the interface prevents a restrictive imposition of public activities onto private space;
- the public spaces are provided with a sense of enclosure, scale, continuity and protection, and consequently the interface is largely instrumental in determining their quality (and therefore their use);
- the way in which the interface is made affects the use of private space. The closer to the street the interface is, and the less complex its definition, the less private it becomes. When the private space is very small, and therefore very close to the street, it merely defines privacy.
- the definition of public and private social space is maintained throughout the area by the continuity of the fabric which provides a sense of scale and dimension.

In the public setting and residential domain, a variety of building types is possible which generate a variety of public and private interface relationships. Commercial, industrial and community facilities usually "front directly onto the pavement; residential activity on the other hand requires a much greater degree of privacy and consequently the interface has a zonal structure, creating graduating zones of increasing privacy" (Dewar et al, 1977, p 12).

Active building fronts

Bentley et al (1985, p 63) observe that "the public edge of the building should house activities which benefit from interaction with the public realm, and can contribute to the life of the public space itself".

To achieve this:

- Locate as many entrances as possible in such positions that comings and goings are directly visible from the public space;
- Encourage any compatible uses within the buildings to spill out into the public area. This principle applies to uses on the ground and first storeys;
- Even if there are no uses, most buildings contain activities which can contribute to the animation of the public space itself;
- It is still necessary to preserve the privacy of the indoor activity, so that the users will not feel the need to screen themselves totally from the public space, thus negating any contribution to the experience of the space itself. This privacy can be achieved by horizontal distance, a change in level and/or a combination of both; and
- The usefulness of the edge is important for people-watching and is greatly increased by the provision of places to sit;

19

Outdoor oriented
formal and
informal
social activity

Peck (1982, p 333) after examining the agoric planning of the ancient Greek civilisation observed no one seems to have recognised that the "glory that was Greece" was made possible by a special form of town planning, that is the provision of the agora located at the centre of each Greek city. The agora was the place where the inhabitants gathered for political, commercial and social business, so that the agora became the city's living heart. With a positive approach to the planning of the city's outdoor spaces, the potential social amenity of spaces external to buildings can be enhanced to the benefit of the urban dweller.

Agoric planning implies the application of the following principles:

- Comprehensiveness: The agora must contain all the commoner amenities for active recreation, within reason, for both sexes, all age groups and all interest and activity groups;
- Centralisation of amenities;
- Attractor planning based on the principle of "cumulative attraction"; and
- Biopoint, biopattern and biodistance planning. Mark a person's biopoints on a map, join them up, and that is his biopattern. The distance that the urban dweller has to travel to visit all his biopoints is his biodistance. If the distances are too long, the urban dweller has simply to abandon certain of his biopoints, to the detriment of his feeling of personal fulfilment and even his health.

Peck holds that agoric planning is vitally and crucially essential to the well-being of modern man because it enriches the individual by enriching his environment.

20

Personal space

It is in the nature of animals, including man, to exhibit behaviour which is called territoriality. In so doing the senses are used to distinguish between one space or distance and another. The specific distance chosen depends on the transaction: the relationship between interacting individuals, how they feel, and what they are doing (Hall, 1966, p 120). This hypothesis is behind the four part proxemic classification system based the observations of both animals and men. Researchers hold that the simplest form of the situational personality is that associated with responses to intimate, personal, social and public transactions. Some people never develop the public phase of their personalities and similarly, others have trouble with the intimate and personal zones which requires tolerance of closeness with others.

- Intimate distance: At this distance, the presence of another person is unmistakable and may at times be overwhelming because of stepped-up sensory inputs. Researchers divide intimate distance into two phases: close and far (15 to 45 cms);
- Personal distance: This distance can be represented as a protective sphere that an organism maintains between itself and others. In the close phase (45 to 75cms), physical contact is possible if so desired, but equally so separation. Keeping someone at 'arm's length' is one way of expressing the far phase (75 to 125 cms) of personal distance:
- Social distance: The boundary line between the far phase of personal distance and the close phase of social distance marks the 'limit of domination'. Impersonal business occurs in the close phase (125 to 215 cms). In the far phase (215 to 365 cms) business is conducted in a more formal manner; and
- Public distance : At the distance of the close phase (365 to 800 cms) an alert subject can take evasive or defensive action. At the far phase distance (800 cms or more), much of the non-verbal part of communication shifts to gestures and body stance. The whole man can be seen as quite small, and he is perceived in a setting.

Proxemic behaviour is culturally conditioned and entirely arbitrary, however, it is important for the phenomenon of personal space, the need for privacy and an escape from stress to contribute to the planner's understanding of human reaction to spatial distances.

21

Neighbourhood
privacy from
public activity

Communities exist in the minds of the city dwellers, and there is often agreement about their boundaries and

their stereotyped characteristics. Communities are also important to strengthen a sense of belonging.

Elements of settlement design can reinforce an agreed image of community by means of separations, the placement of local centres, the diversion of main trafficways, the exploitation of irregularities or terrain and other differentiations of physical character.

The creation of common land for the neighbourhood, is in keeping with the concept of clustering described under PDG13, and assists the gradations of publicness to which the urban setting is exposed. Alexander (1977) promotes the idea that a clear distinction should be made between three kinds of homes - those on quiet backwaters, which are twisting paths, those on busy streets and those in-between. Each neighbourhood should be given an equal number of each type. Lynch (1981, p 248) conjectures whether, "since the basic issue is one of control", neighbourhoods should be strengthened and reinforced by spatial form, allowing the urban dweller's options to range from escape from stress to social interaction.

Another device to create a psychological shield against over exposure of a neighbourhood to public activity, is the use of main gateways into clusters. The gateways should be solid elements, visible from every line of approach, and could even be a hole through a building.

Alexander creates the image of the neighbourhood square as a public outdoor room, which is a partly enclosed place, with possibly a structure without walls which is useful to and maintained by the community.

22

Territorial
needs

The territorial needs of the individual or the group as expressed in the thematic analysis, is instrumental in the development of group and place identity, such as the ethnic enclaves which may characterise parts of larger cities.

There is an obverse side to the question of providing for territorial needs. Corporate business territorial needs differ from that of individuals in that they aim to project an image of prosperity and not to create physical barriers of ownership.

"The very idea of modestly fitting into the collective city is antithetical to corporate aspirations and the chest-beating individualism of the American way" (Trancik, 1986, p 17). The result is the public space, which is a public good, is turned over to private enterprise for development, usually with conditional usufruct attached. Trancik argues that the city of collective spaces has been transformed into the city of private icons.

The territorial needs of the individual or the group as expressed in the thematic analysis, is instrumental in the development of group and place identity, such as the ethnic enclaves frequently characterising parts of larger cities. Population size will effectively threaten the territorial boundaries of the individual especially in high density settings, and is associated with the potential carrying capacity of an urban setting without overcrowding.

Rapoport (1977, p 359) observes that "open-endedness is also intimately linked with territoriality since it allows personalisation, which is an important way of defining individual and group domains. By allowing group signs to develop this also helps to define rules of occupancy, which are then not only noticed and understood, but willingly obeyed. Since these rules are subtle and frequently understated, and also change subtly, the designer cannot provide for them - they are best allowed to develop within an open framework and they can then also respond to change in the population of the various areas. It is a principal way of giving to the environment".

Transportation-related air pollutants and the spatial and temporal distribution differ greatly from place to place within the city.

Air pollution is a function of commuting patterns, traffic volumes and speed, topography of urban form, built materials and meteorological conditions.

Spirn (1987, p 310) identifies causes which once understood could lead to effective initiatives, amongst others, control on the building form to open space relationships.

- In flat, open terrain under calm conditions, air pollution levels are highest adjacent to the road and decrease with distance from it;
- Street canyons lined with buildings of similar height, oriented perpendicular to the wind direction tend to have poorer circulation than street canyons that are lined with buildings of different heights and interspersed with open areas. To promote air circulation in street canyons step buildings back from the street, increase openings and vary building heights;
- Wind shadows on the lee of buildings reduce air circulation and pollutant emitted with them tend to build up. To reduce wind shadow at the base of a building, design buildings with a pyramidal shape or openings that permit air flow;
- The more enclosed the space the more likely the accumulation of pollutants. To promote air circulation in streetside arcades design the canopies to be high; and
- To reduce the effects of pollution, create highway embankments and woodland growth to help filter pollutants from the air; pollution-sensitive uses should be located away from highway emission zones.

Green spaces within the urban setting are dust-reducing and have the property of assisting toward cleaner air by a process of carbon-dioxide fixation through photosynthesis.

The relation of smog to urban sprawl is well known. "The more sprawl, the greater the energy expended in getting people and materials back and forth between them, and so the greater the air pollution" (Dantzig and Saaty, 1973). In the sense that green spaces are dust-reducing they contribute to healthier urban settings and consequently well-being of the urban dweller. The aim is to achieve a 'safe' urban environment so that people breath pure air and utilize the outdoors without concern for their health.

Other forms of pollution, such as noise pollution, potentially detract from spatial quality and should be addressed scientifically particularly where integrated functions are being contemplated.

24

Security provided
by the presence
of others

Community life in the suburbs has been found wanting. Street life has in its hustle and bustle and unstructured supervision, something which helps to raise kids successfully, according to Jane Jacobs (1961). The practice of fencing in homes and gardens (for privacy and protection) and the practice of using a motor car for every errand effectively isolate the family from personal encounters with those who live in the neighbourhood. To overcome the limitation, the designer runs the risk of the residents forced to become overly friendly with one's next door neighbours and to lose their privacy. In addition, such environments do not provide guarantees against crime.

In high density settings, it is possible to provide a spatial system which ensures that the potential presence of others either living in the street or in transit through the street help to maintain a sense of security. The governing principle that important foci

or meeting points are visible along local axes, implies that there will always be a point from where the important foci will be seen. Such a system will allow access to strangers, but they would be controlled by the immediate adjacency of dwellings, the residents of which would in turn provide an effective mechanism for policing the space. Hillier (1977) holds that this is a more subtle form of security than a simple grouping of dwellings alone which is usually expected to produce a self-policing environment.

25

Spatial options
for informal
marketing and
jobs

Much more must be made of the system of social spaces in the urban setting to promote fulfilment through economic activity. Potentially social spaces play an important role in housing the informal and periodic activities, and which are so important to urban life, such as public meetings, spontaneous theatre, periodic markets, fairs and circuses.

Unfortunately, "Most planners conceive of the street as a transitional space and do not allow for it to act as an open space, activity space, or social space, yet it can play an immensely important role in the design and planning of many cities, as we have seen in Mexico, Africa and elsewhere...." (Rapoport, 1977, p 357).

The social and commercial role of the traditional street has been undermined by such design features as enclosed malls, which "have siphoned shopping and entertainment off the street, which no longer functions as a gathering place" (Trancik, 1986, p 10). Most often such emporia are situated on the fringe of the urban area and requiring transportation. In this way they do not facilitate access to the market, which excludes the less affluent from ready access to the marketplace.

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Trafficways and nodal intersections can provide an important venue for small trading enterprises, not requiring large capital sums for infrastructure and accommodation, provided that they are designed to enable such activities to take place there. By enabling trading activity, such venues can increase income options.

The most humane cities are always full of street cafes. Alexander (1977, p 437) considers the street cafe as special to cities and provides a unique setting so that people can mix in public, in streets, parks, squares, along promenades and avenues. Busy streets should allow the front of the cafe to spill out onto the pavement, so that a set of table and chairs stretch out of the cafe into the street. Mobile food vendors should be accommodated so that public seating can be utilized to enjoy a snack while seated. Some rules proposed by Alexander for food stands include:

- They should be concentrated at road crossings where they can easily be seen;
- They should be free to take on the character of the area around them; and
- They can be either portable stands, built into the fronts of buildings or mobile carts.

Alexander (1977, p 737) also holds that "as the decentralisation of work becomes more and more effective, the workshop in the home grows and grows in importance". The relationship between a workshop and a public street is a special one, and is a potential way to enlarge the connection between the worker and the community, from which every member of the community will benefit, provided that it can be seen from the street and that the owner can 'hang out a shingle'.

26
Concentrations
of
activity

Proximity and intensity of social and commercial
activity

The economic or physical means to close the distance, and ease access to facilities is usually the privilege of the affluent in the modern city, which by nature of its sprawl, necessitates rapid modes of transport. Dewar (1984, p 28) considers the "basic unit of performance measurement", and concludes that the primary unit is the "range of opportunities, experiences and activities to which inhabitants of a settlement have easy access". Also, the unit of measurement must be defined in terms of the mobility of the poor which is access by people on foot. "If essential city facilities and opportunities are so located and dispersed through space that they are easily available to the poor as well as the wealthy, the entire system is richer" (Dewar, 1984, p 28)

People want to be close to shops and services, for excitement and convenience, but they also want to be away from services for quiet relaxation (Alexander, 1977). To achieve a balance, a gradient of density is proposed. It is held that community facilities scattered individually through the city do nothing for the life of the city. For that reason, nodes of activity provide a viable option spread about 300 yards apart. At the centre of the node, a small public square should be created, surrounded by a combination of community facilities and shops which are mutually supportive. The objective is to increase vitality of the urban setting.

A feature of older cities is the promenade. The relation between the catch basin of the promenade, and the actual physical paved area of the promenade itself, is extremely critical. A formula for determining catch basin size is developed by Alexander (1977, p 169), with the qualification that "a promenade will not work unless the pedestrian density is high enough..."

A further traditional activity of the urban dweller, which is the quest for some form of night life. A cluster of night spots will create life in the street. The public places surrounded by night life amenities must be well-lit, safe and lively. The clustering of amenities will increase the intensity of pedestrian activity at night by drawing all the people out at night to the same few spots in the town. Transport terminals create an ideal opportunity night time activity, as they are places for people waiting to embark on public transport, or to be met by others.

27

Planned
outdoor
amenities

Children in particular have a better sense of place if the urban setting contains play environments which are scaled to their size and are humanised. The physical setting makes a difference in, and directly contributes to a child's behaviour and willingness to learn acceptable social behaviour. The urban setting can create the right elements to equip the child for his role in the community. Children learn through their senses, so that a child at play is learning and can learn from the built environment in a positive way. The alternative to barren urban spaces is to combine visual interest with physical challenge. Good neighbourhood playgrounds can stimulate multisensory play if well-designed and provide for the child's experiential appreciation of his urban habitat.

Within the category of planned amenities in the urban setting, are many familiar forms usually contained under the umbrella of landscape architecture, such as:

- Fountains, shelters, steps, kiosks, bandstands;
- Sportsfields and landscaped parks;
- Trails along a natural feature; and
- Botanical gardens and Sanctuaries.

Options for recreational space should include a range for both formal (e.g. organised games) and informal use (e.g. play space, parks).

The extent of formal recreation space will be determined largely by available space and official standards, limited by the ability of the target population to bear the costs. The Liverpool Planning Manual (1983) for overseas development isolates the following considerations for formal facilities as being important:

- The location of the recreation facilities should be as central as possible to the areas which the spaces serve, though this need not be the most valuable area of the project site;
- Access will be important, but a location behind commercial, industrial or public facility areas would be suitable; and
- Areas for formal games should be reasonably level and of suitable surface.

For informal areas the Manual proposes that:

- They should be provided on a more pragmatic basis;
- Locating a large number of small open spaces relating to housing clusters or local access roads will prove to be most economical and socially acceptable, particularly for the supervision of children from their homes; and
- Hardened areas may be desirable for older children, though these must be located so that activity does not affect other users of the social space.

An important factor in current thinking, is the matter of responsibility for the maintenance of outdoor amenities with a view to reduction of public costs. Design proposals should be developed in accordance with prudent economic policy, such as:

- Private maintenance of garden areas in front of houses, this could include the house-owner's responsibility for the maintenance of the immediate street trees;
- maintenance of sports areas by clubs; and
- maintenance of small public gardens by commercial establishments e.g. cafes.

28

Integration of
natural
regimes

If nature is only the world untouched by man, then it follows that the remaining pure natural regions must be safeguarded from human intrusion. On the other hand, if man-managed landscapes such as farming and forestry are regarded as part of the valued natural setting, it follows that the city and the inhabited countryside should be one unit. Lynch (1981, p 256) observes that "sometimes it has been the unity of exploiter (city) and the exploited (countryside), but they have always been linked together socially, economically and politically".

The integration of natural regimes is not just a matter of saving plants and animals, but of making their presence apparent. "The movements of sun and tides, the cycles of weeds and insects and men, can all be celebrated within the spatial network of the urban setting". The urban dweller can be liberated from the dichotomies of city and country, artificial and natural, man versus other living things, once the city can be accepted as being as natural as a farm (Lynch 1981).

The integration of natural regimes, in this context, implies the integration of natural resources, which are common property resources and have a particular place in social well-being and due to pressures, require to be brought into the management plan for urban settings. The United States Multiple Use/Sustained Yield Act of 1960, "mandated the U.S. Forest Service to recognise 1) the diversity and ecosystemic characteristics of

land...., and 2) the need to regulate the resource yields of these lands in a way that could be sustained" (Steiner, 1988, p 31). Stauth (1983, p 93) argues that "the destruction of common property resources, may well be the more serious problem for society" than pollution, for the following reasons:

- It is a far more insidious phenomenon because it is often a gradual process, the effects are not always so obvious, and the ultimate implications for social well-being are far from clear; and
- It will probably prove to be a more intractable problem because dealing with it will require much greater sacrifices on the part of society.

The above considerations of management of natural resources on a sustained yield basis could well require physical space allocations or integration of resource areas into the fabric of the urban setting so that they are thereby enriched.

29

Employ
biogeographical
principles

To promote species diversity and enhancement of urban living.

Although urban growth appears to destroy wildlife habitats and to reduce the diversity of flora and fauna, the new buildings, open spaces and food sources in cities provide a great variety of ecological situations which are exploited by particular types of plants and animals. Within each of these urban habitats an equilibrium develops between the colonising plants and their physical and biological environment (BNK Davies, 1976).

"The notion of corridors linking "habitat islands" together is perhaps one of the more practical uses of island biogeographic theory in urban areas". This approach "should allow for the development of open

space networks which are ecologically resilient and diverse, and combine a low cost of maintenance with high, scientific, educational, aesthetic and recreational value" (Roberts, 1985, p 11). The open space network, including the primary street system, the neighbourhood street and square and private social spaces would all potentially contribute to the "linking corridor" concept. The application of such concepts could strengthen the ecological base and encourage ecological diversity.

Principles for the design of habitat islands in the urban area could be derived from the MacArthur-Wilson theory for off-shore islands. After the thesis that nature reserves behave as habitat islands, Diamond (1975) proposed that a set of geometric principles could be employed with the aim of optimising the function that reserves have in saving species. In an adapted form these principles could be applied to the planning of the open spaces in the urban setting, so that they promote species diversity. Roberts (1985) summarises as follows:

- A large habitat area is better than a small one for two reasons: the large area can hold more species at equilibrium, and it will have a lower extinction rate;
- Several smaller areas adding up to the total of the single area are not biogeographically equivalent to it, since they tend to support a smaller number of species;
- The equilibrium number of species in one of the smaller habitats can, however, be raised by increasing the immigration rate to it. This can be done by judicious juxtaposition of the several scattered reserves, and by providing corridors of stepping stones of natural habitat between them; and
- Any habitat should be as near-circular as other factors permit, to minimise dispersal distances within the habitat. If the habitat area becomes narrowed or has dead-end peninsulas, local

extinction rates are likely to be high due to the presence of small populations and peripheral disturbances, and dispersal is unlikely to keep pace with extinction.

In a pioneering article, Davis & Glick (1978, p 299-303) advocate:

- A combination of careful planning and benign neglect;
- The need for some abandonment of the 'well-entrenched manicure complex' to ensure that the natural diversity of regenerating nature is not entirely replaced by the uniform and technology-dependent landscape of established design tradition; and
- The recognition that urban habitat islands and corridors are biogeographically valuable, as they provide 'reservoirs' and 'stepping-stones' for a variety of plants and animals.

Compared to the traditional park, woodland-like communities may be more expensive to establish initially, but these new natural areas may well prove cheaper in the long run, because they require less maintenance than the traditional mown grass and flower bed of the traditional park (Gerell, 1980).

Only by rethinking planning and indeed management policy can ecological viability and conservation of indigenous flora and fauna be achieved. By ignoring open space resources, biogeographical capabilities of the open space network become limited.

Brady, Tobias et al (1978), developed a typology for the urban ecosystem and its relationship to larger biogeographical landscape units, as a tool for the study of urban ecosystem dynamics. The typology is applied specifically to the north American situation, but application of the approach to the urban spatial network in other contexts could be achieved by adaptation of the terminology for colloquial usage and

so lead to improved integrated environmental management.

30

Offset

Geomorphic

Impacts

To compensate for the destruction of the ecological base, and minimise the alteration of the natural regimes

The city is a new landscape, with new forms such as man-made cliffs, long narrow tracts of hardened surface, sometimes broken by the intervention of the original natural landscape. The nature of the land cover is a major factor in affecting climate, wind patterns, nutrient status and diversity of the intra-urban ecosystems as city habitats and biotic communities can be called. Extremes in settings in the urban environment, are characterised by completely covered built-up central business area on the one hand to relicts of the rural landscape on the other in the form of remnant woodlands, copses, commons and urban heaths.

The hydrological changes associated with urban development cause exposure of the soil during the development of new construction sites allowing rapid erosion of soils and increased silt loading in streams, up to as much as 100 times (Douglas, 1983, p105) thereby also influencing the extent of floodplains. The extraction of ground water by the standard practice of hard channelling of stormwater, withholds water from the subsurface, which may create physical changes and induce subsidence, and slope instability. In planning new urban environments, the possibility of precipitating mass ground movement must be met with solutions which include lessening of hard surfacing in urban settings and incorporating the relict landforms as far as is practicable.

Legal controls, introduced in North Carolina, USA in 1973 to limit the effects of development activities on natural systems, require:

- A sediment and erosion control plan for all urban development on areas greater than one acre;
- re-establishment of cover on disturbed areas inside 30 days, if active construction is not proceeding;
- retention of a buffer strip between the disturbed areas and streams or lakes; and
- grading of cut and fill slopes to a stable angle, and application of vegetation or structural measures within 30 days of slope modification.

Coastal sites are particularly sensitive to change due to the dynamic and complex nature of their forms. Impacts of development affecting estuaries cannot be evaluated simplistically and require specialised study.

Apart from changes to the landform and surfacing in the built environment, Douglas (1983) states that it should be understood by designers and planners that when buildings are grouped together:

- They influence the energy balances of one another and complicate the air movements and heat flows in the intervening spaces;
- The bulk of two buildings of differing size adjacent to one another, affect wind flows so strongly that the downward flow of air on the taller block creates higher wind speeds in two zones. Such effects can be avoided by carrying out appropriate analysis at the design stage, if necessary, with wind tunnel models, and thereby determining the spacing to minimising gusting;
- Vertical walls tend to reflect solar radiation towards the ground rather than the sky. Re-radiation from the ground bounces back on to the walls of the adjacent buildings. Skyscrapers can absorb more than six times the heat absorbed by the featureless rural plain, but an area of dispersed suburban housing would absorb only

slightly more than the rural plain (Terjung & Lewis, 1973); and

- The orientation of the streets, the season of the year and the techniques of and materials used in building construction may all affect the absorption of short-wave radiation.

The intensity, size and shape of any urban heat island varies with the topography of the city, land uses within the city, patterns of artificial heat generation and the weather. The inevitable changes to weather patterns in the region of urban development are well documented. Changes in the chemistry of the rain from the emission of substances into the atmosphere affect geomorphic processes, including building materials. Chemical weathering of building materials will be interlinked with any change to the quality of air over urban areas.

Douglas (1983, p 107) states that a "capillary rise of saline groundwater may cause salt attack after the structure is completed". Changes in the groundwater conditions under new urban development 'trigger-off' changes to the hydrological subsurface profile, which in turn can alter soil chemical profiles. In the planning of new urban settings, it is therefore important to observe subsurface characteristics and to plan to allow a high degree of surface water penetration, through measures allowing penetration and incorporating carefully conceived landscaping.

The city modifies the natural energy balance and air circulation through its multiple reflection and absorption patterns, its rough, uneven surface, its lack of water and vegetation over many tracts and additional sources of heat and dust provided by human activity. Intensive landscaping and "greening" policies by both the public and the private sectors must be practised for attaining successful urban settings.

To offset these manifestations of the built environment, each one must be considered in the planning of new urban settings. Solutions to these

problems require in-depth study, commencing with the identification of the geomorphic characteristics of the original natural site and landforms of the urban setting. A comprehensive approach can then be developed, with a view to offsetting the effects of the alteration of the original geomorphic properties by appropriate mitigative planning.

APPENDIX A

Stylised Layout of Urban Social Spaces