



SCOTTISH EXECUTIVE

A Literature Review of the Social, Economic and Environmental Impact of Architecture and Design

Education



A LITERATURE REVIEW OF THE SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACT OF ARCHITECTURE AND DESIGN

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SECTION 1: EXECUTIVE SUMMARY

1.1 The United Kingdom is in the midst of its biggest building boom post World War II. Much of this transformation is in the public sector, spearheaded by the increasing belief of policy makers in the potential difference that good, or bad, architecture and design can make to the lives and aspirations of individuals and communities.

1.2 In Scotland, this is evident in:

- A 30% rise in the total turnover of the construction industry in Scotland, from £8.4m in 1998 to £10.9m by 2003¹
- The largest ever investment in school buildings with 200 schools being built or refurbished by 2006 and a further 100 schools by 2008-09²
- A total of 27 hospital project proposals in the last five years with a total value of £983m³
- A total of 119,000 new residential dwellings built between 2000 and 2004, equivalent to 5% of the total occupied households in Scotland⁴, with a 9% increase in the number being built between 2003 and 2004⁵.

1.3 We know that well-designed buildings and places have the power to inspire us; to make us feel good about who we are, what we do and where we live, and importantly, they motivate us to achieve more – for ourselves and for our communities.

1.4 In Scotland, a belief in this connection between good architecture and design and quality of life is fundamental to government policy. It underpinned the publication of A Policy on Architecture for Scotland (2001a)⁶ and the subsequent establishment of Architecture and Design Scotland (A+DS) in April 2005 to be the champion for good architecture, design and planning in the built environment.

“Scottish Ministers want Scotland to be one of the best small countries in the world, valued as an outstanding place to visit, work and live. In turning this aspiration into reality a key task is to maintain and enhance the quality of our natural and built heritage. It is equally important that any development, whether new build or refurbished, contributes positively to the quality of our cities, towns and rural areas.”⁷

¹ Office for National Statistics, Annual Business Inquiry, www.scotland.gov.uk

² Scottish Executive Spending Proposals 2003-2006

³ www.show.scot.nhs.uk/pfcu

⁴ Scotland’s Census Results Online, 6.3.06

⁵ www.scotland.gov.uk/topics/statistics, HSG/2005/05, Table 6: New dwellings completed: 1995 to 30 June 2005

⁶ Scottish Executive (2001a), A Policy on Architecture for Scotland

⁷ Scottish Executive (2005), Scottish Planning Policy, SPP20, Role of Architecture and Design Scotland, Crown copyright 2005

1.5 In light of the development of the Policy on Architecture for Scotland and to provide better access to information on the impact of architecture and design in many spheres of life, the Scottish Executive commissioned this literature review. The aim was to gather sufficient national and international evidence of the social, economic and environmental impact of architecture and design, both positive and negative, to inform new design with a view to improving quality of life.

1.6 Research was sourced from a total of 158 organisations who supplied 195 documents from throughout the UK, mainland Europe, particularly Scandinavia and as far a field as Canada and New Zealand. The intention was, as far as possible, to gather empirical evidence, not only of the impacts but importantly, of the building and design factors causing these impacts. The review was focused solely on the end-user, those individuals for whose use buildings and places are ultimately designed. Literature was reviewed from within the last ten years, between 1995 and 2005.

1.7 The review adopted a ‘best-evidence synthesis’ approach (Slavin, 1986) to enable a combination of narrative review of qualitative and case-study evidence with quantitative evidence⁸. The aim was to provide enough information to give confidence in the commentary and to enable the reader to reach independent conclusions. While much case-study evidence exists, limited robust quantitative research has been undertaken with end-users. Much of the evidence presented is therefore a synthesis of case-study evidence.

1.8 To ensure the review was undertaken within a systematic and coherent framework, potential economic, social and environmental impact indicators and causal factors associated with the architecture and design of buildings and places were identified in the initial stages of the review. These were drawn from a range of work undertaken in the sector, particularly by CABE. On the basis of this framework a database was set-up to analyse the 165 documents identified as containing empirical evidence. The analysis included the profile and context of the research; type of research evidence and validity of the findings alongside a commentary on the impacts found and their associated causal factors.

1.9 There are many, detailed findings, which are outlined in the Key Findings and analysed in greater detail in both the main body of the report and Appendix.

1.10 Clearly both the causal factors and the range of impacts cross-over. One impact may be caused by several factors coming together. Multiple impacts may arise from a single causal factor. Often, the causal factors are generic such as ‘restoration’ or ‘high quality design’. Wherever possible, when the factors have been identified, we have attempted to be specific about both the causal factors and the impacts.

1.11 In summary, however, the key findings are:

Vision

1.12 **Visionary buildings**, those with character or a ‘wow’ factor create jobs; are important in business location decisions; help recruit and retain staff and increase land or property prices in surrounding areas.

⁸ Slavin, R.E. (1986) *Best-evidence synthesis: an alternative to meta-analytic and traditional reviews*, Educational Researcher, 15 (9), in literature reviews by, Wynne Harlen and Ursula Schlapp, *The Scottish Council for Research in Education*, 1998, www.scre.ac.uk

Restoration

1.13 **Restoration of historic buildings or sites** can engage local communities encouraging community interaction, which contributes to community cohesion and revival of civic pride.

Aesthetics

1.14 **Buildings with aesthetic appeal and a high-quality of design**, which allow for exterior views, fresh air, sunlight, spaciousness, tailor-made design, layout which encourages interaction, use of colour and visual art:

- Increase property and land values; are important in business location decisions; increase rental income and improve the marketability of property.
- Can help staff recruitment; provide inspiration and stimulation; heighten staff morale and satisfaction; improve effectiveness; reduce absenteeism; aid staff retention.
- Enhance pupil and student motivation; reduce absenteeism and improve academic performance.
- Contribute to improved patient recovery rates in hospitals.
- Can provide less harmful environments for people to live, work and learn in by reducing exposure to harmful pollutants.

Context

1.15 **The context of buildings**, particularly where they have natural views, are near to green spaces, trees and water features:

- increases rental value of commercial and retail property and enhances worker satisfaction and retention, particularly where the context is contiguous to high quality mixed-use public space
- has a positive effect on health and well-being of staff and residents
- increases residential property prices particularly where the green spaces include parks and playgrounds.

1.16 Homes that overlook each other and have good sight from kitchens and living rooms to outdoor areas where children might play, are safer or afford perceptions of increased safety for residents. Housing near busy roads is also felt to be safer from crime but clearly not from road-traffic.

Sustainability

1.17 **The use of sustainable design features** including energy saving techniques, reduces energy use and costs, both in construction and ongoing operation. This includes intelligent lighting; insulation; low temperature and automatically adjusting heating and glare systems and low emissivity glass.

1.18 Socially, careful use of building materials can have health benefits by reducing exposure to harmful materials. Use of energy-saving techniques can reduce the number of households experiencing fuel poverty. Effective sound insulation can lessen noise problems in high-density accommodation.

Space

1.19 The allocation and use of **space** has a significant impact on the effectiveness, efficiency, comfort and satisfaction in all sectors. In most cases, a variety of space affording different environments is beneficial.

1.20 In education, cramped classrooms reduce motivation and performance of pupils. Linking of space in schools can reduce staffing costs. Quiet spaces for study increase student motivation and performance. Common areas foster social interaction.

1.21 In hospitals, patients appear to be happier in private recovery rooms; multi-bed rooms can reduce feelings of isolation.

1.22 In work environments, open-plan offices improve communication but can also be distracting. Provision of creative / flexible spaces can encourage creativity and inspiration. Greater space per employee reduces illness.

Comfort

1.23 User comfort in terms of good-quality and natural lighting, air-quality, temperature and acoustics is important in all sectors for productivity, satisfaction, health and well-being.

Easy Navigation

1.24 Effective navigation for people is aided by providing external views from within to help people orientate themselves. In hospitals, disorientation is reduced by creating natural progression from public to treatment rooms supported by clear way-finding.

Character

1.25 Areas deemed to have character are more valued by potential house-buyers. Character, particularly if it involves restoration of historic sites can rejuvenate an area and give it a unique sense of identity. Standardised buildings and those that do not fit into their surroundings are less valued. There is however, evidence that regeneration increases property prices and a negative effect of this can be the displacement of local communities.

Enclosure

1.26 Gated communities are more likely to lack community cohesion; make people outside feel excluded and increase travel times and congestion for those who have to travel round them. Estates can also make people who live on them feel socially excluded due to physical separation from the rest of society.

1.27 Non-gated communities have greater street-vitality and compact, rather lower-density developments encourage greater community cohesion, due to lower car dependence.

Public Space

1.28 Safe, comfortable, accessible public realm attracts residents to an area and encourages greater use, which can lead to greater social cohesion, while lack of public space reduces the opportunity for this. Economically, quality public realm raises property prices and increases retail spend. Key causal factors include pedestrianisation, street-furniture and provision of benches and tables in play areas. Safety measures and perceptions of increased safety also

help increase use, particularly effective lighting, CCTV and designing public spaces to have natural surveillance.

Mixed Use

1.29 Diversity – varied environments offering a range of mixed-uses and experiences – appears to create significant impact. Mixed-use development helps regeneration by increasing an area’s vibrancy, attracting businesses and residents and creating jobs.

1.30 Socially, mixed-use development affords more opportunities for people to form social relationships and by lessening travel to work time can provide individuals with more personal time. There is also some evidence however that while mixed-use may help create socially diverse communities, these do not necessarily lead to social inclusiveness. Personal safety is felt to be greater in mixed-use public spaces. Health benefits accrue from mixed-use as greater exercise is taken when more people walk to work, retail and leisure facilities and decreased car-use lessens the health impact of car emissions. Economically, mixed-use environments create jobs for local communities; increase workforce productivity by providing nearby leisure and retail opportunities. Environmentally, mixed-use lessens pollution by reducing people’s car use for travel to work, leisure and retail facilities whereas greenfield locations increase car emissions.

Green Space

1.31 Green spaces and trees provide significant economic, social and environmental impact. Economically, proximity to green space increases residential property prices while lack of green space reduces them. Accessibility to green space increases the rental income for offices but as offices with significant green space tend to be located out-of-town, there are both health and environmental impacts arising from increased car use.

1.32 Socially, green space, particularly smaller, natural areas of green space close to housing, provides opportunities for social interaction and community activities, which foster community cohesion. Health benefits accrue from access to a natural environment and provision of opportunities to exercise, both of which help reduce stress and enhance individual well-being. Access to green space appears to be particularly beneficial to children, providing areas for social interaction which helps their emotional development and varying topography which can aid physical development more than traditional playgrounds.

1.33 The environmental benefits of green space and trees are extensive. Trees and shrubs help cool the air temperature in heavily trafficked streets; are good interceptors of solar reflection and radiation from buildings and streets; improve air quality by reducing airborne particulate and gaseous pollutants and produce oxygen. They can reduce overall energy use in buildings and CO₂ emissions. Trees provide carbon-storage capacity and lower the level of water run-off into drains, reducing flood problems.

Ease of Movement

1.34 Ease of movement, afforded by accessible, well-connected spaces has economic impact from being a major factor in business location decisions; helps attract and retain staff and increases the economic value of land where buildings are located near to transportation networks. Socially, low traffic streets afford a greater sense of neighbourhood as people use the streets more and move on less quickly. From a health perspective, well-designed streets that restrain vehicle speeds can reduce traffic accidents while provision of transport alternatives to cars, such as cycle networks and walkways increase exercise. Well-connected

and visible areas have reduced crime due to the existence of natural surveillance. Environmentally, good public transport systems, provision of cycle ways and walkways decrease car use and consequent pollution.

1.35 For both buildings and places, consulting and involving users and stakeholders in the design process can help foster a sense of pride, local identity and ownership and increase future use. These factors contribute to community cohesion and reduced crime, particularly vandalism.

1.36 It is clear from the literature review that architecture and design can and do impact on many aspects of life. Architecture can have either a positive or negative social, economic or environmental effect, depending on the quality of the design.

1.37 A more detailed outline of the main impacts of architecture and design is contained in the Key Findings section while analysis of the individual review documents can be accessed in the Appendix.

SECTION 2: HOW TO READ THIS REPORT

2.1 The report is presented in the following sections:

Executive Summary: brief summary of aims, context, methods and key findings.

Introduction: context of the review; aims and objectives; scope; methods and key findings.

Review Framework: describes the parameters of the literature search; the framework developed to review the literature and the approach taken to the analysis.

Key Findings: brings together and presents in table form, the economic, social and environmental impacts identified alongside their causal factors, giving an indication as to the strength of the evidence for each impact.

2.2 Separate sections for economic, social and environmental impact follow which summarise the key impacts and causal factors for each. This is followed by more detailed reviews of particularly relevant or interesting research in different sectors including commercial, housing, health, education and leisure.

2.3 A full bibliography is appended should a reader wish to follow up on individual research.

2.4 A more detailed outline of the main impacts of architecture and design is contained in the Key Findings section while analysis of the individual review documents can be assessed in Appendix.

2.5 A Dissemination Strategy has been developed to inform the Scottish Executive's distribution of the report, identifying key organisations and media in Scotland, the rest of the UK and selected other countries identified as relevant to the Scottish situation: Republic of Ireland, Scandinavia, Netherlands, France, Belgium, New Zealand and Canada. This is presented separately.

SECTION 3: INTRODUCTION

Context

3.1 The United Kingdom is in the midst of its biggest building boom post World War II. Much of this transformation is in the public sector, spearheaded by the increasing belief of policy makers in the potential difference that good, or bad, architecture and design can make to the lives and aspirations of individuals and communities.

3.2 In Scotland, this is evident in:

- A 30% rise in the total turnover of the construction industry in Scotland, from £8.4m in 1998 to £10.9m by 2003⁹
- The largest ever investment in school buildings with 200 schools being built or refurbished by 2006 and a further 100 schools by 2008-09¹⁰
- A total of 27 hospital project proposals in the last five years with a total value of £983m¹¹
- A total of 119,000 new residential dwellings built between 2000 and 2004, equivalent to 5% of the total occupied households in Scotland¹², with a 9% increase in the number being built between 2003 and 2004¹³.

3.3 We know that well-designed buildings and places have the power to inspire us; to make us feel good about who we are, what we do and where we live, and importantly, they motivate us to achieve more – for ourselves and for our communities.

3.4 In Scotland, a belief in this connection between good architecture and design and quality of life is fundamental to government policy. It underpinned the publication of A Policy on Architecture for Scotland (2001a)¹⁴ and the subsequent establishment of Architecture and Design Scotland (A+DS) in April 2005 to be the champion for good architecture, design and planning in the built environment.

“Scottish Ministers want Scotland to be one of the best small countries in the world, valued as an outstanding place to visit, work and live. In turning this aspiration into reality a key task is to maintain and enhance the quality of our natural and built heritage. It is equally important that any development, whether new build or refurbished, contributes positively to the quality of our cities, towns and rural areas.”¹⁵

⁹ Office for National Statistics, Annual Business Inquiry, www.scotland.gov.uk

¹⁰ Scottish Executive Spending Proposals 2003-2006

¹¹ www.show.scot.nhs.uk/pfcu

¹² Scotland's Census Results Online, 6.3.06

¹³ www.scotland.gov.uk/topics/statistics, HSG/2005/05, Table 6: New dwellings completed: 1995 to 30 June 2005

¹⁴ Scottish Executive (2001a), A Policy on Architecture for Scotland

¹⁵ Scottish Executive (2005), Scottish Planning Policy, SPP20, Role of Architecture and Design Scotland, Crown copyright 2005

3.5 In 2001, the Scottish Executive published A Policy on Architecture for Scotland (2001a), setting out the Executive's commitment to the promotion of good architecture and good building design and its actions to encourage improvements in the quality of our buildings. The latest development in this policy is the establishment of Architecture and Design Scotland (A+DS) in April 2005 to be the champion for good architecture, design and planning in the built environment.

3.6 In light of the development of the Policy on Architecture for Scotland and to provide better access to information on the impact of architecture and design in many spheres of life, the Scottish Executive commissioned this literature review on the social, economic and environmental impact of architecture and design.

3.7 The review is intended primarily to inform the Scottish Executive and Architecture and Design Scotland but it is hoped that it might be beneficial for wider audiences, encompassing public, community interests and private interests, including:

- Central government
- Local authorities
- Government agencies and non-departmental public bodies
- Think Tanks
- Architecture and design professionals
- Planning authorities
- Research Funding Councils
- Trusts and foundations
- Industry groups and initiatives
- Professional institutions and trade associations
- Academic institutions, networks and groups
- Landowners
- Developers
- Investors
- Funders
- Management agents
- Occupiers
- Highways authorities
- Emergency services
- Amenity groups
- Local communities

Aims and objectives

3.8 The aim of the research was to gather sufficient national and international evidence of the social, economic and environmental impact of architecture and design, both positive and negative, to inform new design with a view to improving people's quality of life.

3.9 Within this, the specific objectives were to:

- Cover national and international examples of research, both positive and negative
- Explore the impact of architecture and design on the end-user - the individuals - who participate in activities in a building or an area and to identify, where possible, the building and design factors giving rise to these impacts.
- Cite, where found, examples of good practice, where a building or place has been designed to create a specific, beneficial environment, and this has been achieved.
- Provide a separate Dissemination Strategy for the literature review to ensure that the report is made available to the widest possible range of relevant organisations and individuals.

Scope

3.10 The primary focus of the literature search was, as far as possible, to gather empirical rather than anecdotal evidence. While much case-study evidence exists, limited robust quantitative research has been undertaken with end-users. Much of the evidence presented is therefore a synthesis of case-study evidence.

3.11 Research was sought from central government; government agencies and non-departmental public bodies; think tanks; architecture and design professionals; research funding councils; trusts and foundations; industry groups and initiatives; professional institutions; trade associations and academic institutions, networks and groups.

3.12 The literature review focused on research undertaken in the last ten years, between 1995 and 2005, with the greatest emphasis placed on the most recent research.

3.13 The final sample achieved was:

- 158 organisations contacted
- 195 documents sourced
- 105 documents reviewed.

3.14 The geographic reach of the review was given three levels of priority:

Level	Geographic Reach	Organisations Contacted
Priority	Scotland, Rest of UK: England, Northern Ireland, Wales	127
Important	Republic of Ireland, Scandinavia, the Netherlands, France, Belgium, New Zealand, Canada	14
Others	Rest of the world	17
Total		158

3.15 A full list of organisations initially contacted is set out in the Appendix with a list of documents reviewed in the bibliography.

Methods

3.16 The review was undertaken in 6 stages:

	Stage	Method	Output
1	Sample Identification	Personal recommendation and web-searches	Identification of organisations, individuals and research sources
2	Data Collection	Web, email and telephone search	Identification of 195 potential documents for review
3	Literature Prioritisation	Initial appraisal of all documents sourced	Confirmation of 105 priority documents for review
4	Review Framework	Initial analysis of key research documents	Development of framework for literature review
5	Analysis	Database analysis of priority literature	Analysis of research including profile; context; type of information; validity and findings
6	Reporting	Interpretation of database analysis	Commentary on impact and causal factors

SECTION 4: KEY FINDINGS

- 4.1 The principle findings from the review are summarised in the following tables.
- 4.2 Causal factors for buildings and places are presented separately. Clearly there is often overlap between for example the context of a building and the character of the public realm but for the sake of clarity and because the literature usually distinguishes between the two, they have been kept separate.
- 4.3 Impacts are separated into economic, social and environmental. Within this, the impacts are groups by sector, including generic – where the impact applies across all or most sectors; commercial; residential; education and hospitals.
- 4.4 The quality of the evidence is coded by a star rating:
- *** conclusive
 - ** strong
 - * suggestive
- 4.5 More extensive analysis of the research findings is contained in the body of the report.

Attribute	Economic	Social	Environmental
<p>Building: Vision/Character</p> <p>Vision Ambition Character</p>	<p>Generic</p> <p>* Increased land and property prices can lead to increased government revenue through taxation.</p> <p>*Cultural landmark buildings provide a tourist attraction creates jobs through additional tourism spend and can increase land and residential property prices in the surrounding area.</p> <p>*Wow factor of buildings significant in retention and recruitment of staff and students in HE</p> <p>**Restoration of historic buildings/ sites can initiate wider regeneration of a surrounding area providing employment and opportunities for volunteering and training for local communities.</p>	<p>Generic</p> <p>*Restoration of historic sites and buildings encourages community interaction can help promote local community cohesion and revive civic pride; provide facilities for local communities which increases use.</p> <p>*Cultural landmark buildings create distinction, which enhances the culture of an area.</p>	<p>Generic</p> <p>**Emergence of urban sprawl has been linked to a decrease in the aesthetic appeal of the landscape, increased the potential for flooding, harmed fragile ecosystems, and created more toxic wastes.</p>
<p>Building: Appearance</p> <p>External form Design Aesthetic appeal</p>	<p>Generic</p> <p>*Higher quality design increases land and property values.</p> <p>*Pleasant working environments can inspire and stimulate employees; reduce absenteeism and aid staff retention.</p> <p>** Exterior views, natural views and sunlight can improve staff morale and satisfaction.</p> <p>*Investment in tailor-made design can</p>	<p>Generic</p> <p>*Transparency from exterior to interior of building can reduce perceived barriers to entry.</p>	<p>Generic</p> <p>*A sense of openness, light and space can be achieved through the use of atria and water features in central areas.</p> <p>*Urban green roofs provide wildlife foraging habitats.</p>

Attribute	Economic	Social	Environmental
	<p>increase productivity and higher costs can be off-set by reduction in space required by conventional layouts.</p> <p>*Layout which encourages interaction between functions can increase workforce effectiveness.</p>		
	<p>Commercial</p> <p>*Pleasant architecture (and environment) is key in business location decisions.</p> <p>**Higher quality design can attract greater rents and increases the marketability of offices / commercial properties.</p> <p>*Cosmetic and environmental features of a building help to enforce corporate identity in employees and customers.</p>	<p>Commercial</p> <p>**Inclusion of roof terraces or green spaces provides areas for workers in offices to socialise.</p>	<p>Commercial</p> <p>*Roof terraces provide a less polluted area for social activity for workers than at street-level.</p>
	<p>Residential</p> <p>*Distinctive design qualities in residential properties can have a positive effect on property prices and improve marketability.</p>	<p>Residential</p> <p>*The appearance of the neighbourhood and safety issues leads to greater satisfaction with homes from their occupants</p> <p>*Raised ground floor and location of private rooms at rear can enhance residents' sense of security in their homes.</p>	<p>Residential</p> <p>*Circulation of fresh air reduces exposure time to bacteria and chemicals found in the home.</p>
	<p>Education</p> <p>***A well-designed school can increase</p>	<p>Education</p> <p>**The use of colour in the classroom can help</p>	

Attribute	Economic	Social	Environmental
	<p>student recruitment and motivate students leading to increased academic performance and enhance teaching quality.</p> <p>*Aesthetic appeal and spaciousness influential in staff recruitment in HE.</p> <p>*** Use of colour reduces pupil absenteeism in schools leading to higher levels of motivation and academic performance. Alternative colour behind the teacher can help focus attention on the teacher.</p>	<p>reduce eye strain in pupils.</p>	
	<p>Hospitals</p> <p>**A well-designed hospital can reduce staff turnover including spaciousness.</p> <p>*Display of visual art in hospital and the use of colour can lead to increased levels of staff morale and reduce patient recovery times.</p>	<p>Hospitals</p> <p>**Capital investment in refurbishing old hospitals or building new hospitals can reduce patient recovery times by increasing morale of staff and patients.</p> <p>***Well-designed hospital buildings have therapeutic properties for patients, helping them recover faster.</p> <p>**Exterior views from hospital beds can increase patient recovery rates.</p> <p>** Lack of windows on the ICU wards in hospitals can be linked to levels of anxiety and depression for patients on intensive-care units.</p> <p>*Non-institutional design including use of colour and pattern helps children recover faster in hospital.</p>	

Attribute	Economic	Social	Environmental
		<p>*The interior design of wards and nurses' stations in hospitals can help to increase patient contact times.</p> <p>*Increasing the amount of personal space for patients recovering in hospitals leads to better satisfaction with their environment.</p> <p>**Displays of visual art in hospitals can bolster staff morale and reduce patient recovery times.</p>	
<p>Building: Context</p> <p>Sited in relation to context Urban and social integration Contribution and connection to neighbourhood Contribution to its environment</p>	<p>Commercial</p> <p>*Contiguity to high-quality public space can increase rental value of commercial and retail property facing the space.</p> <p>*Prestige / image of surrounding area important factor in choice of office location</p> <p>*Initial capital investment can be recouped through increased productivity and lower running costs in commercial developments.</p> <p>*Natural views increase worker satisfaction and retention.</p>	<p>Commercial</p> <p>*New developments can have a positive effect on their surrounding area by providing cultural facilities for occupants and workers to use.</p>	<p>Commercial</p> <p>*Development of traffic flow management has reduced traffic generation and car usage for companies relocating to out of town developments.</p>
	<p>Residential</p> <p>**Proximity to water features, green spaces, street trees, parks and playgrounds can increase residential property prices.</p>	<p>Residential</p> <p>*Scenery and views add to residents' satisfaction with their homes.</p> <p>*Homes that overlook each other makes residents feel safer, as this tended to deter</p>	

Attribute	Economic	Social	Environmental
		<p>crime.</p> <p>*Homes looking in a state of disrepair increases the risk of burglary</p> <p>*Homes with good sight from kitchens and living rooms to outside reduce child involvement in accidents.</p> <p>*Having gardens as part of the home reduces road traffic accidents.</p> <p>**Housing near busy road reduces crime rates and makes residents feel safer.</p> <p>*The location of housing can facilitate or hinder social relationships between neighbours.</p>	
	<p>Education</p> <p>**Capital investment in schools influences staff morale and pupil motivation to learn.</p>		
	<p>Hospitals</p> <p>** Landscaped hospital buildings, providing views have a positive effect on the health and well-being of staff, in terms of reduced stress levels and increased satisfaction.</p>	<p>Hospitals</p> <p>**Landscaped hospital buildings, have a positive effect on the health and well-being of patients, in terms of reduced stress levels and increased satisfaction, by providing windows with a view.</p>	

Attribute	Economic	Social	Environmental
<p>Building: Buildability</p> <p>Build quality Ease of construction Materials Sustainability Resource use</p>	<p>Generic</p> <p>**Sustainable design features reduce energy use and utility bills in commercial and residential properties in construction and ongoing maintenance.</p> <p>*Choice of building materials can reduce construction costs by up to 30 per cent.</p> <p>*Greater use of energy efficient resources reduces operational costs in terms of lower utility bills.</p>	<p>Generic</p> <p>*Careful use of building materials can increase well-being by reducing the effect of exposure to irritating chemicals.</p>	<p>Generic</p> <p>** Incorporation of sustainable design features in the construction and planning of new developments can minimise the impact on the natural environment including reducing energy use and carbon emissions.</p> <p>*Evidence that new build can be more costly due to costs of demolition and construction.</p> <p>*Automatically adjusting heating and glare systems reduce energy costs.</p> <p>*Energy taxes levied on thermal conductivity of buildings reduces energy use.</p> <p>*Low-emissivity glass reduces energy use.</p>
	<p>Commercial</p> <p>*Loose-fit approach reduces construction time and costs and provides for greater flexibility in future use.</p> <p>*The use of intelligent lighting design can reduce energy costs in office buildings.</p>		<p>Commercial</p> <p>*Installation of Highly Interactive Visual Environment Suites in offices reduces traffic initiated carbon-dioxide emissions. [295]</p>
	<p>Residential</p> <p>* Use of energy saving techniques and materials in the construction of homes including low temperature heating and insulation reduces future utility costs.</p>	<p>Residential</p> <p>*Use of energy saving materials and techniques in house construction can reduce the number of households experiencing fuel poverty.</p>	<p>Residential</p> <p>*Use of energy saving techniques and materials in the construction of homes including low temperature heating and insulation reduces future energy use.</p>

Attribute	Economic	Social	Environmental
		*Sound insulation between flats increases happiness in residents of high-density accommodation.	
			<p>Education</p> <p>*A reduction in energy loss and construction costs can be achieved through using low perimeter [?] in the design of the school. (Also in economic if about costs?)</p> <p>* Larger windows facing East allows natural light into the classroom, reducing energy use.</p> <p>* Use of retractable external blinds can reduce heat and sun glare in schools.</p>
	<p>Hospitals</p> <p>*Internal design of wards to allow for flexible use increases nursing efficiency.</p>		<p>Hospitals</p> <p>* Using photovoltaic cells on the roof of hospitals can create energy.</p>
<p>Building: Operation</p> <p>Space range and use Accessibility Navigation User comfort/control Flexibility /adaptability Effectiveness Safety</p>	<p>Space:</p> <p>Commercial</p> <p>*Open plan offices can have a positive or negative [?] effect on workforce effectiveness and efficiency.</p> <p>*Provision of extreme / creative / flexible / connected spaces encourage creativity and inspiration in workforce.</p> <p>Education</p> <p>*Linking of space in schools can reduce</p>	<p>Space:</p> <p>Commercial</p> <p>* Providing additional space per employee reduces the occurrence of sick building syndrome and absenteeism due to respiratory problems.</p> <p>* Open plan offices improve communication amongst the workforce.</p> <p>Education</p> <p>*Corridor type accommodation made students</p>	

Attribute	Economic	Social	Environmental
	<p>staffing costs.</p> <p>**Small classroom size, which results in high density of pupils in classes, can be detrimental to motivation and academic performance in schools.</p> <p>*Availability of quiet areas for study important to student motivation and performance.</p>	<p>withdraw into their own rooms, whilst suite accommodation and the incorporation of common space fosters social relationships amongst residents.</p> <p>Hospitals</p> <p>*Use of private recovery rooms for patients staying in hospital can improve their happiness.</p> <p>*Multi-bed rooms in hospitals are beneficial to reducing the patient's feeling of isolation during recovery but can lead to lack of privacy and compromise patient disclosure of confidential information.</p>	
	<p>User comfort / control:</p> <p>Commercial</p> <p>*** Air quality, temperature control, quality of lighting, and reduced noise levels, all contribute to employee health and well-being in the workplace which leads to increased productivity.</p> <p>* Exposure to natural light and ventilation can increase productivity of workers.</p>	<p>User comfort / control:</p> <p>Commercial</p> <p>** Poor air quality, noise levels, poor lighting and inappropriate temperatures in the office environment can be detrimental to workers' health.</p>	

Attribute	Economic	Social	Environmental
	<p>Education</p> <p>***Good quality lighting, air quality, moderate temperature and acoustics contribute to increased levels of academic performance in schools.</p> <p>**Natural light enhances student performance.</p> <p>*The integration of design and technology in the school establishment can contribute towards student performance.</p> <p>Hospitals</p> <p>***Levels of noise, sunlight, air quality and ergonomics can have a positive and negative on hospital workforce efficiency and satisfaction, in terms of delivering patient care and safety.</p>	<p>Residential</p> <p>* Exposure to natural light and ventilation can increase well-being of occupants.</p>	
		<p>Navigation:</p> <p>Generic</p> <p>*External views from a building can aid navigation within.</p>	

Attribute	Economic	Social	Environmental
		<p>Hospitals</p> <p>*Natural progression from public to treatment rooms and clear way-finding and plans prevent reduce sense of disorientation in hospitals.</p>	
	<p>Flexibility / Adaptability:</p> <p>Commercial</p> <p>*Flexibility of use in office buildings helps to make the organisation more efficient and adaptable to changing market trends.</p>	<p>Flexibility:</p> <p>Leisure</p> <p>* Flexible spaces and areas for community group activities in libraries have attracted more young people and local residents.</p>	
<p>Place: Character</p> <p>Sense of place, character, identity Responsive to local context</p>		<p>Generic</p> <p>*Restoration of heritage sites can rejuvenate an area and make a place unique.</p> <p>*Regeneration of an area can push up property prices and cause displacement of local resident communities.</p> <p>* Decline in the high street and emergence of out-of-town retail park has been linked to decline in the health of the nation, due to the lack of exercise.</p>	

Attribute	Economic	Social	Environmental
	<p>Residential</p> <p>*Areas deemed to have character are valued more highly by potential house-buyers.</p> <p>* Involvement in restoration of historic sites can help participants can develop new skills.</p>	<p>Residential</p> <p>* Endless rows of standardised buildings and new developments that do not fit into their surroundings can contribute to decline in quality of life.</p> <p>*Terraced housing is perceived as most defensible type of residential property; high-rise flats the most susceptible.</p>	
<p>Place: Continuity and enclosure</p> <p>Defined and coherent public space</p>		<p>Residential</p> <p>** Neighbourhoods with gated communities can lack community cohesion and make those outside feel socially excluded</p> <p>*Street vitality, particularly playing is greater in non-gated communities.</p> <p>*Estates can make people who live on them socially excluded because of the physical separation the rest of society.</p> <p>**Compact rather than lower-density neighbourhoods where people are more car-dependent encourage greater community cohesion.</p> <p>*Occupants in residential properties felt safer in developments where their children could play in safety within a gated courtyard.</p> <p>*High-density developments can cause residents to feel isolated due to the lack of</p>	<p>Residential</p> <p>*Living in gated properties increase the distance for commuters to travel to work which potentially increase traffic congestion and pollution.</p>

Attribute	Economic	Social	Environmental
		semi-private space and hostile towards each other.	
<p>Place: Quality of public realm</p> <p>Safe, attractive, functional public space for all</p>	<p>Generic</p> <p>**Quality and secure public space, including pedestrianisation and street furniture increases use and associated retail spend</p> <p>*Restoration of public spaces can stimulate rejuvenation of adjacent sites.</p> <p>*Capital investment in quality and safety of public space attracts new residents to move to an area.</p> <p>**Well-planned and well-managed public spaces can have a positive impact on residential house prices.</p>	<p>Generic</p> <p>*Evidence that people place more emphasis on the quality and appearance of their neighbourhood than on their own homes</p> <p>Use</p> <p>*Regeneration of public spaces and parks increases use</p> <p>*Adaptable public space is used by more people for longer than space designed for specific functions.</p> <p>Cohesion</p> <p>Lack of public space reduces the opportunities for informal social interaction.</p> <p>* Provision of benches and tables near play areas, increases the time families spent</p>	

Attribute	Economic	Social	Environmental
		<p>together and especially make disabled children feel socially included in public spaces.</p> <p>**Public parks provide the resident population with facilities in which to carry out leisure activity and quiet places for contemplation, which contributes to the health and well-being of the community.</p> <p>Safety</p> <p>**Natural surveillance in public places reduces the risk of crime.</p> <p>*Public spaces overlooked by residential buildings provide safer recreational space.</p> <p>*CCTV and radio-security schemes increase perception of safety and use of public spaces.</p> <p>**Poor lighting in public places can make people feel unsafe.</p>	
<p>Place: Diversity</p> <p>Varied environments offering a range of uses and experiences</p>	<p>Mixed-use</p> <p>*New mixed-use developments can increase an area's vibrancy and attract businesses and residents into an area.</p> <p>*New mixed-use developments in the city centre can help to regenerate an area by attracting other investors and creating jobs.</p> <p>*Mixed-use areas contribute to reducing travel time to work and job creation for local</p>	<p>Mixed-use</p> <p>***Adaptable and mixed use public spaces increase social interaction and usage.</p> <p>*Commercial out-of-town developments do not offer the local community mixed-use spaces in which to form social relationships.</p> <p>*Mixed-use may help create socially diverse communities, but do not necessarily lead to social inclusiveness.</p>	<p>Mixed-use</p> <p>**Mixed-use lessens car use for travel to work, reducing pollution.</p> <p>*Greenfield locations for commercial premises increase travel to work car emissions.</p>

Attribute	Economic	Social	Environmental
	<p>communities.</p> <p>*Locating offices in mixed-use environments with green space, retail and leisure facilities increases workforce productivity.</p>	<p>** Mixed-use can help decrease personal violence and increase personal safety in public spaces.</p> <p>*Mixed-use reduces travel to work time, affording more personal time and increasing quality of life</p> <p>*Mixed-use lessons car use for travel to work, reducing incidence of respiratory disease</p>	
	<p>Green Space</p> <p>*Accessibility to green spaces has seen office rents and popularity increase for out of town office developments.</p> <p>**Proximity to green spaces increases residential property prices, whilst lack of green space can reduce property prices in an area.</p>	<p>Green space</p> <p>**Green space provides opportunities for interaction and community activities which foster community cohesion</p> <p>*Smaller, natural areas of green space close to housing are more effective in promoting community cohesion than large open spaces.</p> <p>*Urban wildlife habitats are highly valued and offer local communities places for social interaction.</p> <p>**Proximity to and use of green space reduces stress and enhances well-being</p> <p>*Green spaces afford health benefits through provision of opportunities for exercise</p> <p>*The provision of green space has been linked to children’s emotional development, as it provides an area for social interaction.</p>	<p>Greens space</p> <p>***Trees and shrubs help the cooling of the air temperature in heavily trafficked streets; are good interceptors of solar reflection and radiation from buildings and streets; improve air quality by reducing airborne particulate and gaseous pollutants and produce oxygen.</p> <p>**Trees and shrubs can reduce overall energy use in buildings and reduce CO2 emissions.</p> <p>*Trees provide carbon-storage capacity and lower the level of water run-off into drains, reducing flood problems.</p> <p>*Urban wildlife habitats are highly valued and offer local communities first hand knowledge of nature</p> <p>Wildlife habitats damaged in construction can be replaced by incorporating green spaces in new design.</p>

Attribute	Economic	Social	Environmental
		<p>*Introducing greenery inside and outside of the school can improve the attention span of children with attention-deficit disorders.</p> <p>*Varying topography may help children's balance and co-ordination develop faster than traditional playgrounds.</p>	
	<p>Public Space</p> <p>*Public spaces for events can help to increase usage of public space and rejuvenate an area.</p>		
<p>Place: Ease of movement</p> <p>Accessible Well-connected</p>	<p>Generic</p> <p>*Economic value of land increases where buildings are situated close to transportation networks and accessible to local amenities.</p>	<p>Generic</p> <p>*Spaces that have generous paths and are connected but not split by movement paths increase use.</p> <p>** Provision of cycle networks and walkways increases instances of people walking which contributes to a healthier lifestyle.</p> <p>*Well-connected and visible areas have reduced crime due to provision of natural surveillance.</p> <p>*Well-designed streets that restrain vehicle speeds can reduce traffic accidents.</p>	<p>Generic</p> <p>**Good public transport network can reduce the level of traffic and pollution.</p> <p>*Replacement of inner-city ring road with green boulevard providing bus, cycle and walking options reduces car use and pollution</p> <p>*Traffic calming strategies reduce traffic accidents and congestion, and encourage walking and cycling.</p> <p>Connectivity in design of public spaces increases walking and cycling, especially for local trips, reducing car-use emissions.</p>
	<p>Commercial</p> <p>*Accessibility to transport networks is a major factor in business location decisions.</p>		

Attribute	Economic	Social	Environmental
	*New developments without access to a transportation network cause occupier dissatisfaction with the workplace.		
		Residential *Low traffic streets afford a greater sense of neighbourhood as people use the streets more and move on less quickly than in heavy traffic streets.	Residential ** Neighbourhoods with accessible land-use and multi-modal transportation systems reduce car use and pollution. *Having local amenities near where people live can reduce the dependence on the car, as walking becomes an alternative mode of transport.
	Hospitals *Location of the hospital, amenities and proximity to transport facilities affects the hospitals effectiveness in attracting and retaining staff.		
Building & Place: Process Involvement of users and stakeholders in design		Generic ***Consultation and involvement during the design phase of a building or public space can help foster a sense of pride, local identity, ownership and future use and can lead to community cohesion and reduced crime, particularly vandalism. Commercial *Workers pride in their place of work can be	

Attribute	Economic	Social	Environmental
		<p>obtained through their involvement in designing their workspace.</p> <p>Residential</p> <p>*Participation in the design process increases occupier engagement and satisfaction of their homes.</p> <p>Education</p> <p>*Involvement in design discussions enhances a sense of ownership and learning potential of students in schools.</p>	

SECTION 5: REVIEW FRAMEWORK

5.1 This section describes the framework within which the review has been undertaken, including the:

- Definition of architecture and design adopted for the review
What is meant by ‘impact’
Broad range and definition of potential economic, social and environmental impact indicators
- Range and definition of possible causal factors
Approach to the analysis.

Architecture and design

5.2 The Scottish Executive in A Policy on Architecture for Scotland (2001a)¹⁶ confirms the Executive’s:

Commitment to the promotion of good architecture and good building design and its actions to encourage improvements in the quality of our buildings

5.3 In the context of this review, this is taken to mean the quality of buildings and the environment in which these buildings exist, both urban and rural.

5.4 Multiple definitions exist. The most simple might be Cowan’s definition of urban design as the art of making places (Cowan, 2000)¹⁷.

5.5 In Designing Places the Scottish Executive (2001b)¹⁸ defines urban design as:

The collaborative process of shaping the setting for life in cities, towns, villages and rural areas...

5.6 The Centre for Architecture and the Built Environment (CABE, 2001)¹⁹ suggest that the most significant is the Department of the Environment’s 1997 definition:

“... urban design should be taken to mean the relationship between different buildings; the relationship between buildings and the streets, squares, parks and waterways and other spaces which make up the public domain ; the nature and quality of the public domain itself; the relationship of one part of a village, town or city with other parts; and the patterns of movement and activity which are thereby established: in short, the complex relationships between all the elements of built and unbuilt space”

5.7 Accepting these definitions includes the following in the definition of architecture and design for this review, in both urban and rural contexts, which includes:

¹⁶ Scottish Executive (2001a), A Policy on Architecture for Scotland

¹⁷ Bartlett School of Planning commissioned by CABE and DETR (2001) *The Value of Urban Design*, CABE

¹⁸ Scottish Executive (2001b) Designing Places, A Policy Statement for Scotland

¹⁹ DOE (1997) Planning Policy Guidance Note 1, cited in CABE (2001) *The Value of Urban Design*

- Design of individual buildings
- Design of the spaces between and surrounding buildings
- The way buildings relate to each other
- The way buildings relate to the external environment around them
- The relationship between different areas
- How people use, move around and between buildings and spaces

Impact

5.8 In this context, impact might most simply be described as the difference made by architecture and design. Within this, the review attempts to consider:

- Both positive and negative impacts, where they are identified.
- Hard, quantitative measurements of impact, where a clear, quantifiable, causal relationship has been established between an input and an impact.
- Soft, less easily quantifiable impacts around, for example, personal or community-development. These can often be a contributing, rather than directly causal factor in achieving a hard impact.
- Direct impacts such as where the building of a new office building for example, is likely to have a direct impact on job creation for individuals.
- Indirect impacts: for example where the creation of a park might have a direct impact on leisure participation for individuals and an indirect impact on their health and well-being.
- Both short and longer-term impacts.

Impact for whom?

5.9 There are many stakeholders on whom architecture and design have an impact, with diverse needs, wants, interests and desired outcomes. These stakeholders, whose interests may be private, public or community focused range from property owners, investors, funders and managers; the architecture and design sector both in practice and in education; regulatory and planning authorities to amenity groups, local communities and individuals.

5.10 For the purposes of this study, the brief required a consideration of the impact of architecture and design on those who live in the area or attend / participate in activities in the building. This means we are concerned with the individual end-users, those people who use a building or space for a particular purpose or who engage with a building or space in the course of their daily life.

Type of impact

5.11 The overall purpose of this review is to illustrate social, economic and environmental impact of architecture and design, both positive and negative, to inform new design with a view to improving people’s quality of life.

5.12 The Scottish Executive (2001b)²⁰ believes that good design is recognised as:

A practical means of achieving a wide range of social, economic and environmental goals, making places that will be successful and sustainable.

5.13 For the Scottish Executive, quality of life is enshrined within the concept of sustainability, which is further defined as:

The measure of the likely impact of development on the social, economic and environmental conditions of people in the future and other places

5.14 So how does architecture and design affect the economic, social and environmental conditions of people?

5.15 The table below illustrates the broad categories of potential economic, social and environmental impacts identified for the purposes of this review. It must be stressed that this was intended simply as a starting point, designed to give some initial structure to the review, but not to pre-judge the findings.

Type of impact	Indicator Category
Social	Aspiration Happiness Health and well-being Social inclusion / equity Community cohesion / vibrancy / interactivity Personal Development Safety / crime prevention / reduction Social Capital Aesthetic Sense of identity, place, community Civic pride

²⁰ Scottish Executive (2001b) Designing Places, A Policy Statement for Scotland

Type of impact	Indicator Category
	Cultural vitality Civic engagement and pride
Environmental	Regeneration Cleaner Greener Resource use Traffic Pollution Waste

Causations

5.16 If the review is to inform new design with a view to improving people’s quality of life, the findings will only be meaningful if the factors contributing to these impacts are identified as specifically as possible.

5.17 At the outset, a range of causal factors believed to contribute to the social, economic and environmental impact of architecture and design was determined. The casual factors were developed from CABI’s definitions of what is meant by a well-designed building or a well-designed place²¹, and are supplemented by the Construction Industry Council’s Design Quality Indicators²².

5.18 The causal factors identified as contributing to well-designed buildings or places, while identified separately, clearly overlap. For clarity of analysis and reporting we have however, kept them separate. At all points we are attempting to clearly distinguish between the causal factors associated with an individual building and those arising from urban design – the public domain and the relationship within the public domain and between the public domain and individual buildings.

5.19 The categorisation and broad range of potential causal factors identified for the Review Framework is outlined in the table below:

What is meant by a well-designed building?

5.20

²¹ CABI (2002) Better Civic Buildings and Spaces, London, CABI

²² Construction Industry Council, Introduction to DQI Questionnaire, www.dqu.org.uk, accessed 14 October 2005

Causal Factors	What is meant by this?
Vision	Vision Ambition Character Thought-provoking Iconic / wow factor
Appearance	External / Internal Design External form Aesthetic appeal Well-composed / pleasing Appropriate to surroundings Viewed favourably by users, public Material finishes: appropriate, range and quality
Context	Seen as a place not just a building Urban and social integration Creates public space Contributes / connects to neighbourhood Contributes to its environment Sited in relation to context
Buildability	Build quality Ease of construction Use of materials: appropriate, quality, enhance use Environmental impact Materials from sustainable sources Resource use

Causal Factors	What is meant by this?
	<p>Future climate change considered in design</p> <p>Designed for demolition / recycling</p>
Maintenance	<p>Effectiveness, efficiency, ease of maintenance</p> <p>Durability</p>
Operation	<p>Effectiveness, efficiency, ease of future operation and use</p> <p>Space: uses, size, proportion, openness, variety</p> <p>Accessibility: Accessible for range of users with different needs</p> <p>Navigation: circulation, routing, wayfinding, signages</p> <p>User comfort and control: Comfortable, flexible, appropriate, user-controlled Thermal climate, acoustics, lighting</p> <p>Flexibility / Adaptability: Adaptable to changing needs Allows for changes of use</p> <p>Effectiveness: Meeting user needs Organisational efficiency Enhances user activity</p> <p>Safety</p> <p>Security</p> <p>Effectiveness, ease of use of health and safety systems</p>

What is meant by a well-designed place?

5.21

Causal Factors	What is meant by this?
Vision	Distinct sense of place, character, identity Responsive to local development, landscape and culture contexts
Continuity and enclosure	Clearly defined, coherent public space
Quality of the public realm	Safe, attractive, functional, public space for all
Ease of movement	Accessible, well-connected
Legibility	Understandable, navigable environment
Adaptability	Flexible, adaptable public and private environments Responsive to changing social, technological and economic conditions
Diversity	Varied environments offering a range of uses and experiences Responsive to local needs

Review Approach

5.22 The review adopted the best-evidence synthesis approach (Slavin, 1986)²³ to enable a combination of narrative review of qualitative and case-study evidence with quantitative evidence. The aim was to provide enough information to give confidence in the commentary and to enable the reader to reach independent conclusions.

5.23 To minimise the potential for subjectivity the review adopted the coding system used in a review by the New Zealand Ministry for the Environment²⁴, which categorises the quality of the evidence according to its robustness:

Conclusive: consensus conclusions from top experts in the field; or objective evidence based on findings of more than one empirical study, reaching a clear and firm conclusion

Strong: Conclusions of a top expert in the field; supported by multiple citations; or some systematic objective evidence, especially a robust empirical study (quantitative or qualitative)

²³ Slavin, R.E. (1986) Best-evidence synthesis: an alternative to meta-analytic and traditional reviews, Educational Researcher, 15 (9), in literature reviews by, Wynne Harlen and Ursula Schlapp, The Scottish Council for Research in Education, 1998, www.scre.ac.uk

²⁴ McIndoe, Graeme et al (2005), The Value of Urban Design - the economic, environmental and social benefits of urban design, Ministry for the Environment, New Zealand

Suggestive: Assertions from someone from standing in the field; or a collation of anecdotal evidence; or conclusions based on only a single empirical study of limited validity or restricted application

5.24 This review has focused on empirical findings and excludes anecdotal evidence.

Structure and content of the literature review

5.25

Section	Content
Research Profile	Client Author / Research Agency Publisher Format Date of publication Research purpose
Context	Location of architecture / design / research Date of research Type / purpose of architecture / design Target group: who the research was undertaken with
Information	Description of information available Nature of the data Quality / validity of the evidence
Findings	Economic, social, environmental impacts and causal factors identified

SECTION 6: SOCIAL

Vision and character

6.1 The British Urban Regeneration Association (BURA) reviewed best practice in urban regeneration and concluded that ‘historic buildings could act as focal points around which communities would rally and revive their sense of civic pride’ and that ‘care should be taken not to destroy old buildings before their potential was realised’²⁵. The restoration of the early nineteenth-century St. John’s Church in the London Borough of Hackney, UK, has been a good example of how the restoration of a local building has inspired the regeneration of an area. The church has been developed to incorporate a nursery school, community café, an employment project, a fitness centre, as well as its continued use as a church.

Appearance

Healthcare

6.2 Research in the healthcare sector has highlighted the effects of working and being a patient in new or refurbished hospital buildings. For example, a Sheffield study found that patients treated entirely in the new building had an average reduction of 14 per cent in their length of stay (36.5 days compared with 42.4 days)²⁶.

6.3 A King’s Fund document published in 2002 highlighted the example of Newham Hospital in South East London, UK, where 78 per cent of the staff recorded increased levels of morale (56 per cent) following the redesign of the hospital²⁷.

6.4 A US study conducted at a Pennsylvania hospital recorded similar results. It found that patients with open views had shorter post-operative stays 7.9 days compared to 8.7 days of patients who looked out onto a brick wall. This also affected the morale of staff in the respective wards, as the nurses working in the open view ward were less negative about their workplace²⁸.

6.5 Studies by Scher & Senior (1999) highlighted the benefits of displaying visual art in hospitals to staff morale and patient care. 42.6 per cent of front-line clinical staff considered that the arts had a positive effect on the healing process; 23.6 per cent considered that the arts produced therapeutic benefits²⁹. These findings were also supported by Hutton and

²⁵ The British Urban Regeneration Association (2002) *Learning from Experience: The BURA Guide to Achieving Effective and Lasting Regeneration*, BURA

²⁶ University of Sheffield, School of Architecture (1999) *The architectural healthcare environment and its effect on patient health outcomes: a report at the end of the first year of study*, University of Sheffield, School of Architecture in association with NHS Estates, Poole Hospital NHS Trust and South Downs Mental Health Trust

²⁷ Coote, A. (ed) (2002) *Claiming the health dividend: unlocking the benefits of NHS spending*. London; in CABA (2002) *The Value of Good Design - How buildings and spaces create economic and social value*, CABA, pp3

²⁸ Ulrich, R. (1984) *Viewing through a window may influence recovery from surgery*. *Science*, Vol 224 (27), April 1984, pp420-421

²⁹ Scher P & Senior P, (1999) *The Exeter Evaluation*, Manchester, Arts for Health; in *A bibliography of design value for The Commission for Architecture and the Built Environment*, The Bartlett School of Planning, University College London

Richardson's (1995)³⁰ studies of the impact of the physical appearance of the health care environment on patient and staff satisfaction.

6.6 Lawson and Phiri³¹ (2000) studied hospitals in the UK, with the support of NHS Estates and with the collaboration of two NHS Trusts, in an attempt to measure the benefits associated with architectural projects. The research findings highlighted two sets of factors; firstly those that concern the direct relationship between people and their environment, such as colours of surfaces or the temperature of rooms; the second set involving matters of privacy or how spaces enable people to establish community or maintain 'personal space'³². They discovered that it was the second set of factors, which mattered more to the patients interviewed.

Residential properties

6.7 Cooper (1982)³³ found a negative correlation between the appearance of a house and a feeling of inferiority. The findings were drawn from an analysis of 100 post-occupancy evaluation studies of resident reactions to multi-family housing design from across the English speaking world. In the study residents valued the attractiveness of their homes and environment. This was determined by a good site layout and attractive landscape, varied and interesting views from the windows of homes, provision of private open space, some degree of aesthetic complexity, some degree of uniqueness of scheme sub-units³⁴.

6.8 The Popular Housing Forum (1998) conducted a survey of 819 interviews with the general public divided between 'potential new build buyers' and 'others'. They found that new-build homes are generally regarded negatively and were associated with the bottom end of the market, as there was a strong preference for traditional housing with character of the neighbourhood. However, the appearance and safety of the neighbourhood was more important than the house itself³⁵.

6.9 A recent poll by MORI³⁶ found that 39 per cent of people said that the presence of good scenery and views was an important factor in making the area a pleasant place to live. The level of satisfaction with the home was also found to be related to whether the resident felt safe in their homes. Cozens et al (No date)³⁷ found that visible signs of decay were seen to increase criminogenic activity and reduced defensibility emphasising the importance of keeping properties and surrounding areas well-maintained. He also found that different types

³⁰ Hutton, J.D. and Richardson, L.D. (1995) *Healthscape: the role of the facility and physical environment on consumer attitudes, satisfaction, quality assessments and behaviours*, Health Care Management Review, 20, 2, pp48-61 ; in Cortvriend, P. (2005) *The Effect of the Healthcare Environment on Patients and Staff*, Manchester Business School

³¹ Lawson, B. and Phiri, M. (2000), *Room for improvement*, Health Service Journal, vol. 110, no. 5688, pp.24-7]

³² Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

³³ Cooper, M.C. (1982) *The Aesthetics of Family Housing: The Residents' Viewpoint*, Landscape Research, Vol.7, No.3, pp9-13

³⁴ Ibid

³⁵ Popular Housing Forum (1998) *Kerb appeal*, Winchester: The Popular Housing Forum; in CABE (2002) *The value of good design*, pp5

³⁶ MORI (2002) *Streets of Shame*, CABE

³⁷ Cozens, P, et al (No date) *Criminogenic Associations and British Housing Design*, Pontypridd, Wales, University of Glamorgan; in *A bibliography of design value for The Commission for Architecture and the Built Environment*, The Bartlett School of Planning, University College London, pp48

of dwellings were perceived as more prone to crime. Terraced housing was identified as the most defensible form of high density development with high rise flats being the most susceptible.

Commercial buildings

6.10 Researchers have found that natural views increased satisfaction, especially in high-stress work environments. A study of workers in a wine production facility determined that providing sufficient sun exposure could increase worker satisfaction and retention while reducing fatigue³⁸.

Public places

6.11 The external appearance of a building can form a barrier to those it serves. The library is often seen as a valuable and safe place, providing a valuable service to the local community, yet it has also been perceived by some people as too municipal looking. In Sweden, the library is perceived as being 'the living room in the city' or even 'the town salon'³⁹ whereby the interior of the library is furnished to replicate the home. The Central Library in Rotterdam offers users greater visual transparency between interior and exterior which is felt to be a symbol of a more open and democratic culture.

Buildability

Healthcare

6.12 Environmental psychology studies offered an insight into the effect of the hospital environment on patients' well-being and happiness. A study by Campbell (1990) focused on the experiences and feelings of five oncology patients in relation to their environment. He found that they all appreciated having a natural view; regardless of whether that was the harbour they could see from one side of the ward or trees on the other. The view made them feel less 'shut in'⁴⁰.

6.13 Several research projects have looked at the effect of the immediate environment on patients in hospitals. Lawson (2003) found that a new building appeared to have a positive affect on treatment times in the mental health sector (14 per cent reduction) and 76.5 per cent of patients thought their environment had helped their recovery compared to 53.5 per cent in the old wards.

6.14 The benefits to hospital and patient staff of environmental factors such as air quality, heating, lighting and temperature, have been recorded by CABE (2003)⁴¹:

³⁸ Leather, P et al (1998) *Windows in the workplace: sunlight, view and occupational stress*, Environment and Behaviour 30(6): 739-762

³⁹ Worpole, K. (2004) *21st Century Libraries - Changing Forms, Changing Futures*, Building Futures, pp12

⁴⁰ Campbell, T. (1999) *Feelings of oncology patients about being nursed in protective isolation as a consequence of cancer chemotherapy treatment*, Journal of Advanced Nursing, 30, 2, 439-447

⁴¹ CABE (2003) *Healthy Hospitals Campaign*, London, CABE; in CABE Space (2003) *Lewisham Primary Care Trust Children and Young People's Centre: Design and innovation for primary health and social care*, CABE, pp9

- 91 per cent of all nurses, and 100 per cent of Directors of Nursing believed that a well-designed environment was significant in improving recovery rates
- 87 per cent of nurses said that working in a well-designed hospital would help them to do their jobs better
- 90 per cent of Directors of Nursing said that patients responded better to staff in well-designed wards
- 90 per cent of nurses felt that a poorly designed hospital contributed towards increased stress levels

Residential

6.15 In a survey conducted by CABE (2002), security against crime emerged as the single most important factor in housing design. This MORI survey found that safety rated three points higher than energy efficiency. Privacy in front of the house can be achieved while allowing overlooking the street for security reasons, for example, the traditional Georgian house with its raised ground floor⁴². A careful design of the layout of the house is believed to equally meet this desire for privacy and security, with the most public rooms at the front of the house, and the private rooms at the back.

6.16 The three principles of sustainable design - economy of resources, life cycle design, and humane design - provide a broad awareness of the environmental issues associated with architecture. Building and window design that utilised natural light has been found to enhance the psychological well-being and productivity of occupants⁴³. The use of durable materials means occupants received less exposure to irritating chemicals used in the installation and maintenance of materials⁴⁴. Fresh air has been seen as being vital to the well-being of occupants. The health benefits of fresh air go beyond the need for oxygen; it has been found that it reduces the exposure time to occupants of bacteria and chemicals used in the home. Daylight has also been found to improve occupants' health as it keeps the body clock working properly.

6.17 Stripped wooden flooring can heighten the noise of normal household activities and may cause unhappiness as sound travels between homes from neighbours⁴⁵.

Commercial buildings

6.18 In the publication *Building Green: A guide to using plants on roofs, walls and pavements*, it found that the inclusion of a roof terrace in city centre blocks provided workers with a social space for informal recreation. These areas tended to be less polluted and noisy

⁴² Samuels, I. (2002) *What home buyers want: Attitudes and decision making among consumers*, CABE, pp15

⁴³ Kim, J., Rigdon, B. (1998) *Introduction to Sustainable Design*, National Pollution Prevention Centre for Higher Education, pp16

⁴⁴ Ibid, pp24

⁴⁵ Edge, M. et al (2003) *Mapping Survey of Non-Technical Research on the Social Value and Benefits of Good Architectural Design*, Scottish Executive

than street level areas⁴⁶. The concept of the roof gardens has been a major success in Germany. More radical ideas have been proposed by German architect Rudolf Doernach. Many of his designs including a chapel in Bonn, Germany, suggested that plants should be incorporated within the façade as an active building material with the ability to reproduce itself⁴⁷.

Context

Healthcare

6.19 Several examples have emerged from the review, which demonstrate the contribution of architectural design on patient and staff satisfaction and stress levels, notably in UK hospitals, Poole hospital and Mill View mental health unit in Brighton. At Poole hospital 72 per cent of the patients in the new unit gave the highest rating they could for overall appearance, compared with only 37 per cent of the patients in the old units⁴⁸. This has been supported by findings at the new Mill View mental health unit where patients were judged by staff as significantly less aggressive in terms of verbal abuse and physical violence. In addition, the amount of time patients needed to spend in intensive supervisory care was reduced by 70 per cent from 13.1 days to 3.9 days⁴⁹.

6.20 The ability of architectural design to contribute to the health and well-being of patients and staff has been well documented with the research undertaken by Ulrich (1984) in the US being quoted often. He linked the benefits of having windows with a view with shorter post-operative stays for surgical patients and greater levels of work satisfaction by nurses⁵⁰. He went further to demonstrate substantial restoration and positive changes in less than five minutes in blood pressure, heart activity, muscle tension and brain electrical activity when viewing nature. This has been a view supported by research conducted by CABA (2003) in the UK where similar results have proven substantial on the impact of landscaped buildings on the health and well-being of patients⁵¹.

Residential properties

6.21 In the literature review and study commissioned by CABA and DETR, *The Value of Urban Design*, all the case studies showed that the occupants felt that the developments contributed to some extent towards a new identity for their areas. For example, Exchange Quay in Salford, UK, provided a landmark through height and colour, and Barbirolli Square in Manchester, UK, offered new cultural facilities. However, such impacts were not always viewed positively. Standard Court in Nottingham, UK, was seen as not valuing the historical associations of its site, Waterfront in Dudley, UK, was blamed for ruining Brierley Hill town centre, and the regeneration impact of Exchange Quay was characterised by one occupant as

⁴⁶ Johnston, J. and Newton, J. (2004), *Building Green: A guide to using plants on roofs, walls and pavements*, Greater London Authority, pp47

⁴⁷ Ibid, pp32

⁴⁸ Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

⁴⁹ Ibid

⁵⁰ Carmona, M. et al (No date) *A bibliography of design value for The Commission for Architecture and the Built Environment*, University College London

⁵¹ CABA (2003) *Healthy Hospitals Campaign*, London, CABA; in CABA Space (2003) *Lewisham Primary Care Trust Children and Young People's Centre: Design and innovation for primary health and social care*, CABA

‘soulless out of town estate’⁵². Other research studies identified that the regeneration of a place pushed prices up and caused the displacement of local resident communities⁵³. The literature review showed that people’s perceptions of a good place to live have centred on the issues of safety and security, low crime rates, and access to good facilities. Where houses overlooked other homes and streets, occupants felt safer and crime statistics have shown that they *are* safer, with much lower rates of burglary. Also slower car speeds, more walkers and cyclists meant it was safer for children to walk to school or play outside⁵⁴.

6.22 Darwood (1987) found that location makes homes more vulnerable to crime, such as on a corner, whether it has more than two points of access, and is not overlooked at the front. The relative condition of the house also contributes to the poor image and increases its vulnerability to crime⁵⁵. Living in a detached house has also been found to increase the risk of burglary⁵⁶.

Public space

6.23 The decline in a high street economy and the emergence of retail parks and hypermarkets has meant that the number of people walking to amenities has dramatically fallen. For example, those able to reach a food shop within six minutes walk of home fell from 68 per cent to 57 per cent. The distance walked per year per individual has fallen from 410 km/year in 1975/76 to 298 km/year in 1998/2000⁵⁷. Declining local economies can be seen as an indirect cost on people’s health. A Detroit study (Schulz, 2002)⁵⁸, showed that poorer neighbourhoods had fewer supermarkets, more liquor stores, and less access to recreational and commercial facilities. These physical conditions work against healthy behaviour, such as regular exercise or eating fresh food. The Urban Green Space Taskforce reported in *Green Spaces, Better Places* that greater investment in parks has been worthwhile, as it adds value to regeneration and renewal and has cost savings in other areas, such as health, education and environmental management⁵⁹.

6.24 There has been extensive evidence linking participation in regular exercise with overall lower mortality, and a lower risk of developing coronary heart disease, diabetes and some cancers⁶⁰.

6.25 Lochner’s et al (2003) study highlighted that the built environment can facilitate or hinder social relationships between neighbours. Busy roads and the absence of meeting areas

⁵² Bartlett School of Planning commissioned by CABE and DETR (2001) *The Value of Urban Design*, CABE, pp69

⁵³ DCMS (2004) *Culture at The Heart of Regeneration - Summary of responses*, DCMS

⁵⁴ CABE (2005) *Better Neighbourhoods: Making Higher Densities work*, CABE, pp 12

⁵⁵ Carmona, M. et al (No date) *A bibliography of design value for The Commission for Architecture and the Built Environment*, , University College London

⁵⁶ Ibid

⁵⁷ Living Streets (2001) *Streets are for living – the importance of streets and public spaces for community*, August 2001: 7-8; in Jochelson, K. (2004) *The Public Health Impact of Cities and Urban Planning*, London Development Agency, pp14

⁵⁸ Schulz, A. et al (2002) *Racial and spatial relations as fundamental determinants of health in Detroit*, *The Millbank Quarterly*, Vol. 80, No.4, pp677-708

⁵⁹ Jochelson, K. (2004) *The Public Health Impact of Cities and Urban Planning*, London Development Agency, pp14

⁶⁰ Riddoch, C. (2003) *Physical activity and health outcomes*, UKPHA Conference, March 2003, Cardiff; Sport England, *The Value of Sport*, pp20-21

or few local services, for example, have made it difficult to make informal social relationships between neighbours. The study also highlighted a 40 per cent risk of reporting fair or poor health, and higher neighbourhood death rates in a low social capital area⁶¹.

6.26 Several studies have found that areas with no cul-de-sacs and only through roads are less likely to be subject to crime, as the street outside is constantly being used, and is well lit by street lights⁶².

6.27 The research also found that public spaces overlooked by residential buildings offered users with a safer recreational space because residents provided surveillance over the area⁶³. A research project in Kitchener, Canada, compared the before-and-after effects of turning a large under-developed plot of land in a crime-ridden neighbourhood into a community garden. As a result, crime incidents in the surrounding buildings dropped by 30 per cent immediately, and by 49 per cent and 56 per cent in the two subsequent years⁶⁴.

Operation

Healthcare

6.28 The interpretation of patient-centred design in recent buildings has generally resulted in hotel-like accommodation with more comfortable hospital décor, upholstered furniture, pastel colour schemes and mood lighting. These designs tended to make the hospital less austere as clinical environments by focusing on and increasing comfort and control⁶⁵.

6.29 Sensory deprivation was associated with high levels of anxiety and depression, high rates of delirium and temporary psychosis in patients on intensive-care units (Ulrich, 1992). This has been linked to aspects of the building, such as the lack of windows on intensive care units⁶⁶. Patients with a view from a window were discharged earlier than those without (Ulrich, 1984). Mazurch (2001) study claimed that colour, light, temperature and smell enhanced the release of serotonin which dilated the cardio-vascular system and enhanced productivity and healing⁶⁷.

6.30 There was opposing research on the beneficial affects of adopting multi-bed wards in hospitals. Some patients found that their privacy and confidentiality had been compromised which led to patients withholding information from staff⁶⁸, whilst other studies⁶⁹ cited that patients liked the multiple bed space, as they had company and did not feel isolated.

⁶¹ Lochner, K.A. et al (2003) *Social capital and neighbourhood mortality rates in Chicago*, Social Science and Medicine 56: 1797-1805

⁶² Nick Skeens, N. (2002) *Design Against Crime*, Design Council

⁶³ Ibid

⁶⁴ McKay, T. (1998) *Empty spaces dangerous places*. ICA Newsletter, Vol. 1(3) pp 2-3

⁶⁵ Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

⁶⁶ Carmona, M. et al (No date) *A bibliography of design value for The Commission for Architecture and the Built Environment*, , University College London

⁶⁷ Ibid

⁶⁸ Marberry, S. (2004) *Designing better buildings: What can be learned from Offices, Factories and Schools*, The Robert Wood Johnson Foundation

⁶⁹ Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

Residential properties

6.31 Research found that occupants were happy with living in high density accommodation if there were good sound insulation between dwellings, and adequate car parking that does not dominate the street scene⁷⁰.

6.32 Houses with front gardens with good visual oversight from the kitchens and living rooms enabled parents to keep watch on children playing outside and reduced the risk of road traffic accidents⁷¹.

Commercial buildings

6.33 Users' well-being can be negatively affected by aspects of a building, such as poor air quality, noise level or temperature, which has been linked with asthma, allergies and raising blood pressure. It has also been shown that poor lighting can cause eyestrain, headaches, fatigue and dental cavities⁷². Referencing published data from studies by BT, National Panasonic and others, a cost of £8.33 per square metre a year was judged to be the minimum cost to an organisation of avoidable absenteeism due to respiratory problems or 'sick building' syndrome⁷³. The development of the Wells-Riley equation was used which led to the provision of 15-20 litres a second of outdoor air for each occupant to be pumped into the building to reduce the risk of absenteeism from respiratory infection. That amount was deemed to be sufficient to halve the normal infection rate, which would very significantly cut production losses⁷⁴.

6.34 Companies have found that open-plan office space promoted a sense of community, with improved communication amongst employees⁷⁵.

Public spaces

6.35 In *Developing Accessible Play Space* (2002), the research highlighted design aspects which enhance social inclusion of children with and without disabilities. These were the provision of benches and tables close to the play area for parents to offer support from a vantage point but at a distance where it was felt less obtrusive. The provision of a shelter or covered space designed near to the play area increased the amount of time that families spent together⁷⁶.

6.36 Libraries where the design provided quietness, secure space, refreshment areas, and toilets have been more successful at attracting young people to the library to study. Libraries that have been adaptable and flexible allowing out of hours use have acted as community hubs holding various social and community group activities⁷⁷.

⁷⁰ CABE (2005) *Better Neighbourhoods: Making Higher Densities work*, CABE

⁷¹ Whewey, R. and Millward, A. (1997) *Child's Play: Facilitating Play on Housing estates*, The Chartered Institute of Housing

⁷² Higgins, S., et al (2005) *The Impact of School Environments - A literature review*, Design Council

⁷³ Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

⁷⁴ Ibid

⁷⁵ Myerson, J. (2000) *About: Workplace Design*, Design Council

⁷⁶ Dunn, K., et al and Childhood and Education Ltd (2003) *Developing Accessible Play Space - A Good Practice Guide*, ODPM

⁷⁷ Worpole, K. (2004) *21st Century Libraries - Changing Forms, Changing Futures*, Building Futures

6.37 Empirical research by Sampson and Raudenbush (1999) revealed a statistically significant link between mixed land use and decreased personal violence, and no correlation with crime, such as homicide, robbery and burglary⁷⁸. These findings from user groups were consistent with expert observations of a linkage between intensive mixed use and safety in the centres of major US cities (Petersen, 1998)⁷⁹.

6.38 At the neighbourhood scale, patterns of burglary were strongly linked to the street structure and lighting, and studies showed that areas that are well-connected and visible had a significantly reduced risk of burglary (Shu, 2000)⁸⁰. This finding reflected the fact that connectivity allowed people and places to benefit more from natural surveillance, as people felt safer, and criminals felt exposed⁸¹. In addition, access without use increased risk but access with good potential use should always be created (Space Syntax, 2001)⁸².

6.39 In *Safer Place – The Planning System and Crime Prevention*, the Office of the Deputy Prime Minister⁸³, highlighted what makes a safer sustainable environment; informed through a study of case studies:

- **Access and movement** – places with well-defined routes and signage, spaces and entrances that provide for convenient movement without compromising security. Routes for pedestrians, cyclists and vehicles should run alongside one another, and not be segregated to avoid under-used and isolated areas which are potentially at risk to crime. Where footpaths are used, they should be overlooked by surrounding buildings and activities. Also keeping pedestrians and vehicles at the same level would avoid creating intimidating spaces such as subways and underpasses.
- **Structure** – places that are structured so that different uses do not cause conflict. Defensible spaces can be provided by private or communal gardens that can only be accessed from the surrounding buildings. Blocks surrounding such spaces also reduced the risk of vandalism and crime. Homes in cul-de-sacs can be highly secure but those joined by a network of footpaths foster criminal activity. Buildings and spaces that are derelict or uncared-for conveyed the impression that crime and anti-social behaviour was tolerated, or more likely to go undetected, than places that are well maintained.
- **Surveillance** – places where all publicly accessible spaces are overlooked. Windows and doors should face onto the street, and ‘active frontages’ should be encouraged. Open, bright spaces reduced the number of potential hiding places and the removal of potential loitering areas, such as benches or low walls near cash-points, deterred criminal activities. CCTV has been most effective when combined with good lighting, continuous monitoring and publicity in its usage.

⁷⁸ Sampson, R. and Raudenbush, S. (1999) *Systematic Social Observation of Public Spaces: A new look at disorder in urban neighbourhoods*. American Journal of Sociology, 105(3), 603-51

⁷⁹ Petersen, D. (1998) *Smart Growth for Center Cities*, In Urban Land Institute, *ULI on theFuture, Smart Growth: Economy, community, environment* (pp 46-56), Washington, Urban Land Institute

⁸⁰ McIndoe, Graeme et al (2005), *The Value of Urban Design - the economic, environmental and social benefits of urban design*, Ministry for the Environment, New Zealand

⁸¹ Ibid

⁸² Ibid

⁸³ Davies, L. et al (2004) *Safer Places - The planning system and crime prevention*, ODPM, Chapter 2 pp14-44

- **Ownership** – places that that promote a sense of ownership, respect, territorial responsibility and community. Lower barriers, hedges and bushes have been highly useful to signify the public and private divide. The involvement of residents and users, including young people, encouraged a real sense of ownership, and can be achieved through tenant management organisations, community groups and regeneration programmes. ‘Pepper-potting’ different tenures and housing types ensured a variety of ownership patterns and people are sprinkled, resisting clustered and exclusive enclaves⁸⁴.
- **Physical protection** – places that include necessary, well-designed security features including CCTV, entry phone systems and fencing. The adverse of affect of grilles and barbed wire can often make a place look and feel unsafe and unattractive.
- **Activity** – places where the level of human activity is appropriate to the location and creates a reduced risk of crime and a sense of safety at all times. Different people use the same spaces in different ways and at different times. The public realm should be designed to be enjoyed by different cultural or age groups at the same time by providing complementary activities which prevent segregation or monocultures. The development of an evening economy has been a good way of diversifying uses and extending activity throughout the day and night. Theatres, cinemas, restaurants, bars, galleries and shops have all contributed to ensuring that an area does not become just a drinking culture area. This was also coupled with secure car parking, good public transport facilities and lighting.
- **Management and maintenance** – places that are designed with management and maintenance in mind, to discourage crime in the present and in the future. As stated previously, disorder and neglect has led to a decline in some areas which resulted in fostering crime. Cleaning and maintenance systems should include regular grass cutting, ground maintenance, and litter and graffiti removal.

Process

Education

6.40 Danko (2003) found that involving students in the design and renovation of a school helped to increase the students’ sense of ownership of the space and the enhanced the learning process⁸⁵.

Residential properties

6.41 Wekerle (2000) found that the participatory process engaged and informed residents, who consequently felt better connected to their community. At the same time, participation legitimises user interests, giving a sense of empowerment and consequent well-being⁸⁶. However, Francis (2003) found that a poorly run process led to participatory gridlock. This occurred when there was no agreement, or when the outcome of the process contradicted

⁸⁴ Davies, L. (2000) *Urban Design Compendium*, English Partnership

⁸⁵ Killeen, J., Evans, G., Danko, S. (2003) *The role of permanent student artwork in students’ sense of ownership in an elementary school*, *Environment and Behaviour* 35(2): pp250-263

⁸⁶ McIndoe, Graeme et al (2005), *The Value of Urban Design - the economic, environmental and social benefits of urban design*, Ministry for the Environment, New Zealand

established social and environmental goals; or narrow or vested local interests contradicted the broader public interest⁸⁷.

Commercial buildings

6.42 Pride by workers in their organisation and of their workplace can be obtained through involvement in the design discussions for the company building. This recognition for their opinions made the employers feel valued and passed ownership of the workspace back to the employees⁸⁸.

Public spaces

6.43 Research has shown that the user's needs may be different to those anticipated by the architect and the successful projects have been those that have consulted potential users. A community's sense of pride and ownership of the area in which they live will be enhanced if they are involved from the outset. For example, areas made safer through Crime Prevention Through Environmental Design were offered a framework to resolve neighbourhood and community problems and provided opportunities for prevention in new and refurbished developments. This increased the use of public parks and recreation facilities in the area and stronger neighbourhood spirit⁸⁹. Other research has shown that involving the local community in caring for their park or green space area provides opportunities for personal development, for example, participating in physical activities for exercise, meeting new people and learning new skills, as well as, feeling good by helping their local area⁹⁰.

6.44 CABE (2004) found that involving young people at risk of offending in the process of designing their own spaces curtailed potential vandalism in public places; there was a new respect for their surroundings and a sense of pride in their place⁹¹.

Character

Education

6.45 Historic buildings provide an engaging environment for historical education for schools and for individuals learning about their own personal history, as well as broader social history. Research in *Heritage Counts 2004*, for example, demonstrated how much the 42 Anglican cathedrals in England contributed to the local areas providing countless opportunities for education and volunteering. In 2003, there were 362,000 educational visits to cathedrals, 2,065 million school visits to historic attractions recorded by Visit Britain and 104,475 students in higher education studying for historic environment related degrees⁹².

⁸⁷ Ibid

⁸⁸ Myerson, J. (2000) *About: Workplace Design*, Design Council

⁸⁹ National Crime Prevention Council, 1997) *Designing Safer Communities: Crime Prevention through Environmental Design Handbook*, Washington, DC: National Crime Prevention Council; in Carmona, M. et al (no date) *A bibliography of design value for The Commission for Architecture and the Built Environment*, The Bartlett School of Planning, University College London

⁹⁰ Land Use consultants with assistance from The National Urban Forestry Unit (2005) *Connecting Londoners with Trees and Woodlands: A tree and woodland framework for London*, Mayor of London

⁹¹ CABE Space (2005) *Decent parks? Decent Behaviour?*, CABE

⁹² English Heritage and The Heritage Lottery Fund (2004) *Heritage Counts 2004 – The State of England's Historic Environment*,

6.46 The social benefits reported were the development of new skills, including project management and administration, as well as heritage skills, such as conservation or survey. They also benefited from working in a team, meeting and working with new people and many reported greater confidence⁹³.

6.47 *Back-to-Backs* in Birmingham, UK, is a case in point. Located in one of the most deprived wards in Birmingham, the buildings are among the last examples of early nineteenth-century terraced houses located, literally, 'back-to-back' around open courtyards. HLF, National Trust and Birmingham Conservation Trust, restored these houses and the project has become a catalyst for additional investment including an education room, holiday accommodation, offices and a working 1930s sweet shop. The mix of commercial and educational premises has meant that the project is sustainable. Over 100 volunteers have received training to act as tour guides and outreach work has been developed in the local community⁹⁴.

Healthcare

6.48 Further studies undertaken by Ulrich (1999) have found a reduced need for medicinal drugs and lower blood pressure in patients who had the opportunity of overlooking a garden or being in the presence of plants⁹⁵.

Residential properties

6.49 The Waterfront in Dudley, UK, is an example of a development where the successful landscaping and integration of the canal, as well as the integration of the leisure facilities along the canalside, provides a pleasant and much appreciated environment. The Standard Court development in Nottingham, UK, has been criticised for a lack of greenery and poor integration of the development with its surroundings making the development seem unpleasant⁹⁶. Endless rows of standardised buildings and ill-fitting developments contribute to a form of urban entropy, a general deadening of the visual and even spiritual qualities of the places in which we live and work. This has led to a long term winding down of aspirations and quality of life⁹⁷.

Commercial buildings

6.50 Northern Ireland, like other parts of the British Isles, has suffered urban decline in recent decades but the UK Government has been committed to tackling the problems created, for example, by finding new uses for land and buildings previously occupied by major manufacturing or heavy industry. The Waterfront Hall in Belfast, Northern Ireland, has been instrumental in regeneration of Laganside, making a link between new and old. Art has strengthened links between people and places, for example Deborah Brown's *Sheep in the Road* which remained recognisable as the TGWU building.

⁹³ Ibid, pp9

⁹⁴ Ibid, pp 7

⁹⁵ Ulrich, R.S. (1999) *Effects of gardens on health outcomes: Theory and research*. In A Dilani (ed.) *Design and Health: Proceedings of the Second International Conference on Health and Design*. Stockholm, Sweden: Svensk Byggtjänst, pp49-59

⁹⁶ Bartlett School of Planning commissioned by CABI and DETR (2001) *The Value of Urban Design*, CABI pp 74

⁹⁷ Wigginton, M. (1993) *Better Buildings Mean Better Business*, Royal Society of Arts

6.51 In the UK, The Tate Modern building in London is one of the best examples of adaptive re-use. The former Bankside Power Station was converted into a unique landmark building in London. The Guggenheim museum in Bilbao, Spain, is also a good example of putting a place on the map through regeneration focused on Heritage and Culture⁹⁸. However, the Standard Court development in Nottingham, UK, has failed to incorporate the historical significance of its location next to Nottingham Castle. It has been regarded by developers as ‘the wrong square in the wrong place’⁹⁹.

Public spaces

6.52 Public spaces are not just empty voids. Typically, they are filled with both soft and hard landscape elements to help shape their character. What we put into our public spaces is just as important as the space itself.¹⁰⁰

6.53 Public art in Aachen, Germany, contributed to the city’s unique identity as the fountains and sculptures depicted everyday life in Aachen by making historical references. Sponsorship of these artworks allowed other stakeholders, such as local businesses, to feel that they had a direct stake in the quality of the public environment¹⁰¹. The result is a public space which has generated social benefits, such as, local identity and civic pride.

6.54 A public space network, with focal points coinciding with facilities, has a key role in helping the process of community building creating opportunities for social contact and making the place feel more secure¹⁰².

Continuity and enclosure

Residential properties

6.55 A study in Brisbane, Australia, measured pedestrian behaviour and human interaction and found that street vitality was higher in non-gated communities, where more than 30 per cent of activity was due to the presence of children. In contrast, children in the gated communities were restricted to playing in their own gardens. The study concluded that providing quality space was not enough but there was a need for high-quality public spaces¹⁰³. A similar study in Manchester, UK, (Walker, 2000) showed that developments with a courtyard into secure community garden, where only residents had keys, reduced burglaries and fear of crime in one UK Openshaw development, and promoted a neighbourhood watch scheme¹⁰⁴. The negative impact of gated-communities was the feeling of exclusion from the people excluded.

⁹⁸ Architecture and The Built Environment for Northern Ireland Consultation (2005) *Good Design Supplement: Architecture and the Built Environment for Northern Ireland*, Department for Culture Arts and Leisure, Northern Ireland, pp 13

⁹⁹ Bartlett School of Planning commissioned by CABE and DETR (2001) *The Value of Urban Design*, CABE pp61

¹⁰⁰ CABE (2003) *The Value of Public Space - How high quality parks and public spaces create economic, social and environmental value*, CABE, pp13

¹⁰¹ Hagelskamp, C. (2003) *Please touch: How Aachen’s public art adds to its public life*. Project for Public Space Newsletter, September 2003

¹⁰² Samuels, I. (2005) *What home buyers want: Attitudes and decision making among consumers*, CABE

¹⁰³ Blandy, S. et al (2003) *Gated Communities: a systematic review of the research evidence*, CNR Paper 12

¹⁰⁴ CABE (2003) *The Value of Public Space - How high quality parks and public spaces create economic, social and environmental value*, CABE, pp11

6.56 In a US study, the research showed that suburban sprawl increasingly isolated the growing minority and immigrant population in North American inner city and older suburbs, in terms of new job and housing opportunities in the outer suburban ring (Yaro, 2001)¹⁰⁵.

6.57 The physical design of estates also affects residents' behaviour and well-being. The clear physical separation of estates from the surrounding areas make residents feel they lived in a ghetto¹⁰⁶. Common entrances used by many people make it difficult to keep out strangers or feel secure. US studies confirmed the impact of design on community cohesion and individual well-being. For example, Pruitt-Igoe, near downtown St Louis, Missouri, US, opened in 1954 and consisted of 43 eleven-storey buildings, and housed more than 12,000 people. It was demolished in 1972. Studies showed that the residents were atomised, hostile to one another, experienced high levels of crime and vandalism, and provided each other with no social support. This atomisation was attributed to the design of the buildings, which offered no semi-private space or facilities, around which social relationships could be fostered¹⁰⁷.

6.58 Another study compared the social interaction between students living in shared rooms on a long hallway to those in suite of three shared rooms. The density of students in each design was the same but the corridor residents showed more withdrawal whilst students in the shared suites formed supportive groups and felt that social interaction was under their control¹⁰⁸.

Public spaces

6.59 A US study in Baltimore found developments which incorporated semi-private space, such as a common play area on each floor, increased the amount of neighbouring, visiting, and mutual aid among persons moving from slums into the development¹⁰⁹.

Quality of the public realm

Education

6.60 Taylor (1999) found that the attention in children suffering from attention-deficit disorder and attention-deficit hyperactivity disorder while in schools, is restored by incorporating green elements in the physical environment inside the school, and green spaces outside, that can be played in, and viewed from classroom windows¹¹⁰.

¹⁰⁵ Yaro, R. (2001) *Innovations in spatial planning in the United States*, In OECD (ed.), *Towards a new role for spatial planning* (pp. 133-142), Paris: Organisation for Economic Cooperation and Development

¹⁰⁶ Jochelson, K. (2004) *The Public Health Impact of Cities and Urban Planning*, London Development Agency, pp7

¹⁰⁷ Halpem, D. (1995) *Mental Health and the Built Environment. More than Bricks and Mortar?* Taylor and Francis, London, p124-133

¹⁰⁸ Ibid

¹⁰⁹ Ibid

¹¹⁰ Marberry, S. (2004) *Designing better buildings: What can be learned from Offices, Factories and Schools*, The Robert Wood Johnson Foundation

Residential properties

6.61 A US study showed that residents of more compact and interconnected portions of the US city of Atlanta region know their neighbours better and have a better sense of their communities than residents of more dispersed and disconnected environments (Frank et al, 2003)¹¹¹. Other studies have suggests similar results (Ewing, 1997)¹¹². The weight of evidence suggests that the reduced encounter rate between people in dispersed settlements diminishes the potential for forming communities of choice (Bentley, 1999)¹¹³. This is true where lower density is associated with greater car dependence as is often the case. Putnam (2000) of Harvard University, an expert on social capital, has found that each additional 10 minutes of commuting time cuts all forms of civic engagement, such as attending public meetings and volunteering by 10 per cent¹¹⁴.

Public spaces

6.62 In research conducted by Swanwick (2001), he found that there are social benefits associated with green spaces. These include contact with nature, opportunities for exercise, and involvement in social, cultural and community activities. All of these are beneficial to people's physical and mental health and encourage social interaction and education opportunities¹¹⁵.

6.63 In a study by Tibbats (2002), the research found that there is clinical evidence to suggest that green spaces reduce stress and prevent obesity in the population. It also claimed they play a vital part in the fabric of the local people and are essential to the physical and emotional development of children. Green spaces are also a congregation point for local festivals, civic celebrations, fairs and other forms of social interaction¹¹⁶.

6.64 The literature review has found clear evidence of the value of green spaces in promoting community cohesion. For example, a Chicago study (Kuo, 1998) found that people living in apartments tend to use nearby public spaces more if they were 'natural' rather than man-made, leading to greater levels of socialising among neighbours¹¹⁷.

6.65 Research has shown that the built environment affects people's sense of pride in their surroundings. Carr (1992) referred to empirical studies that supports their claim that certain criteria should apply to the design of public space. They said that places should be meaningful, allowing people to make strong connections between the place, their personal lives and the larger world, accessible to all groups and responsive. This view has been corroborated by Carmona et al (2003) in his study of what made a good public space¹¹⁸.

¹¹¹ McIndoe, Graeme et al (2005), *The Value of Urban Design - the economic, environmental and social benefits of urban design*, Ministry for the Environment, New Zealand

¹¹² Ibid

¹¹³ Ibid

¹¹⁴ Ibid

¹¹⁵ Swanwick, C. et al (2001) *Improving Urban Parks, Play Areas and Green Spaces: Interim Report on Literature Review*, Unpublished, Department of Landscape, University of Sheffield

¹¹⁶ Tibbats, D. (2002) *Your Parks: The benefits of parks and green spaces*, Urban Parks Forum, Berkshire

¹¹⁷ Kuo, F.E. et al (1998) *Fertile ground for community: inner-city neighbourhood common spaces*, American Journal of Community Psychology, Vol. 26(6), pp 823-851

¹¹⁸ McIndoe, Graeme et al (2005), *The Value of Urban Design - the economic, environmental and social benefits of urban design*, Ministry for the Environment, New Zealand

6.66 Gehl and Gemzoe (2000) discussed the experience of Copenhagen, Denmark, where because of the psychological comfort derived from the high-quality urban environment and experience, public place activity has increased into winter months previously considered climatically unsuitable¹¹⁹.

6.67 There is substantial evidence to show the impact of public parks on the health and wellbeing of the population. For example, walking in the park on the advice of doctors reduces the risk of heart attack by 15 per cent (Hakim, 1999); diabetes by 50 per cent (Diabetes Prevention Research Group, 2002); colon cancer by 30 per cent (Slattery, 1997), and fracture of the femur by up to 40 per cent (Grisso, 1991)¹²⁰. This is supported by research undertaken in Scotland by Bird (2003) who claimed that if one in hundred inactive people took adequate exercise, it could save the NHS in Scotland up to £85m per year¹²¹. Green space also has the effect of reducing stress, as it is a place of quiet contemplation, a place 'to get away from the stresses of life' (Dunnett, 2002)¹²² and promotes a drop in blood pressure (Hartig, 2003)¹²³.

6.68 Melbourne, Australia is a good example of a city that has consciously set and achieved urban design quality and performance targets. The strong community support for these targets reaps dividends in terms of civic pride and widespread commitment to further achievements (Adams, 2005)¹²⁴. Studies of the Brazilian city of Curitiba showed citizens felt a high sense of civic pride and widespread commitment to further developments as a direct link to the city's commitment to an integrated transport system, preservation of the environment, employment opportunities and social integration (Taniguchi, 2005)¹²⁵.

6.69 Safety is a major factor to whether people use public spaces. Kjellstrom and Hill (2002) found that activity was discouraged by poor lighting and footpaths, and a perceived lack of safety both from accident and crime¹²⁶, particularly for women and children. The importance of safety, both perceived and actual, emphasises that these are necessary conditions, if walking is to be encouraged. But when a place is designed to a high quality, an additional 'wide range of optional activities will occur because place and situation now invite people to sit, eat, play and so on' (Gehl, 2001)¹²⁷.

Diversity

Commercial buildings

6.70 Studies of new developments¹²⁸ found that commercial retail parks are 'soulless out of town estates' and do not encourage wider community interaction, as developments are

¹¹⁹ Ibid

¹²⁰ CABE (2003) *The Value of Public Space - How high quality parks and public spaces create economic, social and environmental value*, CABE

¹²¹ Ibid

¹²² Ibid

¹²³ Ibid

¹²⁴ McIndoe, Graeme et al (2005), *The Value of Urban Design - the economic, environmental and social benefits of urban design*, Ministry for the Environment, New Zealand

¹²⁵ Ibid

¹²⁶ Ibid

¹²⁷ Ibid

¹²⁸ Bartlett School of Planning commissioned by CABE and DETR (2001) *The Value of Urban Design*, CABE

deserted at the weekends and evenings, as well as having poor connectivity to the public realm in which they are set. A lack of community activities and facilities hindered the process of building social bridges between groups in the neighbourhood (Forrest & Kearns, 1999)¹²⁹.

Public spaces

6.71 The Greenwich Open Space Project in South London, UK, evaluated attitudes to nature in local people's lives. Different neighbourhoods were interviewed about what open spaces meant for them. There was clear evidence that the provision of urban wildlife habitats are highly valued and offer the opportunity to experience nature first hand. Even the simple knowledge that a natural area exists is, for many, a source of satisfaction¹³⁰.

6.72 It has been found (Kaplan, 1985) that large open spaces do not promote positive community feelings as much as smaller natural areas close to housing. This sense of community cohesion can be further promoted by providing a range of uses including private and public activities keeping the area animated throughout the day for the enjoyment of a wide range of users¹³¹. People also become attached to urban wildlife habitats which can provide a focus for local communities (Shoard, 2003)¹³². The Countryside Agency (2005) promoted the creation of extensive public green spaces immediately around towns and cities which compliments the provision of usually smaller, locally accessible green spaces within urban areas. Together they created a variety and choice for people in how they wanted to spend their free time and connect with nature and enjoy the outdoors¹³³.

6.73 The outdoor environment has long been a favourite place to play for children. The majority of time spent outdoors involved children moving around the outdoor environment they have access to and playing en route (Moore, 1986)¹³⁴. The quality and diversity of the outdoor environment within two streets of the front door is therefore important if children's needs for active, quiet, imaginative, creative and social play are to be satisfied¹³⁵.

6.74 A paper to the Environmental Design Research Association (EDRA) by Shehayeb (1995) was based on an extensive literature review of empirical research into human behaviour in public space. People tend to interact more when they could avoid it. It was clear that adaptable public space is used by more people in more diverse ways over a longer time period than spaces designed for specific limited functions. Key attributes include open space along streets that are well defined by enclosed edges of buildings and landscapes, open

¹²⁹ The Bartlett School of Planning (No date) *A bibliography of design value for The Commission for Architecture and the Built Environment*, University College London

¹³⁰ Harrison, C. et al (1987) *Nature in the city – popular values for a living world*, Journal of Environmental Management, Vol. 25, pp347-362

¹³¹ Kaplan, R. (1985) *Nature at the doorstep – residential satisfaction and the nearby environment*, Journal of Architectural and Planning Research, 2, pp115-127

¹³² Shoard, M. (2003) *The Edgeland*, Town & Country Planning, May 2003, pp122-125

¹³³ The Countryside Agency and Groundwork (2005) *The Countryside in and around towns: A vision for connecting town and country in the pursuit of sustainable development*, The Countryside Agency

¹³⁴ Wheway, R. et al (1997) *Child's Play: Facilitating Play on Housing estates*, The Chartered Institute of Housing

¹³⁵ Ibid, pp8

spaces that are connected but not split by movement paths through the main space, and generous footpaths¹³⁶.

6.75 US evidence (United States Environmental Protection Agency, 2001) shows that accessible local facilities, when combined with a safe and attractive street system with an appropriate degree of connectivity, enhances social equity by reducing the need to own a car to get access to services¹³⁷. While mixed use may help to create socially diverse communities, it does not necessarily lead to social inclusiveness. Work in the UK by DEMOS (Urban and Economic Development Group, 2000) suggested that there may be little contact between richer and poorer in mixed-tenure developments¹³⁸.

Ease of movement

6.76 A Scandinavian study showed that children's balance and co-ordination developed faster if they have access to play areas in forest settings rather than in traditional playgrounds, varying topography, vegetation and rocks presented greater challenges (Fjortoft, 2001)¹³⁹.

6.77 Access to the countryside and the opportunity to use the facilities and amenities within the countryside is made available, regardless of social and economic circumstances, by providing an infrastructure of car-free routes and open spaces to link urban green spaces to the natural green spaces¹⁴⁰.

6.78 A US study (Appleyard, 1981) found that heavy traffic erodes sense of community. The heavier the traffic, the more limited the social activities of all kinds in that community. The research showed that residents on low traffic streets had a greater sense of neighbourhood compared to those on heavier traffic streets¹⁴¹, as they rarely extended their home territory beyond their front yards. People on heavily trafficked streets tended to sell their homes more quickly and move on, further undermining any sense of a stable community.

6.79 The majority of traffic accidents occur at junctions and can be reduced through adequate design. Building roads that restrain vehicle speeds and discourage non-access traffic reduce road traffic accidents¹⁴². This was supported by other research (Maconachie, 2002) which found that a reduction in accidents and car fumes was attributed to a well-designed street layout where 20 mph speed restrictions had been enforced¹⁴³.

¹³⁶ Shehayab, D. (1995) *The Behavioural Opportunities Approach: An explanatory and narrative approach to urban public space*. In A. Seidal (ed.), *Banking on Design: Proceedings of the 25th Environmental Design Research Association (EDRA) Conference* (pp. 208-215). San Antonio: EDRA

¹³⁷ USEP (2001) *Our Built and Natural Environments: A technical review of the interactions between land use, transportation, and environmental quality*, Washington, United States Environmental Protection Agency

¹³⁸ URBED (2000) *Living Places: Urban renaissance in the South East: Background Review*, London, Urban and Economic Development Group

¹³⁹ Fjortoft, I. (2001) *The natural environment as a playground for children: the impact of outdoor play activities in pre-primary school children*, *Early Childhood Education Journal*, Vol. 29(2) pp111-117

¹⁴⁰ The Countryside Agency and Groundwork (2005) *The Countryside in and around towns: A vision for connecting town and country in the pursuit of sustainable development*, The Countryside Agency

¹⁴¹ CABE (2003) *The Value of Public Space - How high quality parks and public spaces create economic, social and environmental value*, CABE

¹⁴² The Bartlett School of Planning (No date) *A bibliography of design value for The Commission for Architecture and the Built Environment*, University College London

¹⁴³ Maconachie, M. and Elliston, K. (2002) *Morice Town Home Zone: a prospective health impact assessment*, Health and Community Research Programme, University of Plymouth and the South & West Devon NHS Trust

6.80 People would change their long-distance travel and commuting habits if the built environment provided opportunities for mode change, and are more likely to increase the amount of time they spend walking or cycling to local destinations. Cyclists also gain access benefits from appropriate connectivity. Frank et al (2003) cited studies of cycle use in 18 US cities and in Germany. All demonstrated links between the structure and design of the cycle network and cycle mode share. These findings are significant because they show a combination of connectivity and sensitive public space design encourages some people to change their mode of transport, at least for predominantly local trips. The studies highlight a 10 per cent increase in the rate of walking for shopping trips and access to transit stations relative to the rate in car-oriented developments¹⁴⁴.

6.81 In the same study (Frank et al, 2003)¹⁴⁵, the research also found that land use mix, especially the availability of retail or commercial uses close to people's homes, led to a three-fold reduction in the likelihood of obesity for certain sectors of the population.

¹⁴⁴ McIndoe, Graeme et al (2005), *The Value of Urban Design - the economic, environmental and social benefits of urban design*, Ministry for the Environment, New Zealand

¹⁴⁵ Frank, L. et al (2003) *Health and Community Design: The impact of the built environment on physical activity*, Washington, Island Press

SECTION 7: ECONOMIC

Vision and character

7.1 From the review, it was evident that vision and character was an important facet of a building's or development's design. Indeed one of the first principles of urban design is cited as being "promote character in townscape and landscape by responding to and reinforcing locally distinctive patterns of development and culture"¹⁴⁶. The following examples illustrated how vision and character of buildings and places have contributed to economic impact.

7.2 Dundee Contemporary Arts (DCA), Scotland, resulted from a competition set by the City of Dundee Council in 1996. The vision for the building was to have all activities – galleries, cinemas, print workshops, shop and research facilities, around a central social space and café. The DCA café and foyer sit at the internal corner of the L-shaped building, and therefore, at the heart of the building in plan and operation. The DCA has introduced some welcome cultural life to the centre, sparse of art venues. Westbrook's report (2003) assessed the economic impact of DCA on the local community of Dundee and Tayside three years after its opening in March 1999. Based on the research, the recorded visitor numbers within DCA had exceeded 300,000 in each of its first three financial years. Of these, Tayside residents represented approximately 60% of all exhibition visitors in 2001/02. The One Five Two shop generated a turnover of £72,000 in 2001/02, of which crafts accounted for 39.5%. Several local craft producers benefit from supplying the shop, which helped to promote their work. Community and education work is a significant part of DCA's activity, although the ability to meet demand has been constrained by staffing and finance. The Jute Café had a turnover of £120,095 in 2001/03. DCA can also be attributed to creating 258 jobs in the Tayside area, whether through direct employment or business development¹⁴⁷. Finally, the distinctiveness of DCA has grown through the architect's vision in making the building part of the city as a whole. The use of windows allowed both light to come into the building and allow visitors to look out onto Dundee.

7.3 Similar examples, such as the Tate Gallery in St Ives, Cornwall, UK, and New Art Gallery in Walsall, UK, both demonstrated the economic benefits of having a landmark cultural building in the community. Within the first two years of opening, the Tate Gallery in St Ives contributed £16 million to the local economy through tourism¹⁴⁸. In the first few months of the opening of the New Art Gallery in Walsall, the local Boots store reported that their daily sales increased by £4,000¹⁴⁹.

7.4 The Summerfield Centre in Winson Green in Birmingham, UK, has provided educational and training opportunities for local people. The building is a local landmark and has been refurbished to a high standard and has become a source of local pride.

¹⁴⁶ Carmona et al (2002) What value urban design? *Urban Design International*, 7, pp 63-81

¹⁴⁷ Westbrook, Steve, (2003) Economic Impact Evaluation of Dundee Contemporary Arts, DCA; and www.edinburgharchitecture.co.uk

¹⁴⁸ Worpole, K. (2000) Design, economy and the architectural imagination, London: RIBA Future Studies and Jenkinson, P. (2000) Regeneration: can culture carry the can? *RSA Journal* (2000); in CABA (2002) *The Value of Good Design – How buildings and spaces create economic and social value*, CABA, pp 6

¹⁴⁹ Ibid

7.5 An independent survey conducted by FPD Savills, an international property consultant, in 2002 indicated that higher quality design in residential schemes yielded a residual value per hectare of up to 15% more than conventionally designed schemes¹⁵⁰.

7.6 In the US study, Value of Parks¹⁵¹, the proximity to landmarks created higher property prices. In San Francisco, USA, the proximity to the Golden Gate Bridge doubled property values and generated \$5-10 million dollars for the Government in annual property taxes. Some researchers believe that the quality of the building is not sufficient to increase marketability values but a poorly designed home in a popular location is likely to be important.

Appearance

Education

7.7 The visual environment has shown to have a positive impact on pupil motivation which had led to increased student performance. A recent study by PricewaterhouseCoopers (2000) examined the relationship between student performance and teaching quality¹⁵². The research also identified that teaching quality and level of staff morale had been the predominant influence on pupil attainment. Another factor that contributed to the higher levels of motivation was the aesthetic appearance of the built environment, with students having more pride in their environment.

7.8 In Fraser's US study (1993), he examined the impact on student performance where the physical environment improved from poor to excellent. The study showed that students over the period increased their performance measured in terms of test scores by 10.9 per cent¹⁵³. Similar research¹⁵⁴ in the US showed significant improvements in student performance including greater levels of motivation and energy levels leading to reduced absenteeism. Similar studies in France have shown that students' perform better in a well-designed building as opposed to those in poorly designed school building.

Commercial buildings

7.9 Aesthetic form can be a major factor in the design of workplaces to enhance a sense of identity in employees and it has become a way for companies to enforce their corporate brand. For example, the interior of the Dyson Research and Appliances Headquarters in Malmesbury, England, has been deliberately styled in a lilac and yellow colour scheme which

¹⁵⁰ Popular Housing Forum (1998) *Kerb appeal*, Winchester: The Popular Housing Forum; in CABE (2002) *The value of good design*, pp5

¹⁵¹ The Value of Parks, Testimony before the California Assembly Committee on Water, Parks and Wildlife, May 18 1993; in CABE SPACE (2003) *The Value of Public Space*, pp5

¹⁵² PricewaterhouseCoopers (2000) *Building Performance: An Empirical Assessment of the Relationship Between Schools Capital Investment and Student Performance*, London, HMSO

¹⁵³ Frazier, L. (1993) *Deteriorating School Facilities and Student Learning*, ERIC Digest, Number 82, Eugene Oregon: ERIC Clearinghouse on Educational Management, www.ed.gov/databases/ERIC_Digests/ed356564.html

¹⁵⁴ Jago, E., Tanner, K. (1999) *Influence of the School Facility on Student Achievement: School Building Age*, The University of Georgia, USA; in Carmona, M. et al (no date) *A bibliography of design value for The Commission for Architecture and the Built Environment*, The Bartlett School of Planning, University College London, pp34

matches the company's brand image¹⁵⁵. In addition, all Hilton hotels' interior foyer area has been designed to be recognisable as a 'Hilton'.

7.10 The new UK headquarters of Japanese car maker Toyota made explicit visual reference to the automotive industry in its curved forms, crisp metallic finishes and spacious interior vistas. The overriding impression was the company's brand ethos being instilled in its employees from the moment they start work¹⁵⁶. Reebok International headquarters in the US was designed to bring 1,000 staff together in one building where they are inspired to improve their creativity and productivity¹⁵⁷. In both cases, the company wanted to provide employees with a sense of identity with the products they are manufacturing.

7.11 When asked which factors would affect the choice of where to locate a business, 98% of managers chose 'pleasant environment and architecture' as their top priority¹⁵⁸. In similar research conducted by Vandell and Lane (1989)¹⁵⁹, they examined over 100 office buildings and found a positive correlation between design quality and market rents. The better the quality of design, the higher the marketability of properties within the building and area.

7.12 Good buildings also have the power to uplift morale¹⁶⁰ which leads to less staff sickness and absenteeism, and have a positive impact on the retention of staff, which leads to increased productivity and creativity. Vanson and Bourne (2005) found that the aesthetic appearance of the workplace could provide an environment which is inspiring and stimulating. This is achieved through providing an environment with a combination of the familiar and unfamiliar; natural and hi-tech elements, tactile surfaces, mood-enhancing lighting and sound, standard and unusual furnishings. This all contributed to helping to create a fun working environment, generating energy and enthusiasm¹⁶¹. The case study conducted by Vanson Bourne consisted of 200 middle and senior management interviews in the UK drawn at random from legal, media and financial services sectors.

¹⁵⁵ Rouse, J.M. (2000) *How do profit generating organisations measure and manage the costs and benefits of architecture and design when investing in properties for their own business use?* Unpublished MBA thesis, University of Nottingham

¹⁵⁶ English Heritage (2005) *Low Demand Housing and the Historic Environment*, English Heritage, pp5

¹⁵⁷ Ibid, pp5-6

¹⁵⁸ Myerscough, J, (1988) *The Economic Importance of the Arts*, Policy Studies Institute, pp140 ; in Worpole, K. (1999) *The Value of Architecture: Design, Economy and the Architectural Imagination*, RIBA Future Studies

¹⁵⁹ Vandell & Lane (1989) in Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

¹⁶⁰ HMSO / NHS Estates (1994) *Better by design: pursuit of excellence in healthcare buildings*; in Cortvriend, P. (2005) *The effect of the healthcare environment on patients and staff*, Paper for the European Health Management Association and European School of Oncology, England

¹⁶¹ Gensler, Architect of Ideas (2005) *These Four Walls: The Real British Office*, pp20-23

Buildability

7.13 The buildability of a building may be considerably improved by adopting a ‘loose fit’ approach¹⁶². This is finding a balance between what building materials are used and building services for ease of installation, speed of construction, simplified maintenance and greater flexibility for future adaptations. This approach may also speed up the construction period, and therefore, reduce the rolled-up interest costs accumulated during this period. On large projects, this may represent around 25 to 30 per cent of the overall cost during the construction phase¹⁶³.

Education

7.14 The Jubilee Campus, University of Nottingham in England was designed as a sustainable building and this has translated into the materials used both in the exterior and interior of the building. The central focus of the campus is the conical library with its prominent ventilation towers¹⁶⁴. A survey of staff at the university revealed that the cosmetic and environmental features of the buildings, such as cleanliness, a feeling of space and aesthetic appeal, had been an influential factor in the staff recruitment process. The survey also polled students’ opinions on what attracted them to the university, and found that structural and functional features, such as modern design, the quality of the facilities and types of materials used were the main factors, with 63 per cent of students citing this as a major reason for choosing Nottingham¹⁶⁵. The findings of the research is supported by Edwards’ (2000)¹⁶⁶ and provided some evidence to link building design and recruitment, retention and performance of staff and students in the higher education sector. It does not, however, attempt to measure the quality of the design or the negative impacts which can result from design inadequacies.

7.15 A study carried out by PricewaterhouseCoopers (2000) for the Department for Education and Skills examined the relationship between capital investment in schools and pupil performance. It found that capital investment in school buildings had the strongest influence on staff morale, pupil motivation and effective learning time¹⁶⁷. The study highlighted one school where the design of playgrounds and the school hall had enabled a reduction of lunchtime assistants from 8 to 5. This represented a saving in resources which could be switched to direct educational expenditure¹⁶⁸.

Healthcare

7.16 The £60m Evelina Children’s Hospital, in London, by Michael Hopkins, was funded by the Guy’s and St Thomas’s charity. The building of the hospital represented a pioneering

¹⁶² Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

¹⁶³ *ibid*

¹⁶⁴ CABE (2005) *Design with Distinction: The Value of Good Building – Design in Higher Education*, CABE, pp12

¹⁶⁵ *Ibid*

¹⁶⁶ Edwards, B. (2000) *University Architecture*, London, Spon Press

¹⁶⁷ PricewaterhouseCoopers (2000) *Building Performance: An Empirical Assessment of the Relationship Between Schools Capital Investment and Student Performance*, London, HMSO

¹⁶⁸ CABE (2002) *The Value of Good Design - How buildings and spaces create economic and social value*, CABE

piece of design with a brief to the designers to “make it not feel like a hospital”¹⁶⁹. As a result the building does not feel institutional but has become a child-centred building with every floor named after a different area of the natural world, with jolly colours and patterns, and a cone-shaped, shiny plastic helter-skelter in the foyer. The design of the building has taken previous evidence that a well-designed, agreeable hospital environment helps people to recover faster, its attention to detail extending to making the ceilings in the wards pleasant to look at, as the majority of the patient’s time is spent staring at the ceiling.

Residential property

7.17 The review findings highlighted the need to use energy efficient materials and incorporate these in the design of buildings, making them cost-effective to run in the long term¹⁷⁰ and reducing utility bills with a potential knock-on effect of reducing the number people and households in fuel and water poverty¹⁷¹.

7.18 In 1997, Scottish Homes sponsored a competition for the creation of a sustainable housing development. The Glenalmond Street estate located in Shettleston, Glasgow, consisted of 16 flats and houses, some of which were privately owned under a shared-ownership scheme, with the others rented through the Shettleston Housing Association. A pre-letting process was initiated with a tenant group, who got involved in discussions on the design of the homes. This has led to a low resident turnover rate and an absence of vandalism on the estate. The innovative heating system, which was designed to work with low water temperatures, has resulted in reduced utility bills, with one tenant reporting a 60 per cent per month reduction. The sustainable design approach to the development also included higher insulation standards, and avoiding PVC, as well higher levels of passive solar gain, and recycled materials¹⁷².

Commercial buildings

7.19 The Pearson Education Headquarters in Harlow, England (Rouse, 2000)¹⁷³ case study demonstrated how the design for purpose has actually been achieved. The company was trying to balance a need to satisfy requirements of the property investment market with a desire to create a space that would foster greater communication and creativity in staff, accommodate increased use of IT, be easy to maintain and cheap to run, and be a pleasure to work in. The building was constructed as a mix of five and six storeys, set around one large central atrium and two smaller atria. The west and east blocks are separately lettable, and one of these blocks was let for a time to a major supermarket chain. It has been regarded as a very green building with natural ventilation, external solar shades and maximum use of natural light. Assessed under the BREEAM energy scheme, the building achieved 20 out of a possible 21 credits – unequalled at the time of assessment.

¹⁶⁹ Sunday Times article by Hugh Pearman

¹⁷⁰ Gensler, Architect of Ideas (2005) *These Four Walls: The Real British Office*, pp20-23

¹⁷¹ Horton, B. (2005) *Sustainable Homes - the financial and environmental benefits*, Environment Agency

¹⁷² SUST.org.uk website downloaded February 2006, *Glenalmond Street Housing, Shettleston, Glasgow, Scotland: Lighthouse*

¹⁷³ Rouse, J.M. (2000) *How do profit generating organisations measure and manage the costs and benefits of architecture and design when investing in properties for their own business use?* Unpublished MBA thesis, University of Nottingham

7.20 In all of Rouse's case studies¹⁷⁴, there was a strong recognition of the corporate benefits to be gained from architectural investment. There was further recognition that these benefits represented a mix of tangible and intangible benefits, some of which would fit within a traditional quantitative cost-benefit analysis, others which were more difficult to measure. The overarching finding was that the companies in the study primarily wanted their buildings to support their own business process, whether these are concerned with generating wealth or providing a service. To do so effectively, they must create an environment where people feel motivated to give their best.

It is not that the company does not care about end value, but it is secondary. Because this building is not re-lettable to the world and its wife, it is wholly and specifically designed to meet RARE's working requirements. (RARE Case Study, Rouse 2000)¹⁷⁵

7.21 In the case of RARE, the computer games developer, the company believed that the new headquarters in Twycross, England, needed to provide an environment whereby their employees could be creative. The design of the building used a mix of shapes and materials – wood, copper, glass, concrete, red brick and Welsh slate. There was no air conditioning and the building replicated a country manor. It also incorporated water recycling and was energy efficient which was built into the design from the outset.

7.22 This was a view shared by Duffy (1997) in his study of how initial investment in customised architecture and design can often be recouped within a few years, after which savings on office rents and greater productivity come into their own. Duffy cited in his study the example of Andersen Worldwide, whose investment in tailor-made design for their newly occupied buildings in Chicago, USA, achieved a 30% reduction in space that would have been used by conventional layout designs. This space-saving design meant that the company had overall savings on rent and occupancy costs paying for the initial capital outlay within four years¹⁷⁶.

7.23 More recently, Pearson (2000) examined the ten winners of the annual design awards which focused on the benefits of good design¹⁷⁷. The awards illustrated the growing awareness of the value of good design in both architecture and the public realm. For example, in a new design of a manufacturing facility, the layout encouraged greater interaction among design and production teams, and as a result, both quality assurance and adherence to schedules improved. In another example, he cited a report on a new fifteen storey building in Japan with 'lushly planted terraces' which reported a 20% reduction in heating and cooling costs over their budgeted predictions. The building, fronting a major urban open space, was designed to reflect the greenery of the park it faced. The potential ongoing cost savings inherent in the good design meant that the company saved a significant amount of money in terms of winning the contract and ongoing maintenance costs¹⁷⁸. Although, Pearson's findings are not conclusive, it has been generally accepted that good design is an investment that produces benefits over time.

¹⁷⁴ Ibid

¹⁷⁵ Ibid

¹⁷⁶ Duffy, F. (1997), *The New Office*, Conran Octopus

¹⁷⁷ Pearson, C. A. (2000) *Making Good Design Pay Off*, 4th Annual Business Week/Architectural Record Awards, Architectural Record, Vol 188, No.10, October 2000, pp84-99

¹⁷⁸ Ibid

Context

Education

7.24 More recent research conducted by CABA in July 2003 found that the existence of well-designed buildings on a campus is a significant factor in the recruitment of staff (65 per cent) and of students (72 per cent)¹⁷⁹. In the same study, the Portland Building School of the Environment, University of Portsmouth in England, was found to be a catalyst for the development of a new campus and the regeneration of one of the poorest parts of Portsmouth¹⁸⁰.

Residential property

7.25 The University of Bristol carried out a survey of 600 households on a large suburban housing estate with little or no distinctive design quality. The researchers found that these residents exhibited more difficulties in selling and experienced more negative equity than those living on more distinctively designed developments¹⁸¹.

Commercial buildings

7.26 The British Airways Waterside building is situated near Heathrow airport in London, and provided the company with an opportunity to move to a single purpose-built headquarters. A stream flows down the length of the internal street, before emerging outside and flowing into a large lake set in 280 acres of restored parkland accessible by the local community. The Waterside development cost £200 million, and the company estimated an average £15 million per year in savings through increased productivity and lower running costs¹⁸².

Healthcare

7.27 The role of architecture and design has been at the heart of the new Lewisham Children and Young People's Centre development, and has been recognised as a model for future delivery of primary care. Being aware of the therapeutic properties of well-designed buildings and their positive impact on staff and patients, the Trust wanted not just a new building but one that would positively contribute to the urban environment and provide an increased sense of place and local identity for people who live nearby¹⁸³.

¹⁷⁹ University of West of England & PricewaterhouseCoopers (2005) *Design with Distinction - The value of good building design in higher education*, CABA

¹⁸⁰ Ibid

¹⁸¹ Forrest, R. et al (1997) *Home owners on new estates in the 1990s*, Bristol: The Policy Press; in CABA (2002) *The Value of Good Design - How buildings and spaces create economic and social value*, pp5

¹⁸² Rouse, J.M. (2000) *How do profit generating organisations measure and manage the costs and benefits of architecture and design when investing in properties for their own business use?* Unpublished MBA thesis, University of Nottingham, pp61

¹⁸³ CABA Space (2003) *Lewisham Primary Care Trust Children and Young People's Centre: Design and innovation for primary health and social care*, CABA

Public spaces

7.28 In research carried out for CABE, 85 per cent of people surveyed felt that the quality of public space and the built environment has a direct impact on their lives, and on the way they feel. The research also highlighted the positive impact on the price of nearby residential property, of well-planned and well-managed public spaces¹⁸⁴.

7.29 In the towns of Emmen, Appeldoorn and Leiden in the Netherlands, it has been shown that a garden bordering water can increase the price of a house by 11 per cent, while a view of water or having a lake nearby can boost the price by 10 per cent, and 7 per cent respectively. A view of a park was shown to raise house prices by 8 per cent, and having a park nearby by 6 per cent. This compares with a view of an apartment block, which can reduce the price by 7 per cent¹⁸⁵.

7.30 In Berlin in 2000, proximity to playgrounds in residential areas was found to increase land values by up to 16 per cent. In the same study, a high number of street trees resulted in an increase of 17 per cent in land values¹⁸⁶. This positive impact on property values has been reflected in similar studies in Dallas, USA, where many residents cited the public green spaces running behind their property as a major factor and reason for living in a particular area. Sixty per cent of the residents believed that the value of their homes was at least 15 per cent higher because of the proximity of the green spaces to their properties¹⁸⁷.

7.31 It has not only been residential properties that benefit from being close to public spaces, it has been shown that retailers also benefit, as the public spaces attracted more people into the area by 40 per cent. In Coventry in England, improved pedestrianisation, a new civic square, clearer signage and better placement of street furniture, the introduction of CCTV and radio security schemes has made the city centre a much safer place to be. As a result, footfall in the town centre has risen by 25 per cent on Saturdays, benefiting local trade¹⁸⁸, as a result of improving the city centre and making the place feel more safe.

Operation

Education

7.32 Employee satisfaction and work performance in schools has improved retention, recruitment and performance of students. For almost all of us, schools are the first buildings we experience without the security of parental support. At best, well-designed schools should enhance our experience of learning, contribute to scholastic achievement, stimulate interest in the built environment, and discourage truancy and vandalism¹⁸⁹. Factors which contributed to

¹⁸⁴CABE (2002) *Streets of Shame*, Summary of findings from 'Public Attitudes to Architecture and the Built Environment', London, CABE

¹⁸⁵Luttik, J (2000) *The value of trees, water and open spaces as reflected by house prices in the Netherlands*, Landscape and Urban Planning, Vol. 48, pp161-167

¹⁸⁶ Luther, M. and Gruehn, D (2001) *Putting a price on urban green spaces*, Landscape Design, No. 303, pp23-25

¹⁸⁷ Peiser, R.B. and Schwann, G.M. (1993) *The private value of public open space with subdivisions*, Journal of Architectural and Planning Research, Vol. 10(2), pp 91-104

¹⁸⁸ DoE and The Association of Town Centre Management (1997) *Managing Urban Spaces in Town Centres – Good Practice Guide*, London, HMSO

¹⁸⁹ Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

increased academic performance were lighting levels, air quality and temperature and acoustics¹⁹⁰.

7.33 Jago and Tanner (1999) highlighted the use of colour in their study of reducing absenteeism and promotion of positive feeling about school amongst US students¹⁹¹. They found that colour affected student performances, and careful colour selection could generate greater motivation and energy levels. They also recommended at least 20% of wall space be devoted to windows to allow natural light into the classroom, as the lack of it will be detrimental on student performances¹⁹².

7.34 Other US studies have highlighted high student density as a major factor which effects pupil performance. For example, schools with more than 100 square feet of area per child tend to perform better than those schools with less¹⁹³. This is especially evident in special needs schools.

7.35 The majority of research into the correlation between building attributes and pupils' examination performances, and the effect of daylight on students' overall performance at school, has been conducted by US researchers. Heschong Mahone Group (1999) analysed the test score results of over 21,000 students from three school districts in California, US. It found that students with the most natural day lighting in their classrooms progressed 20 per cent faster on maths tests and 26 per cent on reading tests in one year than those with the least natural light¹⁹⁴. This has been the view supported by the American Architectural Foundation (2004)¹⁹⁵. They also stated that the lack of daylight and ventilation in the classroom dulls the senses needed for mental work, which makes concentration for students difficult. Teachers have identified that the effects of different lighting and acoustics of classrooms affect the performance and behaviour of pupils. Poor lighting particularly has a negative impact on pupils with sensory impairment¹⁹⁶.

7.36 Researchers have gone as far as suggesting that the colour of surroundings might have an impact on mood and behaviour in the classroom¹⁹⁷. Hamid and Newport (1989) suggested that pink coloured walls in pre-school would encourage a more positive mood in children¹⁹⁸. Maxwell (2000) found that children thought colour was important whilst parents and teachers

¹⁹⁰ Department of Education Training and Youth Affairs (no date) *Building Better Outcomes: The Impact of School Infrastructure on Student Outcomes and Behaviour*, Australia, Schooling Issues Digest; ; in Carmona, M. et al (no date) *A bibliography of design value for The Commission for Architecture and the Built Environment*, The Bartlett School of Planning, University College London; pp33

¹⁹¹ Jago, E., Tanner, K. (1999) *Influence of the School Facility on Student Achievement: School Building Age*, The University of Georgia, USA; in Carmona, M. et al (no date) *A bibliography of design value for The Commission for Architecture and the Built Environment*, The Bartlett School of Planning, University College London, pp34

¹⁹² Ibid

¹⁹³ CABA and RIBA (2004) *21st Century Schools: Learning Environments of the Future*, A Joint Initiative between CABA and RIBA

¹⁹⁴ Heschong Mahone Group (1999) *Daylighting in schools: an investigation into the relationship between daylighting and human performance*, California: California Board for Energy Efficiency Third Party Program

¹⁹⁵ Marberry, S. (2004) *Designing better buildings: What can be learned from Offices, Factories and Schools*, The Robert Wood Johnson Foundation

¹⁹⁶ Edge, M. et al (2003) *Mapping Survey of Non-Technical Research on the Social Value and Benefits of Good Architectural Design*, Scottish Executive

¹⁹⁷ Higgins, S., et al (2005) *The Impact of School Environments - A literature review*, Design Council

¹⁹⁸ Hamid, P.N. and Newport, A.G. (1989) *Effects of Colour on Physical Strength and Mood in Children*, Perceptual and Motor skills, 69, 179-185

were not concerned by the colour of the walls¹⁹⁹. A common complaint in the classroom is eye fatigue and in order to relieve this, Engelbrecht (2003) suggested using different colour walls behind the teacher²⁰⁰. This idea was also offered by Pile (1997)²⁰¹ and Brubaker (1998)²⁰².

7.37 There is also evidence²⁰³ that inadequate temperature control, air quality and acoustics had detrimental effects on concentration, mood, well-being, attendance and attainment of children in schools. This included Schneider's (2002)²⁰⁴ and Earthman's (2004)²⁰⁵ research that concluded that good acoustics are fundamental to good academic performance.

7.38 Research conducted for CABA (2000) found that the modern design of the building and size of the teaching rooms also had an effect on student retention and recruitment of students²⁰⁶. The report also noted that modern schools had to cope with more students, and more subjects are being taught. However, this has not been matched by an equivalent expansion in higher education estates²⁰⁷. This research suggested that smaller schools were better for children's learning, as they found more time and opportunities to participate in activities and develop socially.

7.39 European studies by Alt (2000)²⁰⁸ found that the integration of design and technology in French colleges can contribute towards a learning environment, which is conducive to improving student academic performance. For example, Baccalaureat achieved a success rate of 84% compared to the national average of 78%.

7.40 Price et al (2003)²⁰⁹ also found that cleanliness of the accommodation was important to a number of students, and the availability of quiet areas for study was also ranked as being an important factor.

Healthcare

7.41 Jonassen (1995) found that the noise levels, light, and air quality also contribute positively to hospital effectiveness²¹⁰. Carver (1990) claimed that this was caused by poorly

¹⁹⁹ Maxwell, L.E. (2000) *A Safe and Welcoming School: What students, teachers and parents think*, Journal of Architectural and Planning Research, 17, 4, 271-282

²⁰⁰ Engelbrecht, K. (2003) *The Impact of Colour on Learning*, available at www.merchandise-mart.com/neocon/NeoConConfPro/W305.pdf, accessed 30.11.04

²⁰¹ Pile, J.F. (1997) *Colour in Interior Design*, McGraw-Hill

²⁰² Brubaker, C.W. (1998) *Planning and Designing Schools*, McGraw-Hill

²⁰³ Ofsted 1999-2000 Annual Report; in Higgins, S., et al (2005) *The Impact of School Environments - A literature review*, Design Council

²⁰⁴ Schneider, M. (2002) *Linking School Facility Conditions to Teacher Satisfaction and Success*, www.edfacilities.org/pubs/teachersurvey.pdf, accessed 1.12.04

²⁰⁵ Earthman, G.I. (2004) *Prioritisation of 31 Criteria for School Building Adequacy*, www.aclumd.org/facilities_report.pdf, accessed 1.12.04

²⁰⁶ CABA (2005) *Design with Distinction: The Value of Good Building Design in Higher Education*, CABA

²⁰⁷ Ibid, pp16

²⁰⁸ Alt, P. (2000) *School Design and Management: Three Examples in France*, Administration et education, Issue 86; in Carmona, M. et al (no date) *A bibliography of design value for The Commission for Architecture and the Built Environment*, The Bartlett School of Planning, University College London, pp28

²⁰⁹ Price, I. et al (2003) *The Impact of Facilities on Student Choice of University Facilities*; in CABA (2005) *Design with Distinction: The Value of Good Building – Design in Higher Education*, CABA, pp21

²¹⁰ Jonassen, J. (1995) *Design Design Trends: New Directions for Health Facilities – A Value-driven View*, Journal of Healthcare Design, Volume 7, 1995, pp85-94

designed and over-crowded patient care areas. The lack of these manifests itself in the form of nurses' feelings of frustration leading to increased medical errors, staff dissatisfaction and negative attitudes, often taken out on patients and increased patient violence²¹¹. A literature review of 600 hospitals in the USA by Ulrich²¹² into the impact of design upon clinical outcomes showed that noise and its effect, sunlight, exterior views and ergonomics increased efficiency of the workforce in terms of delivering patient care and safety.

7.42 Studies by Scher & Senior (1999) highlighted the benefits of displaying visual art in hospitals to affect staff morale and patient care²¹³. This was an important consideration when designing the Chelsea and Westminster hospital in London.

7.43 In a study undertaken in the US²¹⁴, the economic impact of efficient design of hospitals has been measured in terms of cost savings in the reduction of staff turnover and reduction of patient stays of \$10.18 million per year. Other research undertaken by CABE (2003) supports these findings – 91% of nurses and 100% of Directors of Nursing believed that a well-designed environment has been related to patient recovery rates; 87% of nurses say that working in a well designed hospital would help them to do their job better; good design improves the service and patients perceive the service as being better²¹⁵. Mazurch (2001) found in his study that a clear plan with a natural progression from public to treatment rooms was necessary to avoid hospitals becoming disorienting places²¹⁶. The internal design of wards to allow for flexibility in use was an important contributor to nursing efficiency²¹⁷.

7.44 Brown et al (1997)²¹⁸ highlighted the importance of 'wayfinding'. 64 per cent of staff in one paediatric hospital said that wayfinding requests from visitors disrupted their work, with staff being interrupted up to 100 times a week for directions. Other research²¹⁹ has claimed that wayfinding issues have led to violence directed towards staff from confused and frustrated patients and visitors.

²¹¹ Carver, A. (1990) *Hospital Design and Working Conditions*, In Moran R et al (Eds), *Building for People in Hospitals: Workers and Consumers*, Ireland, European Foundation for the Improvement of Living and Working Conditions, pp85-92

²¹² Ulrich, R. et al (2004) *The Role of the Physical Environment in the Hospital of the 21st Century: A Once-in-a-Lifetime Opportunity*, report, Centre for Health Systems and Design, College of Architecture, Texas A&M University; in Eclipse Research Consultants (2005) *Better Designed Buildings: Improving the valuation of intangibles*, pp3

²¹³ Scher P & Senior P, (1999) *The Exeter Evaluation*, Manchester, Arts for Health, in *A bibliography of design value for The Commission for Architecture and the Built Environment*, The Bartlett School of Planning, University College London

²¹⁴ Parker, D. (1991) *A Better Building's Benefits*, Modern Healthcare

²¹⁵ CABE Space (2003) *Lewisham Primary Care Trust Children and Young People's Centre: Design and innovation for primary health and social care*, CABE

²¹⁶ Mazuch, 2001 Architect and Associate at RTKL Health Ltd, with extensive experience of healthcare design and knowledge of current theory and research

²¹⁷ Cortvriend, P. (2005) *The effect of the healthcare environment on patients and staff*, Paper for the European Health Management Association and European School of Oncology, England

²¹⁸ Brown, B. et al (1997) *A Post-Occupancy Evaluation of Wayfinding in a Pediatric Hospital: Research Findings and Implications for Instruction*, Journal of Architectural and Planning Research, Vol 14, no 1, Spring 1997

²¹⁹ Mazuch, 2001 Architect and Associate at RTKL Health Ltd, with extensive experience of healthcare design and knowledge of current theory and research

Residential properties

7.45 Greater use of energy efficient resources in residential homes would reduce operational costs in terms of lower energy bills with a knock-on effect of a reduction in the number of people and households in fuel and water poverty²²⁰.

Commercial buildings

7.46 A difference in productivity as high as 25%, has been reported between comfortable and uncomfortable staff. People cannot work at their best if they are distracted by not being able to breathe, hear and see properly. The most important factors in achieving health and comfort are air quality, overall comfort, noise and temperature²²¹. In a US study examining the link between improved air quality and productivity, it was concluded that the increase that resulted from directly improving air quality could be as much as \$55 billion per annum²²² from an initial investment of \$120 billion cost of bringing the indoor air quality of all commercial buildings in the US up to accepted indoor air quality practices.

7.47 The design of the office building has been shown to play a very significant part in improving job satisfaction. This satisfaction impacts primarily on the performance and efficiency of the workforce by affecting their work and psychological well-being. The causes of these impacts are through comfort of the workforce in terms of furniture, temperature and design of the office environment, quality of lighting and air.

7.48 Dyson Research and Appliances Headquarters in Malmesbury is an example of how flexibility of use has improved the efficiency of the organisation²²³. The organisation was able to build in flexibility of the space allowing the organisation to combine research, development, manufacturing, distribution and management functions in a number of different ways.

7.49 The ability to increase creativity from staff, enhanced business performance, improved staff recruitment and retention has left many companies to adopt 'extreme spaces' to stimulate ideas and provoke an attitude shift towards office space.

7.50 A more casual and open working environment engenders communication, collaboration and idea generation. Vanson and Bourne (2005) research demonstrated how the design of the workplace can help stimulate creativity and the ability to attract and retain the best staff, and improve organisational agility²²⁴. However, other research has showed that a balance needs to be achieved in the way the space is arranged. The challenge has been in the finding of a balance between communication and concentration, responding to the needs of the company and the individual.

²²⁰ Horton, B. (2005) *Sustainable Homes - the financial and environmental benefits - Summary and full report*, Environment Agency

²²¹ Based on original research by DEGW, the centre for Building Performance and Diagnostics at Carnegie Mellon University and Arup, CABA, 2005

²²² Dorgan and Dorgan (1997) in Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

²²³ Rouse, J.M. (2000) *How do profit generating organisations measure and manage the costs and benefits of architecture and design when investing in properties for their own business use?* Unpublished MBA thesis, University of Nottingham

²²⁴ Gensler, Architect of Ideas (2005) *These Four Walls: The Real British Office*, pp20-23

7.51 Numerous studies have shown the relative importance to users of lighting, temperature and air quality control. The MOD Abbey Wood case study demonstrated how a company used an intelligent lighting control system which identified the amount of daylight entering the room. Artificial light from the luminaries, then supplement the natural light, without the need for light switches. The cost for the installation was £225,000 and the operational costs measured over the first two years of full use yielded a saving of £156,000 per year in energy costs²²⁵.

7.52 Vandell and Lane (1989) examined over 100 office buildings and found positive correlation between design quality and market rents, and took tentative steps towards establishing a grading system for design dividend that could be identified and to a limited extent measured in financial terms²²⁶.

Character

Commercial buildings

7.53 Prestige and image were important factors for occupiers, particularly those with clients visiting their offices. Occupiers at Brindleyplace, Barbirolli Square and Castle Wharf in the UK, rated their developments highly and were proud to invite clients to their offices, and believed that the environment around the building contributed to the image clients had of the company²²⁷. It has been claimed that developments such as these have helped to create jobs, although there have been counter arguments that these new jobs may be in fact be relocations rather than new jobs. But, all the examples provided not only commercial benefits but led to the development of a retail sector and leisure industry in the surrounding areas.

It's all about the regeneration of the local area and restoring people's pride in their community. The kinds of services on offer at the centre are a lifeline to many members of the local community.

Cathy Jones, Summerfield Centre in Winson Green, Birmingham²²⁸

Public space

7.54 Queen Square in Bristol, UK, has been a case in point on how the restoration of a public space can have an economic impact on its surrounding area. Completed in 1727, the Square represented the affluence of the merchants and the city of Bristol. In 1936, city planners decided to build a dual carriageway, known as Redcliffe Way, diagonally from one corner of the square to the other as part of a new inner relief road. By 1990, around one third of the office space was vacant, and the Queen Square was in disrepair. Today, supported by a regeneration grant by English Heritage, the square has been restored to its 19th Century former character, as a quiet, restful place. Access to the square, seating and lighting were improved and a comprehensive 10-year maintenance regime introduced. A programme of varied events was developed to promote the square as a major civic space. The area has become popular with residents and businesses with properties facing onto the square

²²⁵ Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

²²⁶ Ibid

²²⁷ Bartlett School of Planning commissioned by CABE and DETR (2001) *The Value of Urban Design*, CABE, pp 68

²²⁸ Heritage Lottery Fund (2002) *New Life - Heritage and Regeneration*, Heritage Lottery Fund, pp 42

commanding a 16 per cent premium over identical properties located elsewhere in Bristol. However, this has the negative affect of forcing current residents out of the area. Increased property values have not filtered through to adjacent streets to the square. This could be because of the enclosed nature of Queen Square²²⁹.

Continuity and enclosure

Public space

7.55 Mesnes Park in St Helens, UK, opened in 1926 and was a source of local civic pride. When the borough hit hard times, the parks and green spaces fell into disrepair. Fear of crime cast an intimidating shadow over Mesnes Park, which had been known to the local population as ‘Smack Park’. Through regeneration funding, the park was extended from 5 to 8.5 hectares as new woodlands and a wildflower meadow were added and a footpath network was re-established to offer public footpaths and views over the whole park. The impact of the redevelopment has been to re-establish the use of the park with an increase in people using the park from 15,000 to 180,000 people.

7.56 The case studies²³⁰ showed that there was a positive relationship between increased residential property prices, where the property overlooked or was in close proximity to a high quality park. This link is not in isolation, but varied according to the type of park; the layout of property; the nature of the location; to some extent the nature of the local population and the type of property involved²³¹.

Diversity

Commercial buildings

7.57 Arlington Securities has built an £800 million business park portfolio around the concept of locating business premises in high quality green spaces. It consistently devoted 30 per cent of its sites to communal parkland. The company has seen its rental income almost quadruple to £38 million within four years to the end of 2002 with more companies moving out of city centres. In addition, tenants are happy to pay a charge to cover the costs of servicing buildings, plots and communal spaces²³².

7.58 What the literature does not show is a definitive answer to the debate over the design impact of open plan or private space. Vanson Bourne (2005) highlighted the benefits of having a combination of both private offices and team working spaces, where staff can choose the buzz or stimulation they need to work at their best²³³. The debate surrounded the increase or decrease of communication, with some saying that there was an increase due to the lack of barriers and walls, and others saying it reduced the lack of privacy and distractions.

²²⁹ FPD Savilles, Michael Evamy, SQW Consultants (2005) *Does Money Grow on Trees?*, pp 26-31

²³⁰ Ibid

²³¹ Ibid, pp84

²³² Ibid, pp77

²³³ Gensler, Architect of Ideas (2005) *These Four Walls: The Real British Office*, pp20-23

Public Space

7.59 Canary Wharf's Jubilee Park, London, UK has been instrumental in turning perceptions of the area around it into a location actively sought out by corporate employers and office workers²³⁴. The park has been designed to disguise the crossfall of land and conceal the station and retail mall beneath. It has also been designed to allow workers from their office buildings to look down into the park. The park has also become a destination place for local workers, visitors and residents, as a place to relax, increasing the park's usage from 2,000 to 20,000. The area has also stayed open until 1am, allowing people to enjoy the local bars and restaurants. At roughly £55 per square foot, the cost of creating the park can be offset with the increased interest of companies wanting to relocate to Canary Wharf, such as legal practices, Allen & Overy and Clifford Chance²³⁵.

7.60 Examples of public places that provide a varied environment offering a range of uses and experiences are Castle Wharf (Nottingham, UK), Brindleyplace (Birmingham, UK), and Barbirolli Square (Manchester, UK). All these developments provide a mixed use environment, with offices, restaurants, shops, leisure and a good range of activities and a mix of public and private spaces. These developments have created vibrant areas offering a pleasant and attractive environment for workers, residents and visitors. At Brindleyplace and Barbirolli Square, the design of the surrounding environment was directly credited with increasing the productivity of the workforce, in large part due to the happier work environment created. At Castle Wharf, two commercial occupiers had surveyed their workforce and found that health and satisfaction was better, absenteeism and staff turnover less and productivity higher²³⁶.

7.61 Restoration of national heritage sites has been a major contributor to the regeneration of the Jewellery Quarter in Birmingham, UK. It helped to sustain and create jobs in the local community and converted a once derelict area into a thriving centre for the manufacture and retail of jewellery, with 6,000 people employed by 1,500 businesses²³⁷.

7.62 The regeneration of Bryant Park, New York resulted in increased use of the park and perceived increase in the quality of life in the area; the regeneration project is now a model for other urban public regeneration schemes and illustrates the value of good design and the benefits of focusing on user needs²³⁸. The adverse affect of regeneration tends to be the increase in market and property development which increases property prices and drives out local communities, and overcrowding, parking problems and general reduction in quality of living²³⁹. A prevailing element of regenerated areas has been the creation of mixed use developments for business and leisure which tends to regenerate adjacent sites.

7.63 Research has shown that the marketability and value of residential and commercial property has increased where the development had green space in the adjoining area or

²³⁴ FPD Savilles, Michael Evamy, SQW Consultants (2005) *Does Money Grow on Trees?*, pp70

²³⁵ Ibid, pp72

²³⁶ Bartlett School of Planning commissioned by CABE and DETR (2001) *The Value of Urban Design*, CABE

²³⁷ English Heritage (2005) *Regeneration and the Historic Environment - Heritage as a catalyst for better social and economic regeneration*, English Heritage

²³⁸ Hardy Holzman Pfeiffer Associates (1998) *Bryant Park, New York City*, Places, Vol 12, No 1, Fall 1998, pp10-15

²³⁹ The Hyde Commission (2003) in CABE (2005) *Better Neighbourhoods: Making Higher Densities work*, CABE

nearby. A well known example is Birkenhead Park in Merseyside, UK, where the renovation of the public park has been a catalyst for investment²⁴⁰. More recently, a research study by Greater London Authority in the UK, found that a 1% increase of green space led to an average house price increase of between 0.3-0.5% within one London (UK) ward²⁴¹. Similar research in Netherlands²⁴² and Germany²⁴³, highlighted positive impacts on property prices where the garden bordered water, or had a view of water, or by or near a park. On the other hand, property prices suffered if the view was obscured by an apartment block.

7.64 A good example of the usage of public spaces has been the annual New Year's Eve 'First Night' festival in Boston, US, which has been seen as a major boost for the city's artistic and local community²⁴⁴. It has become an opportunity for communities to come together and local businesses to prosper economically during organised festivals and social activities.

Ease of movement

Healthcare

7.65 In a paper by Penny Cortvriend, Lecturer in Healthcare and Public Sector Management, University of Manchester, she stated that the environment can have a significant impact on staff, through increased stress levels, increased risk of error, and affect recruitment, retention and absence or sickness. Factors influencing recruitment of hospital staff are location, car parking and transport links, family-friendly facilities and ward/patient area workplaces. Cortvriend (2005) also found that open nursing stations result in staff spending more contact time with patients and being able to observe patients easily²⁴⁵.

7.66 Social spaces introduced into some hospitals in the US, including education rooms, community rooms, and staff interaction rooms, have made staff feel that good design has helped them perform their jobs better²⁴⁶.

Residential properties

7.67 There has been strong evidence that households in car-dependent neighbourhoods devoted significantly more of their budgets to transportation than households in

²⁴⁰ Dr Katie Williams and Dr Stephen Green (2001) *Literature review of Public Space and Local Environments for the Cross Cutting Review*, DTLR, Oxford Brookes University

²⁴¹ FPD Savilles, Michael Evamy, SQW Consultants (2005) *Does Money Grow on Trees?*

²⁴² Luttik, J. (2000) *The Value of trees, water and open spaces as reflected by house prices in the Netherlands*, Landscape and Urban Planning, Vol 48, pp161-167; in CABE (2003) *The Value of Public Space - How high quality parks and public spaces create economic, social and environmental value*, CABE

²⁴³ Luther, M (2001) *Putting a price on urban green spaces*, Landscape Design, No 303, pp23-25; in CABE (2003) *The Value of Public Space - How high quality parks and public spaces create economic, social and environmental value*, CABE

²⁴⁴ Schuster (1995) *Two urban festivals: La Merce and First Night: Planning Practice and Research*, Vol. 10(2), pp173-187; in CABE (no date) *The Value of Public Space: How high quality parks and public spaces create economic, social and environmental value*, CABE

²⁴⁵ Cortvriend, P. (2005) *The effect of the healthcare environment on patients and staff*, Paper for the European Health Management Association and European School of Oncology, England

²⁴⁶ Kantrowitz, M. et al (1993) *Design Evaluation of Six Primary Care Facilities for the Purpose of Informing Future Design Decisions*, Martinez, CA., The Centre for Health Design, Inc.

neighbourhoods with more accessible land-use and multi-modal transportation systems²⁴⁷. This would mean a reduction in the necessity to own or use a car.

7.68 Crane and Schweitzer (2003) identified in their study that mixed use areas contributed to better employment opportunities for low-income earners, providing employment closer to where people lived, therefore revitalising an entire low-income community²⁴⁸.

Commercial buildings

7.69 The accessibility to a transportation network was chosen by 84 per cent of respondents as a major factor in locating a business in an area²⁴⁹. Occupiers at the Waterfront development in Dudley, UK, were significantly less happy about their work environment, as the development had poor connections with the surrounding area - limited amenities and the impossibility of walking to work were seen as distinct disadvantages²⁵⁰.

7.70 Additional factors which have been cited include having state-of-art workstations and staff amenities²⁵¹, including access to sporting facilities, places to get food and eat, and breakout areas. For example, British Airways' new headquarters at Waterside near Heathrow, UK, gave a lot of consideration to the environment and working atmosphere from a social perspective²⁵² in the initial design of their new offices. The building has been constructed on three floors overlooking their own courtyards with each street providing many amenities and informal spaces including cafés and supermarkets.

Public space

7.71 Pretty (2003) introduced the term 'green exercise' in his study of the importance of nature in the urban environment where many people expressed that green space made them feel relaxed and reduced stress levels²⁵³. This equated to a £500 million a year saving on behalf of the NHS²⁵⁴. This saving has been directly attributed to encouraging people to use green spaces for leisure and exercise, resulting in a healthier population.

7.72 Iconic green spaces such as Royal Parks in London, UK, the Domain in Auckland, New Zealand, or Central Park in New York, US, are clearly valuable in a local sense. But urban design that incorporates significant swathes of green space can have the effect of lowering densities and causing leapfrog developments in new peripheral suburbs²⁵⁵.

²⁴⁷ McIndoe, G. et al (2005) *The Value of Urban Design - the economic, environmental and social benefits of urban design*, Ministry for the Environment, New Zealand

²⁴⁸ Ibid

²⁴⁹ Worpole, K. (2000) *The Value of Architecture - Design, Economy and the Architectural Imagination*, RIBA Future Studies

²⁵⁰ Bartlett School of Planning commissioned by CABE and DETR (2001) *The Value of Urban Design*, CABE, pp 66

²⁵¹ Gensler, Architect of Ideas (2005) *These Four Walls: The Real British Office*, pp20-23

²⁵² Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

²⁵³ Pretty, J. et al (2003), *Green Exercise: contemporary roles of nature, exercise and diet in physical and emotional well-being and implications for public health policy*, CES Occasional Paper 2003-1, University of Essex

²⁵⁴ Jochelson, K. (2004) *The Public Health Impact of Cities and Urban Planning*, London Development Agency

²⁵⁵ McIndoe, G. et al (2005) *The Value of Urban Design - the economic, environmental and social benefits of urban design*, Ministry for the Environment, New Zealand

7.73 Klaasen and Jacobs (1999) claimed that the economic value of land due to improved accessibility is influenced by the relative location of various activities, and better connections²⁵⁶. This has been a view reflected by Landry (2004) who demonstrated that land on the peripheral or city fringe becomes premium location because of the congestion suffered by some city centres especially for distribution-type businesses which places great importance to accessibility²⁵⁷.

Quality of public realm

7.74 Businesses have a direct stake in the quality of the public environment, in terms of sponsoring civic spaces, making use of public art and enhancing the surrounding area where their businesses exist²⁵⁸. This literature review highlights the need to provide a safe, attractive and functional public space. It has been estimated that the cost of £1.8 billion has been spent on crime prevention and £120 million for fire services on public housing that has been considered unfit for habitation²⁵⁹. Development of good quality green spaces, therefore, promote a favourable image of an area and encourage regeneration and new residents to move in²⁶⁰.

Process

7.75 It has been evident from the literature reviewed, the importance of end user consultation in the design stage of the building or public space. In the design of parks and public places, for example, where vandalism and anti-social behaviour have been common, evidence has suggested that involvement of offenders in the design of the space, helped to curtail negative behaviour in the future. This involvement in the design process helped to instil a sense of ownership and pride in the local community and led to reduced crime rates in the area.

7.76 This involvement in the design process has seen rewards in schools. The involvement of pupils in creating an attractive physical environment and generally encouraging them and their parents to actively participate in school life has a positive impact on school attendance levels and makes vandalism much less likely to occur²⁶¹.

²⁵⁶ Ibid

²⁵⁷ Landry (2004) pp29; in McIndoe, G. et al (2005) *The Value of Urban Design - the economic, environmental and social benefits of urban design*, Ministry for the Environment, New Zealand

²⁵⁸ Hagelskamp, 2003

²⁵⁹ Jochelson, K. (2004) *The Public Health Impact of Cities and Urban Planning*, London Development Agency

²⁶⁰ FPD Savilles, Michael Evamy, SQW Consultants (2005) *Does Money Grow on Trees?*

²⁶¹ Clark, H (No date) *Makeover @ School: Review of Literature*, SENJIT (Special Educational Needs Joint Initiative for Training; in *A bibliography of design value for The Commission for Architecture and the Built Environment*, The Bartlett School of Planning, University College London, pp32

SECTION 8: ENVIRONMENTAL

Vision and Character

“Headquarter environments play a key role in the attraction and retention of staff and the planned development at Gogarburn will create a world class environment with leisure, crèche/nursery facilities as well as a new training centre within a sensitively landscaped environment”. Fred Goodwin, Group Chief Executive, RBS²⁶²

8.1 The Royal Bank of Scotland headquarters covers a 78 acre site in Gogarburn, near Edinburgh, Scotland. A full environmental impact assessment was undertaken by the Bank and submitted with its planning application. The development was designed to minimise the impact on the natural environment. It was landscaped and habitat strategies employed to develop the local woodland. The new development includes new access routes and a range of private bus services to all of the major public transport links with Edinburgh city centre, Fife and the Western Coast of Scotland, therefore minimising the impact of increased traffic congestion on the A8 road. A car-sharing scheme was introduced to reduce traffic generation further. The design of the building features a displacement ventilation system, providing fresh air to the workforce, and extensive heat reclamation, grey water recycling and sustainable urban drainage systems. The project has been designed, in accordance with the Bank’s environmental policy, to address issues of sustainability and energy efficiency.

Buildability

Education

8.2 In the UK there has been a legacy of Victorian school buildings, which have been designed for classrooms designed for ‘chalk and talk’ and teaching areas which account for a high proportion of floor space. Primary schools are typically lofty single-storied structures with tall windows allowing natural light into the classroom. Constructed to be durable and airy, they offer energy efficient buildings²⁶³. However, these buildings do not offer the flexibility of use required in modern day teaching where additional space is required.

8.3 The ability to allow natural light into the classroom has been incorporated into the design of the primary school at Perthcelyn in the Rhonda Valley in South Wales where all the classrooms face east²⁶⁴. Other schools used shading to south-facing windows to shield students from glare.

8.4 However, these good design features do not seem to have transferred into the secondary school sector. This has been partly because of the size of the building needed to cater for the number of students, and the variety of subjects taught. At the City Technology Colleges in Bristol, UK, one of the most noticeable aspects of the building design has been the way natural light pervades the majority of spaces, including the main hall and sports hall²⁶⁵. The building has retractable external blinds to reduce both heat gain and glare. The college is also

²⁶² www.edinburgharchitecture.co.uk

²⁶³ Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press, pp88

²⁶⁴ Ibid, pp93

²⁶⁵ Ibid, pp96

a good example of street pattern²⁶⁶ where the key objective of the design was to provide a main internal corridor with secondary circulation leading off into departments and other areas.

Healthcare

8.5 In 2003, CABE published *Creating Excellent Buildings*²⁶⁷ a step-by-step manual that considered the client's role under four procurement stages: prepare, design, construct and use. The case study of *Lewisham Children's and Young People's Centre* in London, UK, is an example of how a design competition can deliver a great building. In all the designs, generous amounts of natural light and ventilation were incorporated to enable good energy efficiency, as well as providing a comfortable and therapeutic environment. This has improved the external feel of the building, and provided views out and aided navigation within. For example, architects proposed photovoltaic cells on the roof to generate about a third of the building's electricity requirements, while the large roof expanse was designed to collect rainwater for irrigation, water features and toilet flushing. Large atria allow for natural ventilation and light. Another design uses a waterfall running through the middle of the building to obtain a sense of openness, light and space²⁶⁸.

Residential properties

8.6 The Building Research Establishment's Environmental Assessment Method (BREEAM) has been established to ensure that a number of environmental and resource efficiency standards are used in constructing new homes in the UK. New homes are given a BREEAM rating based on impacts on energy and water use, transport, pollution, materials, land use and ecology, and health and well-being²⁶⁹. Meeting these aspirational targets means that the introduction of recycled/recovered materials, further behavioural change, waste minimisation and separation of wastes, are a prerequisite.

8.7 A project in the Black Country, UK, found that reducing carbon emissions by specifying materials and fittings of a higher quality led to an additional cost of a few hundred pounds (BRE, 2003b)²⁷⁰. The estimated cost of specifying low energy light fittings was £100 per unit. The Environment Agency has demonstrated that there are financial costs and benefits to residents of resource efficiency. They found that these savings to residents through reduced utility bills amounted to approximately £138 a year at a cost of £800 per home²⁷¹. The environmental case to building more sustainable homes is clear with 30 per cent of the UK's total energy use and 27 per cent of UK carbon dioxide emissions coming from households.

²⁶⁶ DfES (2002) *Schools for the Future – Designs for Learning Communities*, Building Bulletin 95, London: DfES

²⁶⁷ CABE (2003) *Creating Excellent Buildings*, CABE

²⁶⁸ CABE Space (2003) *Lewisham Primary Care Trust Children and Young People's Centre: Design and innovation for primary health and social care*, CABE, pp7

²⁶⁹ Horton, B. (2005) *Sustainable Homes - the financial and environmental benefits - Summary and full report*, Environment Agency

²⁷⁰ Ibid

²⁷¹ Ibid

8.8 Several research studies have identified the following environmental impacts of urban sprawl and the transfer of people and resources from the inner city and inner-ring suburbs to regenerated sites on the city's outskirts:

- Decreased aesthetic appeal of landscape (Burchell et al, 1998)²⁷²
- Increased risk of flooding (Adelmann, 1998, The Pennsylvania 21st Century Environment Commission, 1999)²⁷³ as more new housing developments have been built near marshland and trees have been cleared removing natural drainage.
- Ecosystem fragmentation (Margules and Meyes, 1992)²⁷⁴
- Toxic and hazardous wastes from abandoned brownfields and landfills (Down, 1994)
- Toxins such as lead and asbestos persisting in older buildings because of disinvestment in inner cities (Bryant, 1995)²⁷⁵

8.9 Trees and shrubs also reduce overall energy use in buildings. The amount of energy saved depends on the building type, choice of tree species, positioning around the building and the prevailing climate. For example, by planting deciduous trees on the west side of an exposed building, beneficial impacts would include protection from wind and cooling from shading from the trees, for example. Savings on energy costs by the careful planting of trees can, for a conventional house over a one year period, be as much as 25 per cent²⁷⁶.

8.10 Other research has identified the planting of trees as being good interceptors of solar reflection and radiation from buildings and streets. The cooling effect of an isolated mature tree transpiring 450 litres per day from its leaves has been estimated to be equivalent to 5 average size room air conditioners running 20 hours per day²⁷⁷. Another environmental benefit of planting trees is improved air quality. Trees have been found to reduce airborne particulate matter by as much as 75 per cent²⁷⁸ and produce oxygen during photosynthesis. For example, a 24m tall beech tree with a crown diameter of 15m has been shown to produce enough oxygen for 10 people to breath²⁷⁹.

8.11 There is also an argument being posed in the research review that demolition of old buildings uses more energy than refurbishing it. Demolition and construction accounts for 24 per cent of the total annual waste produced in the UK²⁸⁰. In *Built to Last – The Sustainable*

²⁷² Burchell, R.W. et al (1998) *The Costs of Sprawl – Revisited*, Transportation Research Board Report 39, National Academy Press, Washington DC

²⁷³ Adelmann G.W. (1998) *Reworking the landscape, Chicago style*, The Hastings Centre Report, 28(6) pp6-11

²⁷⁴ Margules, C.R and Meyers, J.A. (1992) *Biological diversity and ecosystem fragmentation – an Australian perspective*, *Ekistics* 59(357) pp 293 - 300

²⁷⁵ Bryant, B. (1995) *Issues and potential policies and solutions for environmental justice: an overview*, in *Environmental Justice: Issues, Policies, and Solutions*, Island Press, Washington DC, pp 8-34

²⁷⁶ Heisler, G.M. (1985), *Energy Saving With Trees*, *Journal of Arboriculture* 12(5), pp 113-125

²⁷⁷ Pitt, D. et al (1979) *Trees in the City*. In *Nature in Cities*, John Wiley & Sons, Chichester, pp 205-230

²⁷⁸ Pitt, D. et al (1979) *Trees in the City*. In *Nature in Cities*, John Wiley & Sons, Chichester, pp 205-230

²⁷⁹ Brookes, J. and Thompson, M. (1984) *Designing with Plants 2: The Function of Plants*, *Architects Journal*, 2 May 1984

²⁸⁰ *Heritage Counts - State of the Historic Environment Reports 2002 – 2004*, English Heritage

Reuse of Buildings (The Heritage Council, 2004)²⁸¹, the research found that the costs of maintaining and occupying a Victorian terraced house, when considered over a 100-year period, are almost 30 per cent cheaper than those of a house built in the 1980's. Similarly a study carried out in Ireland showed that a refurbished existing building performs better in environmental terms than a hypothetical newly constructed building on the same site²⁸².

Commercial buildings

8.12 In the case of the MOD Abbey Wood, the environmental green agenda has been achieved through displacement ventilation facilities which operated in 'mixed mode' and with 'heat recovery', a cooling and dehumidification of system supply air when needed in high summer, and active static cooling by chilled panels where necessary to offset heat from user equipment²⁸³. The windows have glare control using inter-pane blinds, and the heating is adjustable depending on outside temperature and internal heat radiation from users and equipment.

8.13 A study conducted by Environment Canada in Toronto (2002) estimated that urban temperatures could dip by 1 to 2 degrees centigrade if just 6 per cent of the city's rooftops were green²⁸⁴. The benefits associated with having green roofs include reducing air humidity, helping in cleansing of the air and water, and processing of rainwater back into the atmosphere. Green roofs in Europe have been found to have lasted between 40 and 75 years. Common theory holds that roof life can be at least doubled or tripled because the multiple layers protect waterproofing membrane and structural elements from damaging ultraviolet rays, wind and temperature fluctuation extremes²⁸⁵.

8.14 Singapore has gone further to stem future increases in energy costs and environmental taxation by reducing both the energy consumption and the environmental impact of a building. Energy taxes have already been introduced, where tax was imposed on the thermal conductivity of the building. This tax represents a significant proportion of the occupancy costs²⁸⁶.

8.15 From the outset, the Barbirolli Square development in Manchester, UK, was constructed to be energy efficient, through the provision of low-emissivity glass and bicycle storage²⁸⁷.

Public spaces

8.16 The affect of urban sprawl has an impact on local wildlife habitats with new housing estates being built on open spaces and city centre fringes. In order to replace these habitats, building designs should include green spaces, parks or gardens to assist wildlife conservation. For example, green roofs in London, UK, provide foraging habitat for the black redstart, a

²⁸¹ The Heritage Council (2004) *Built to Last – The Sustainable Reuse of Buildings*, Dublin City

²⁸² *Heritage Counts - State of the Historic Environment Reports 2002 – 2004*, English Heritage

²⁸³ Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

²⁸⁴ Environment Canada (2002), National Research Council, Canada

²⁸⁵ Heritage Lottery Fund (2002) *New Life - Heritage and Regeneration*, Heritage Lottery Fund

²⁸⁶ Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

²⁸⁷ Bartlett School of Planning commissioned by CABI and DETR (2001) *The Value of Urban Design*, CABI, pp 66

rare species of bird²⁸⁸. Studies have shown that birds would travel up to 19 stories of a building in search of food and habitat, therefore, encouraging biodiversity in an urban area²⁸⁹.

Context

Residential properties

8.17 One of the major consequences of urban sprawl and property prices is the necessity of people who have moved to new out of town developments to travel out of the areas in which they work. The main mode of transport used tends to be the car. An increase of more than 250 per cent has been experienced from 1960 through to 1997²⁹⁰. A similar study in the US has shown that the average American driver spends 443 hours each year behind the wheel²⁹¹. This increase in driving time results in an increase in air pollution and in the incidence of respiratory diseases. Research presented on the impact of automobiles and the transportation sector on human health was made at the Third Ministerial Conference on Environment and Health held in London in 1999. It was stated that approximately 36,000 to 129,000 adult deaths a year could be attributed to long-term exposure to air pollution generated by traffic in European cities²⁹². Also at the conference, the results of research from Austria, France and Switzerland were presented. These studies found that air pollution caused 6 per cent of total mortality in the three countries, more than 40,000 deaths per year.

Commercial buildings

8.18 The Brindley Place development in Birmingham, UK, demonstrates how good connectivity, transport links and mixed use correlated with successful inward investment, social and economic outcomes and sustainable regeneration²⁹³.

8.19 Pfizer's new headquarters in Walton Oaks, Surrey, UK, has been widely regarded as a model of good relocation practice, achieving a green campus objective. It is environmentally conscious, with staff being awarded a cash incentive for leaving their cars at home²⁹⁴.

8.20 The MOD Abbey Wood case study²⁹⁵, has an important feature to consider when looking at the performance of the building in terms of travel to work emissions. Travel to work emissions represent a significant proportion of total UK emissions and cutting them is of equal importance, especially as present trends show them to be increasing. This is a constant theme throughout the research where a company relocated to Greenfield site outside of major city centre increasing the use of the car to get to work.

²⁸⁸ White Young Green Environmental Limited (2004) *Design for Biodiversity: A guidance document for development in London*, London Development Agency

²⁸⁹ Heritage Lottery Fund (2002) *New Life - Heritage and Regeneration*, Heritage Lottery Fund

²⁹⁰ Department of Transportation (US), Bureau of Transportation Statistics (No Date) *Journey-to-work trends in the United States and its major metropolitan areas, 1960-1990*

²⁹¹ Pope, C. (1999) *Solving sprawl*, The Sierra Club rates the states

²⁹² World Health Organisation, European Region (1999) *Third ministerial conference on environment and health*, London

²⁹³ Camona, M. (2004) *Adding value through better urban design*, in Macmillan, S, (2004), *Designing Better Buildings: quality and value in the built environment*, Spon Press, London. See also CABE, 2001, *The value of urban design*, Thomas Telford, London

²⁹⁴ Marberry, S. (2004) *Designing better buildings: What can be learned from Offices, Factories and Schools*, The Robert Wood Johnson Foundation, pp6

²⁹⁵ Macmillan, S. (2003) *Designing Better Buildings - Quality and Value In The Built Environment*, Spon Press

8.21 Travel to work also impacts on the quality of life and personal productivity. On average, we spend between 8 and 10 per cent of our lives on getting to work, making it a doubly important concern of a building's ancillary performance in meeting its users' needs.

8.22 The BP Sunbury buildings demonstrate how a company can contribute towards reducing carbon emissions in the environment through affecting transport patterns. A BP-sponsored bus route with a service from local rail station has resulted in a 5 per cent cut in travel to work emissions²⁹⁶. The company has gone further by introducing BP HIVES (Highly Interactive Visual Environment Suites) video conferencing units, saving 125 air miles per person per year. Productivity was found to increase by more than 5 per cent; carbon dioxide emissions have been cut by 80 per cent, and energy costs have gone down by more than \$2.74 million per year. The implementation of the HIVE has led to a reduction in climate change emissions of the building in operation. These can be quantified in terms of the building's progress towards achieving a climate or carbon neutral status, which required at least a 60 per cent cut from today's emissions.

Public spaces

8.23 The benefits of green spaces have been summarised in a literature review undertaken by Swanwick et al (2001)²⁹⁷. In the research, Swanwick (2001) found that green space contributed to several environmental impacts, such as, air quality by 17 per cent, climate amelioration by reducing the negative effects that close buildings have on wind and heat anomalies in urban areas, habitat and biodiversity gains, water management, and reduction in noise levels. The findings are inconclusive but supported by other research in this area²⁹⁸.

8.24 In 1995, a study²⁹⁹ of mobility within the city of Hasselt in Limburg, Belgium, identified the need to ease traffic congestion. Instead of building a new ring road, the mayor decided to restore an existing inner ring road to a boulevard. The city centre population had declined over time and there was a high instance of road traffic accidents in the area. The restoration of the Green Boulevard would rejuvenate the area and attract people back into the city centre. The sustainable Mobility Plan was devised to reduce the need for car dependency in the city centre. This has led to investment in a regular and reliable bus service, which is free of charge. The fare-free service allows bus drivers to focus on customer care rather than on the collection of fares. Passenger numbers have increased 10-fold.

8.25 The Green Boulevard initiative, provided commuters with an alternative means to get to work, with improved pedestrian and cycle routes. The city ranks among the highest for car ownership, but the lowest use, with 16 per cent of former car owners taking the bus. In environmental terms, there was no loss of natural habitat to make way for the new road, and pollution was reduced due to the reduced traffic. More green space was made available and 400 trees were planted enhancing the air quality of the city. Around 800 low-cost underground parking spaces were built and street parking costs remained high to deter car

²⁹⁶ Ibid, pp84

²⁹⁷ Swanwick, C. et al (2001) *Improving Urban Parks, Play Areas and Green Spaces: Interim Report on Literature Review*, Unpublished, Department of Landscape, University of Sheffield

²⁹⁸ Dr Katie Williams and Dr Stephen Green (2001) *Literature review of Public Space and Local Environments for the Cross Cutting Review*, DTLR, Oxford Brookes University

²⁹⁹ SUST.org.uk (no date) *The Green Boulevard Hasselt, Belgium Case Study*, SUST. The Lighthouse on sustainability

users from driving into the city centre. Hasselt, Belgium, has seen an increase in the number of people wanting to move back into the city centre, rejuvenating the once run down area.

8.26 This case study highlighted both economic and environmental impacts of restoring existing roads, instead building new roads to alleviate congestion.

Continuity and enclosure

Residential properties

8.27 A study in Brisbane, Australia, compared street vitality and travel behaviour in gated and non-gated communities. It revealed that those living outside gated communities travel around them rather than through them, increasing their journey times and increasing the number of cars on the road³⁰⁰.

Diversity

8.28 There is a current debate about where new housing should be built – Brownfield or Greenfield sites. It has been asserted that Brownfield sites offer many opportunities for wildlife in the city. For example, at Clifton Backies in York, UK, there is a 12-hectare stretch of scrubby woodland with clearings, which contains a diversity of flowers, birds and other wildlife. This area of land is high-valued by the local community³⁰¹.

8.29 In recent years, over 1,500 species of flowering plant and 300 types of bird have been spotted in London's parks and green spaces. This has impacted on the urban environment by sustaining biodiversity and reducing the amount of surface water run-off, moderated air temperature and offset harmful emissions³⁰².

8.30 Research in Tel Aviv, Israel, similarly points to the benefits of trees. It was shown that the presence of trees results in a cooling of the air temperature of between 1°C, in a heavily trafficked street, to 4°C in the smallest garden. The study also found that the shape of the green area has an impact on cooling, and that the cooling effect can be felt up to 100 metres from the site³⁰³. This has been supported by Swedish research that found that small parks up to two hectares facilitated cooling of the surrounding areas by two degrees³⁰⁴. Similar research in the UK has found similar results. Whitford's (2001) study showed that places with greatest number of trees have better carbon-storage capacity and lower level of surface water running off into drains, which allow sewers to cope better with water-flow and minimising flood problems. The research also found that the temperature is 7°C cooler where the vegetation cover is 50 per cent compared to areas where the vegetation cover is only 15 per cent³⁰⁵.

³⁰⁰ Blandy, S. et al (2003) *Gated Communities: a systematic review of the research evidence*, CNR Paper 12

³⁰¹ Shoard, M. (2003) *The Edgelands*. Town & Country Planning, May 2003, pp122-125

³⁰² Greater London Authority (2002a) *Connecting with London's Nature: The Mayor's Biodiversity Strategy*, GLA, London

³⁰³ Shashua-Bar, L. and Hoffman, M.E. (2000) *Vegetation as a climate component in the design of an urban street: an empirical model for predicting the cooling effect of urban green areas with trees*, Energy and Buildings, Vol.31, pp221-235

³⁰⁴ Upmanis, H. (2000) *The park has its own climate*, Swedish Building Research, No.2, pp8-10

³⁰⁵ Whitford, V. et al (2001) *City form and natural process – indicators for the ecological performance of urban areas and their application to Merseyside, UK*, Landscape and Urban Planning, Vol. 57(2), pp91-103

8.31 The benefits of planting trees also extended to reducing pollutants in the air. They have been found to cleanse the air of both particulate and gaseous air pollutants. For example, a tree-lined street has 10 – 15 per cent less dust in the air than none tree-lined streets³⁰⁶.

Ease of movement

8.32 Several research studies have shown that good public transport reduces levels of traffic. For example, the implementation of a public transport system in Strasbourg increased the use of public transport by 43 per cent³⁰⁷ and reduced the usage of privately owned cars. If designed with an integrated pedestrian friendly network of cycle paths and walkways, this could potentially reduce traffic generation further.

8.33 In the US, the car has been the dominant means of travel for most urban trips other than highly local short trips because of the distance and geography of suburban neighbourhoods. The car gives people valuable mobility under free-flowing traffic conditions, but many observers, including the US Environmental Protection Agency, note that the mobility offered by the car may be outweighed by the negative impact of traffic generation and increased pollution³⁰⁸. However, the reduction in traffic due to a good public transport system will only work if people support a frequent and reliable service.

8.34 The Waterfront in Dudley, UK, adopted good quality public spaces around the heart of the development onto the canal, with large areas of traffic calmed and pedestrianised space, good sense of safety and high quality soft landscaping to provide a safe, attractive and functional public space³⁰⁹. By designing around the average distance that most people would walk on a daily basis and building local amenities close to residential neighbourhoods, researchers have suggested that this would reduce the use of private transport³¹⁰. However, other research undertaken by Cervero and Radisch (1996) showed that these improvements do not necessary mean that car ownership would be reduced³¹¹. A study (Frank, 2003) showed that walking for non-work purposes most highly correlates with the number of shops, restaurants and office buildings within 400 metres of a person's home³¹².

8.35 A reduction on the dependence on cars, increased use of public transport, walking and cycling (Countryside Agency, 2005) have been found to be achieved through new and improved networks of footpaths, cycle ways, parks, woodlands and other green spaces³¹³.

³⁰⁶ Johnston, J. and Newton, J. (2004) , *Building Green: A guide to using plants on roofs, walls and pavements*, Greater London Authority

³⁰⁷ Gehl, J. (2000) *New City Spaces*, Copenhagen, Danish Architectural Press

³⁰⁸ United States Environmental Protection (2001) *Our built and natural environments: a technical review of the interactions between land use, transportation, and environmental quality*, Washington: United States Environmental Protection Agency, Publication No. EPA 231-R-01-002

³⁰⁹ Bartlett School of Planning commissioned by CABE and DETR () *The Value of Urban Design*, CABE, pp95

³¹⁰ Davies, L. (2000) *Urban Design Compendium*, English Partnership

³¹¹ Cervero, R. and Radisch, C. (1996) *Travel choices in pedestrian versus automobile oriented neighbourhoods*, *Transport Policy*, 3(3), 127-141

³¹² Frank et al (2003) *Health and community design: The impact of the built environment on physical activity*, Washington, Island Press

³¹³ The Countryside Agency and Groundwork (2005) *The Countryside in and around towns: A vision for connecting town and country in the pursuit of sustainable development*, The Countryside Agency

Quality of the public realm

8.36 Traffic calming strategies have been adopted to reduce traffic speed and provide pedestrian friendly areas, which encourage walking and cycling. However, research has found that this only works where the connection is highly visible, otherwise, only people who already know the area can take advantage of them³¹⁴. These walkable environments also offer health benefits. They also reduce the public costs associated with car use, such as traffic congestion and the provision of road and parking facilities. There are also positive impacts for local retailers because of the higher pedestrian traffic.

³¹⁴ McIndoe, G. et al (2005) *The Value of Urban Design - the economic, environmental and social benefits of urban design*, Ministry for the Environment, New Zealand

SECTION 9: CONCLUSIONS

9.1 The Literature Review clearly suggests that good architecture and design can impact significantly on individual end-users and contribute to improved quality of life.

9.2 **Socially**, architecture and design can help us feel good about who we are and where we live; it can foster or inhibit social interaction and contribute to or mitigate against social cohesion. The design and fabric of buildings and places can contribute to our cultural identity and pride in our local community.

9.3 Health benefits include less illness, faster patient recovery, reduced stress and greater overall health and well-being.

9.4 **Economically**, well-designed, well-connected buildings and places clearly attract investment and create jobs. Working in buildings and places that offer a variety of spaces, which provide inspiring, comfortable and controllable environments, enhances the recruitment, retention, satisfaction, motivation, productivity and performance of staff. Key to creating these environments are external and natural views, fresh air and daylight.

9.5 In residential contexts, proximity to green spaces, street trees, parks, playgrounds and water features can increase residential property prices. This too can generate increased revenue through property taxation but lead to exclusion of local communities.

9.6 Capital investment in schools has a positive influence on pupil motivation and performance.

9.7 **Environmentally**, sustainable design, mixed-use development, green space and trees and well-connected public realm with effective public transport have significant environmental benefits.

9.8 Management policies and practice are equally important in delivering and sustaining these impacts. The provision of well-designed buildings and spaces alone is not enough.

9.9 While extensive evidence is available on the impact of architecture and design, the overall body of research has not been undertaken in any systematic or coherent way. It is therefore difficult to provide any meta-analysis so the evidence is essentially a synthesis of case-study and quantitative evidence. The sector would benefit from guidance on undertaking this type of impact evaluation in a consistent way. Similarly, much of the evaluation is undertaken in the early stages of the existence of a building or place. Medium or longer-term evaluation would be beneficial.

9.10 This review provides a substantial evidence base on which to build. Adding future research will ensure that the sector continues to have access to the most recent impact evidence.

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