ELSEVIER

CLIFF MOUGHTIN
with Peter Shirley

URBAN DESIGN
Green Dimensions

SECOND EDITION

Architectural Press

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PREFACE TO THE FIRST EDITION

The subject matter of this book is sustainable city development. Any discussion of urban design which does not address environmental issues has little meaning at a time of declining natural resources, ozone layer destruction, increasing pollution and fears of the greenhouse effect. The long-term survival of the planet as a hostess for sustained human occupation in anything other than a degraded lifestyle is in some doubt. In these circumstances any discussion of aesthetics in a pure or abstract form unrelated to environmental concerns could be thought to be superficial. This book considers architecture and its sister art, urban design, to consist of 'Commodotie, Firmness and Delight' (Wotton, 1969; Moughtin, 1992). One aspect of 'Commodotie' in urban development is sustainability, that is a development which is non-damaging to the environment and which contributes to the city's ability to sustain its social and economic structures.

The requirements of sustainable development closely mirror the current agenda in urban design. The reactions to modern architecture and modern planning have led to a new appreciation of the traditional European city and its urban form. The current preoccupations of urban designers with the form of urban space, the vitality and identity of urban areas, qualities of urbanity, respect for tradition, and preferences for developments of human scale can all be encompassed within the schema of sustainable development. The two movements – Sustainable Development and Post Modern Urban Design – are mutually supportive. Post Modern Urban Design gives form to the menu of ideas subsumed under the title of Sustainable Development; in return it is given functional legitimacy. Without this functional legitimacy and the discipline a functional dimension imposes on the design process, Post Modern Urban Design may develop into just another esoteric aesthetic. The foundation of urban design is rooted in social necessity: society today is faced with an environmental crisis of global proportions and it is coming to terms with the effects of this crisis on the world's cities which gives purpose and meaning to urban design.

Pursuit of sustainable city structures presupposes also the development of a built environment of quality. The pursuit of environmental quality in the city requires

attention to aesthetics and the definition of criteria by which visual quality or delight is judged. This book explores the problems of defining quality in urban design but seen against a backcloth of the current concerns about the global environment. It is the third volume in this series and builds upon the ideas contained in the first two volumes. The first volume outlined the meaning and role played by the main elements of urban design; discussing, in particular, the form and function of street and square. The second volume dealt in more detail with the ways in which the elements of the public realm are decorated. It outlined the general principles for the embellishment of floor plane; the walls of streets and squares, corners, roofline, roofscape and skyline, corners; together with a discussion of the design and distribution of the three-dimensional ornaments that are placed in streets and squares. The present book aims to relate the main components of urban design to a general theory of urban structuring, paying particular attention to the city and its form, the urban quarter or district and the street block or insulae.

This book, like the previous volumes, explores the lessons for urban design which can be learnt from the past. However, like *Urban Design: Street and Square* and *Urban Design: Ornament and Decoration* this book does not advocate a process of simply copying from the past: it is not an apologia nor a support for wholesale pastiche in the public realm. The book attempts to come to terms with the logic of sustainable development and then to formulate principles of urban design based upon the acceptance of this particular environmental code. In the final chapter of the book the ideas of sustainable development are confronted with the reality of the modern, largely unsustainable city which has an extensive physical infrastructure and which will change only slowly. The last chapter, therefore, examines those elements within the range of ideas which are subsumed under the umbrella title of sustainable development which may in favourable circumstances be implemented in the foreseeable future.

March 1996

PREFACE TO THE SECOND EDITION

There are five main reasons for the second edition of this book. The first – and possibly the most important – reason for the new edition is bringing the text up to date. A lot has happened since the First Edition was published in 1996: there has been some good news, but generally the environmental outlook for the planet is bleak. In retrospect, it appears to me that the first edition was too circumspect, and was 'skeptical' of some of the 'doom and gloom' which pervaded the writings of the deep green lobby, though the book did not display the blasé optimism of the later 'Lomborgian' analysis of global conditions (Lomborg, 1998). The second reason for this Second Edition is therefore to change the tone of the book and to attack the subject in a more forthright way, fully acknowledging the parlous state of the environment. Following on from this the third reason for this new edition is, to analyse the relationship between urban structures and this deepening environmental crisis, which is both caused by humankind and will impinge negatively and seriously on the quality of life of future generations. In many respects there is no environmental crisis, the environment will recover: rather, the problem is a human crisis, a crisis from which the human race may not recover. Recovery for humanity may depend on a dramatic change in attitude to the environment, resulting in the pursuit of sensible policies of sustainable development. In *The Observer* of 11th January, 2004 there was an account of key talks involving Government's most senior climate experts who have – '. . . produced proposals to site a massive shield on the edge of space that would deflect the Sun's rays and stabilise the climate'. This illustrates how seriously the catastrophic implications of climate change are being taken. But this is further evidence that it is, once again, the symptom – the environment – which is being treated, and not the sickness. It is the way that human society is organized which requires the attention.

Despite the apparent weakness of the Kyoto Protocol and the persistence, in its wayward policies, of the main world polluter, the USA, there have been some notable achievements in the global efforts to secure more sustainable patterns of development. In particular, this country – Great Britain – has much of which to be proud. The fourth aim of this Second Edition celebrates the

leadership role of urban designers in Britain's efforts to achieve more sustainable cities. Clearly, however, there is still much to do. Finally, this edition aims to explore the relationship between culture and sustainable urban form: in particular, to question the validity of the compact city concept as a universal model for sustainability. It will examine other ideas for achieving sustainable urban forms, and particularly the 'bio-city', a city rooted in its bioregion and one which is self sustaining in most of its needs for continued existence.

I have taken the opportunity afforded by this new edition to work with Peter Shirley, a nature conservationist with long experience in environmental management. Peter has written Chapter 5, The Urban Park. Ecology and an appreciation of nature seem to me to be the key to an understanding of sustainable development, and it is to people working in this field to whom architects and urban designers need turn for advice and leadership in the search for sustainable urban forms.

> 'Moreover, if we wish to understand the phenomenal world, then we will reasonably direct our questions to those scientists who are concerned with this realm – the natural scientists. More precisely, when our preoccupation is with the inter-action of organisms and environment – and I can think of no better description of our concern – then, we must turn to ecologists, for that is their competence'. (McHarg, 1969).

November 2004

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I wish to acknowledge my debt to two former students: to Bob Overy who, while I was teaching at The Queen's University of Belfast, introduced me to the role of public participation in planning; and to Steve Charter who encouraged me to start courses in sustainable development at the Institute of Planning Studies in the University of Nottingham. Both of these ideas, sustainable development and participation, are, in my view, critical for the development of a discipline of urban design. I have also had the pleasure, during the early 1990s, of working in the same department as Brenda and Robert Vale. Their work in the field of Green Architecture was and still is inspirational.

The manuscript of this book, as in the case of the other two volumes in the series, was read by my wife Kate McMahon Moughtin who ensured that it made sense and that it could be read easily. Many of the fine drawings, which help to clarify the meaning of the text, were made by Peter Whitehouse, while Glyn Halls turned my negatives into photographs which illustrate the text. I am also greatly indebted to the Leverhulme Trust who gave generous financial support for the preparation of the first edition of this book.

Peter Shirley wishes to acknowledge the help of John Hadidian, The Humane Society of the United States; Paul Stephenson, The Wildlife Trust for Birmingham and the Black Country; Martha and Jim Lentz, Harmony, Florida; Mathew Sutcliffe, the Mersey Basin Campaign; and Dr David Lonsdale, the Amateur Entomologists' Society.

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THE ENVIRONMENTAL CRISIS AND SUSTAINABLE DEVELOPMENT 1

INTRODUCTION

The subject matter of this book is the planning and design of ecologically sustainable cities. It is concerned with the process of structuring public space in the city at a time when the global environment appears increasingly fragile. Any discussion of city planning and urban design, which does not address environmental issues, has little meaning at a time of increasing population pressures on a declining natural resource base, widespread ecological destruction, increasing pollution, ozone layer depletion and climate change. The long-term survival of the planet as a vehicle for sustained human occupation in anything other than a degraded lifestyle is in some doubt: in these circumstances any discussion of the aesthetics of city planning in a pure or abstract form unrelated to environmental concerns could be described as superficial. Architecture and its sister art, urban design, are said to consist of 'Commodotie, Firmness and Delight' (Wotton, 1969). One aspect of 'Commodotie' in any urban development is sustainability – that is, a development which is non-damaging to the environment and which contributes to the city's ability to sustain its social and economic structures. The pursuit of sustainable city structures presupposes also the development of a built environment of quality: one that 'Delights'. Environmental quality in the city is, in part, determined by aesthetic values. This book aims to explore the problem of defining quality, the poetry of civic design, but seen against a backcloth of the current concerns about the environment and the imperative of achieving ecologically sound development.

The theme of this book is the 'Green Dimensions' of urban design: the second half of its title was chosen with care. Nothing, as far as we know, in the physical universe is permanent; nothing lasts forever. All things have a beginning and an end, including vast cultures, their great empires and cities. Sustainable development is a concept with

strict temporal limits: sustainable urban form a mere chimera, a mirage that disappears over the horizon on approach. A degree of sustainability is all that can be achieved in any set of circumstances. It seems appropriate, therefore, to limit a study of sustainability to its dimensions: those factors that, from time to time, appear relevant. Some forms of development will probably be more sustainable and long-lasting than others. There is no authorative research on sustainable urban forms, only informed speculation about the path to be taken. This is a further reason for the tentative title of the book.

It would appear that the Post Modern agenda of the 'New Urbanists' is compatible with much of the theory of sustainable development, particularly those theories of sustainable development of the paler green hue. The current preoccupations of many urban designers are with the vitality and identity of urban areas, the quality of urbanity and the compact city, urban forms of human scale, which are less dependent upon the use of finite resources while respecting and conserving the natural environment. While there is a general consensus on the features of a sustainable development agenda amongst many working in the field of urban design, nevertheless there are differences in emphasis, (Carmona *et al.*, 2003). Over a decade ago, Calthorpe (1993) in the USA outlined his principles for the Transit-Oriented-Development: an agenda that many in this country could still accept as a general guide. In summary, the principles of Transit-Orientated Development are:

(1) Organize growth on a regional level so that it is compact and transit-supportive.
(2) Locate commercial, housing, jobs, parks, and civic uses within walking distance of transit stops.
(3) Design pedestrian-friendly street networks which directly connect local destinations.
(4) Housing should be a mix of densities, tenure and cost.
(5) Sensitive habitat, riparian zones, and high-quality open space should be preserved.
(6) Public spaces should be the focus of building orientation and neighbourhood activity.
(7) Encourage infill and redevelopment along transit corridors within existing neighbourhoods.

This then, is the basic urban design agenda, compatible with sustainable development ideas, but is it sufficient for achieving that aim?

THE ENVIRONMENTAL MOVEMENT

It has been suggested that the publication of *Silent Spring* by Rachel Carson in 1962 was the start of the modern environmental movement (Dobson, 1991). However, the roots of environmentalism may be much deeper. Farmer (1996) has traced the development of 'Green Sensibility' in architecture back to folk buildings and the cult of the cottage through the nineteenth century in the writings of Ruskin, the work of the Arts and Crafts movement to the twentieth century and the organic ideas in Modern Architecture. The planning profession could also cite its list of planners with green credentials. Amongst these father figures of the planning world would be Geddes (1949), Howard and the Garden City

Movement (1965), and Mumford (1938) with his analysis of the 'Rise and Fall of Megalopolis'. No doubt other disciplines could legitimately cite their own lists of people with deep concerns for the environment, many of them working long before the term 'sustainable development' was coined. While it is not the intention to downgrade these fine scholarly traditions, nevertheless, for the purpose of this study, and for convenience, the beginnings of the modern environmental movement will be placed in the 1960s. The mood of environmentalism quickened with Rachel Carson's analysis of the inevitable damage caused by large-scale and indiscriminate use of chemical pesticides, fungicides and herbicides. Carson's influence was widespread, affecting pressure groups such as Friends of the Earth, in addition to the stimulus she gave to the development of green politics and philosophy.

From the USA, Ian McHarg, the Scottish émigré, published his seminal work *Design with Nature* in 1969, seven years after Carson's warning cry. McHarg's ecological thesis spans the disciplines of landscape, architecture and planning: he is one of the founding fathers of sustainable development. McHarg argued that human development should be planned in a manner that took full account of nature and natural processes. *Design with Nature* in addition to articulating a philosophical position also provided a technique for landscape analysis and design using overlays, a technique which now forms the basis of GIS, Geographic Information Systems, an important tool for current planning and design. While McHarg was writing in the 1960s, the thrust of his argument still applies today in the twenty-first century. 'It is their (the merchant's) ethos, with our consent, that sustains the slumlord and the land rapist, the polluters of rivers and atmosphere. In the name of profit they pre-empt the seashore and sterilise the landscape, fell the great forests, fill protective marshes, build cynically in the flood plain. It is the claim of convenience – or – its illusion – that drives the expressway through neighbourhoods, homes and priceless parks, a taximeter of indifferent greed'.

Small is Beautiful by Schumacher (1974) is another milestone in the analysis of the causes of environmental problems and in the development of green principles. One cause of environmental problems according to Schumacher is the notion that we can continue to produce and consume at ever-increasing rates in a finite planet. Schumacher warned that the planet which is our stock of capital is being threatened by overproduction: in effect, the human race is consuming its capital at an alarming rate, endangering the tolerance margins of nature, and so threatening the life support systems that nurture humankind. A further landmark in green analysis was 'The Tragedy of the Commons' (Hardin, 1977). Hardin argued that if everyone maximized his or her own gain from commonly held property, whether land, sea or air (the commons), the result would be the destruction of those commons. Where populations are comparatively small the 'commons' are not under great threat. With rising world populations, the commons now under threat include the air we breathe, the ozone layer that protects us from the sun's rays, and the ecological systems that deal with the waste we cause. How far *The Limits to Growth* (Meadows *et al.*, 1972) for the Club of Rome's Project on 'The Predicament of Mankind' progressed the aims of the environmental movement is problematical. It attempted to plot the

depletion of resources and to warn of the danger of exponential growth, to the ultimate destruction of a global environment fit for human occupation. The book has been described as mechanistic and non-scientific. It has also been criticized for overstating the case, therefore damaging the environmental or green cause. To some extent these criticisms have been addressed in *Beyond the Limits* (Meadows *et al*., 1992). *The Limits to Growth* did attempt, however, to study some aspects of the global environment holistically, concentrating on linkages and adopting a systems approach to environmental analysis, all being common features of a 'green method'.

THE 'SKEPTICAL ENVIRONMENTALIST'

The publication by Lomborg, in Danish, of his book, *Verdens Sande Tilstand* (1998) – later translated into English as *The Skeptical Environmentalist* (2001) – was a further landmark in the environmental debate. According to Lomborg's assessment, conditions on earth are generally improving for human welfare: furthermore, future prospects are not nearly as gloomy as environmental scientists predict. Those working in the field of sustainable development cannot ignore Lomborg's thought-provoking analysis, even though most reputable environmental scientists have rebutted his complacent view of the global environment (see Bongaarts, Holdren, Lovejoy and Schneidr in *Scientific American*, January, 2002). Like Meadows in his *Limits to Growth*, Lomborg may have overstated his case. Unfortunately, his thesis has given credence to the views of those advocating an environmental 'free for all', particularly those to the right of American politics (see 'Bush bending science to his political needs'; *Guardian*, 19th February, 2004).

POPULATION

An important contributory factor affecting the deterioration of the environment is population growth. According to Bongaarts (2002), Lomborg's assertion that the number of people on this planet is not 'the problem', is simply wrong. The population of the planet was approximately 0.5 billion in the mid-seventeenth century. It was then growing at approximately 0.3 per cent per annum, which represented a doubling of population every 250 years. By the beginning of the twentieth century, the population was 1.6 billion but growing at 0.5 per cent per annum, which corresponds to a doubling time of 140 years. In 1970, the global population was 3.6 billion, with a growth rate of 2.1 per cent per annum. Not only was the population growing exponentially but the rate of growth was increasing. From 1971 to 2000 the population grew to about 6 billion, but the growth rate fell to 1.5 per cent per annum. This change in population growth rate is a significant improvement and means a reduction in the rate at which total world population grows. The population growth rate is expected to fall further to about 0.8 per cent per annum by 2030. Despite this fall in population growth rate, the absolute growth will remain nearly as high as levels in the last decades of the twentieth century, simply because the population base rate keeps expanding: the global population is expected to be about

8 billion by 2030 and to reach about 10 billion by 2050.

These global figures mask details of unprecedented demographic change, which are highly significant for the impact they may have on the environment. The world's poorest nations of Africa, Asia and Latin America have rapidly growing and young populations, while in the wealthy nations of Europe, North America and Japan, population growth is zero or in some cases negative. By 2030, over 85 per cent of the world's population will live in these poorer nations of the developing world. Three-quarters of global population growth occurs in the urban centres of these poorer nations, and half of this increase is by natural growth within cities. This urban growth in, and rural-urban migration to, the cities of the poor 'South' is occurring in a context of far higher absolute population growth, at extremely low income levels, very little institutional and financial capacity, and few opportunities to expand into new frontiers, foreign or domestic. 'While urban poverty exists and is indeed growing in all cities of the world, it characterizes aspects of the rapidly growing cities of the developing countries. There, urban poverty disproportionately affects women and children; fuels ethnic and racial tensions; and condemns large sections, and sometimes the majority of urban dwellers to a downward spiral of marginalization, social and economic exclusion and unhealthy living environments' (United Nations, Habitat, 2001). Over 1 billion people live in absolute poverty, living on less than $1 per day. A total of 420 million people live in countries that no longer have enough cropland on which to grow their own food, and 500 million people live in regions prone to chronic drought: by 2025, this number is likely to be 2.4 to 3.5 billion people. Clearly, population pressures will induce migratory movements throughout the world, so that in Europe – including Britain – we can expect to see a continuing influx of economic migrants: some – but not all – in this country would see this immigration of young economically active people as essential to sustain our aging population (*Observer*, 25 January, 2004). Such population movements will not be without conflict.

'Poverty and environmental degradation are closely interrelated. While poverty results in environmental stress, the major cause of environmental deterioration is an unsustainable pattern of consumption and production, particularly in the industrialised countries, which aggravates poverty and imbalances' (UN, 1992b). The cause of the problem does not lie in the poor South, but in the 'over-consumption' in the rich North: over-consumption being a euphemism for the much shorter and more accurate word 'greed', as used by McHarg. Nevertheless, a reduction in population growth rates through education and family planning is of great importance in establishing a sustainable future for humankind: alone, however, it is insufficient. It is worth noting that one child born in Europe or the USA will use the same resources and be responsible for using the same energy and producing the same waste as perhaps thirty or forty born in less advantaged countries. The problems are 'increasingly international, global and potentially more life-threatening than in the past' (Pearce, 1989). Fifteen years on from the time when Pearce wrote those words, global conditions have, if anything, deteriorated. The development of a global environment of quality, in addition to the reduction in population growth in the

Developing World, is dependent upon establishing sustainable patterns of consumption and production in the Developed World, which in part is related to the way in which we build and use cities.

FOOD PRODUCTION

Barring catastrophe, the global population over the next thirty years will grow from 6 billion to 8 billion people. Most of this growth will be in cities of the Developing World. Bongaarts (2002) believes that the demand for feeding this extra population, will be a great challenge: 'The ability of agriculturists to meet this challenge remains uncertain'. He goes on to say that, '... the technological optimists are probably correct in claiming that the overall food production can be increased substantially over the next few decades'. This agricultural expansion will be costly. The expansion will probably take place on soils of poor quality, located in places less favourable for irrigation, than existing intensively farmed land. Water – as we read constantly in our daily newspapers – is in increasingly short supply, while its demand grows not only for purposes of irrigation. The environmental cost of this increased food production, again according to Bongaarts, could be severe. 'A large expansion of agriculture to provide growing populations with improved diets is likely to lead to further deforestation, loss of species, soil erosion and pollution from pesticides and fertilizer runoff as farming intensifies and new land is brought into production.' It would seem prudent for countries like our own, to maintain our potential for food production and limit the extent to which our cities encroach upon agricultural land. It may also be both wise and profitable to explore ways in which food production within city limits can be maximized.

ENVIRONMENTAL PROBLEMS

The nature and extent of global environmental problems have been discussed fully in many texts, so they will be dealt with only in summary here, and only where they have some bearing on the development of sustainable urban form and structure. One major threat to the quality of life is pollution, which can, in part, be related to the ways in which cities are structured and used. Atmospheric pollution includes damage to the ozone layer, acid rain and the greenhouse effect. Depletion of the Earth's stratospheric ozone layer allows dangerous ultraviolet light from the sun to penetrate to the surface of the planet. This increase in radiation has the potential to cause adverse effects upon plants, animals and human beings. Acid rain can do immense harm, particularly to forest areas. There is some evidence of improvements in both of these areas, though much still remains to be achieved. As Lovejoy (2002) points out, '... things improve because of the efforts of environmentalists to flag a particular problem, investigate it and suggest policies to remedy it'. It is also true that problems that have immediate political appeal or obvious economic gain are most likely to receive the most immediate attention. For example, the European and North American middle-class holidaymakers

fearing skin cancer from exposure to the sun are a vocal and powerful political lobby for change. The greenhouse effect upon climate change is one area, which has not so far received such powerful popular support. The economic pain from curbing atmospheric pollution is all too apparent, while the gains are not immediately appreciated. In global terms, we continue with economic policies and land use practices which increase atmospheric emissions, particularly greenhouse gases.

ENERGY AND THE CITY

Much of the atmospheric pollution is caused by the burning of fossil fuels in the creation of energy to support city life. This energy is used: in the building of city structures (energy capital); during the lifetime of the structure; and in the transportation of people and goods between and within cities (energy revenue). Therefore, the design of cities and the ways in which they are used have a great impact on the natural environment. Few serious environmental scientists believe that we are running out of energy to sustain our civilization. 'The energy problem' – and there is an energy problem – 'is not primarily a matter of depletion of resources in any global sense but rather of environmental impacts and socio-political risks – and, potentially, of rising monetary costs for energy when its environmental and socio-political hazards are adequately internalised and insured against' (Holdren, 2002). Oil is the most versatile and most valuable of the conventional fuels that has long provided for all our city-building energy needs: it remains today the largest contributor to world energy supply, accounting for nearly all the energy used in transport. However, the bulk of recoverable conventional oil resources appear to lie in the Middle East, a politically unstable part of the world, as the recent war in Iraq demonstrates. Much of the rest of the recoverable resources lies offshore and in other difficult or environmentally fragile locations. Nuclear energy, which currently contributes about 6 percent of global energy production, has long-term problems of pollution and the storage of waste material. There are also other problems with nuclear energy. Breeder reactors produce large amounts of plutonium that can be used for weapons production – a security problem so significant that it may preclude the use of this technology. Problems with both oil and nuclear power presents urban designers with the challenge of developing urban structures less dependent upon these conventional sources of energy for their continuing existence.

BIODIVERSITY

There is a danger that losses to biodiversity resulting from man's activities could 'reduce the resilience of ecosystems to withstand climatic variations and air pollution damage. Atmospheric changes can affect forests, biodiversity, freshwater and marine ecosystems, and economic activity such as agriculture' (UN, 1992). Peter Shirley deals more thoroughly with biodiversity in Chapter 5, 'The Urban Park'. It is sufficient to note here that, since 1992, on the whole, conditions have deteriorated: still many species are becoming extinct or endangered. Habitat loss continues, including the great forests of the world, which are being exploited and cleared for development (See,

for example, 'An unnatural disaster', *The Guardian*, 8th January, 2004). Nevertheless, '. . . significant progress has been made in abating acid rain, although much still needs to be done. And major efforts are under way to stem deforestation and to address the tsunami of extinction' (Lovejoy, 2002). Lovejoy adds the rider '. . . but it is crucial to remember that whereas deforestation and acid rain are theoretically reversible (although there may be a threshold, past which remedy is impossible), extinction is not'.

CLIMATE CHANGE

Most weeks we read in the press, that climate change is upon us and that matters can only get worse. There is even a 'suspicion abroad' that conditions are worse than we think. Recently, official pronouncements reported in the press added to the concern: they have led to headlines such as: 'End of the World is nigh – it's official'; 'Human race is killing the planet says Meacher'; and 'Risk to the environment poses the same dangers as terror, warns Blair' (*The Guardian*, March 2003). Scientists are, however, more circumspect. As Pearce pointed out as far back as 1989, '. . . there is uncertainty about the nature and effect of these changes to climate. For example, there is uncertainty about the exact trace gas emissions which will enter the atmosphere and the precise fuel mix which will be used in the future. There is also uncertainty about the nature and extent of the ecological changes which will be brought about by pollution; in particular, there is uncertainty about the ways in which the climate will respond, either at a global or in a regional context. There is also uncertainty about environmental thresholds – that is, points at which an environmental catastrophe occurs or where particular processes cannot be reversed. Above all, there is great uncertainty about the ways in which man will respond to any changes to the environment that may occur. Human response to a real or perceived environmental threat may be part of a natural adaptation process and include responses at a personal, institutional or governmental level. The response may range from the small-scale installation in the home of more thermal insulation to a process of mass migration from areas of drought or flooding'. More recently, Schneider (2002) also stressed the uncertainty surrounding the whole vexed question of climate change: 'Uncertainties so infuse the issue of climate change that it is impossible to rule out either mild or catastrophic outcomes'. Temperatures in 2100 may increase by 1.4 degrees Celsius or by 5.8 degrees. The first would mean relatively easy adaptable change: the larger figure would induce very damaging changes. The most creditable international assessment body in this field, The Intergovernmental Panel on Climate Change (IPCC) endorse this range of possibilities so that we could be lucky and see a mild effect or unlucky and get catastrophic outcomes. Since a large body of the scientific community believe that climate change in part is due to human activities, a reasonable behaviour would be for humankind to take preventative measures. As Schneider (2002) points out, 'It is precisely because the responsible scientific community cannot rule out such catastrophic outcomes at a high level of confidence that climate mitigation policies are seriously proposed.' Until the Scientific community, acting on its research findings, advises otherwise, it would seem prudent to

propose development strategies, which reduce, as far as possible, the pressures on a fragile global environment. Here it is intended to continue to advocate 'the precautionary principle' as a guide for environmental design: this principle is fundamental to the theory of sustainable development, which advocates a cautious approach to the use of environmental resources, particularly those which result in the pollution of the atmosphere with greenhouse gases.

SUSTAINABLE DEVELOPMENT

There seems to be widespread agreement that solving global problems means the adoption of policies and programmes that lead to sustainable development. Sustainable development, however, has many different meanings (Pearce, 1989). The shades of meaning given to sustainable development closely mirror – or perhaps match – the writer's intellectual or emotional position along the spectrum of green philosophy. There is also a great danger that the concept will become meaningless, or simply be used as another wordy panacea instead of action for dealing with the environmental ills that befall the planet. The pursuit of a sustainable future for the human race in an environment of quality will require the design of effective policies and programmes which directly address the related problems of unsustainable activities and environmental degradation; they must also be politically acceptable in the jurisdiction where they are proposed. If these policies and programmes are grouped beneath the generic term 'sustainable development', then that term must have a generally accepted meaning which does not reduce it to an anodyne instrument for political obfuscation.

A generally accepted definition of sustainable development, and a good point to begin an exploration of this concept, is taken from the Brundtland Report: 'Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development, 1987). This definition contains three key ideas: development, needs, and future generations. According to Blowers (1993), development should not be confused with growth. Growth is a physical or quantitative expansion of the economic system, while development is a qualitative concept: it is concerned with cultural, social and economic progress. The term 'needs' introduces the ideas of distribution of resources: 'meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better life' (World Commission on Environment and Development, 1987). These are fine sentiments, but in reality the world's poor are unable to achieve their basic needs of life, while the more affluent effectively pursue their aspirations, many luxuries being defined by such groups as needs. There will naturally be environmental costs if the standards of the wealthy are maintained while at the same time meeting the basic needs of the poor. These environmental costs, furthermore, will increase dramatically if the living conditions in developing countries improve, let alone if the aspiration is to bring those conditions in line with the more affluent developed world. A choice may be inevitable: meeting needs therefore is a political, moral and

ethical issue. It concerns the redistribution of resources both within and between nations. Sustainable development means a movement towards greater social equity both for moral and practical reasons. An environmental *cordon sanitaire* cannot be erected around the poor south, nor is there an effective defensive structure that will protect against the anger and frustrations of the militants who claim justification of violence in the hopeless poverty that pervades some parts of the developing world. It is one Earth that we inhabit, and its environmental, social, economic and political problems have no easily policed borders. The third idea of 'future generations' introduces the idea of intra-generational equity: 'We have a moral duty to look after our planet and to hand it on in good order to future generations' (Department of the Environment, 1990). It was the United Nations Conference on the Human Environment which fostered the idea of stewardship in 1972. Stewardship implies that mankind's role is one of caring for the Earth and steering a path that as far as possible benefits the human and natural systems of the planet. Mankind is viewed as the custodian of the Earth for future generations. This attitude is best summed up by a quotation attributed to the North American Indian: 'We have not inherited the Earth from our parents, but have borrowed it from our children'. Following this line of argument the aim is not simply to maintain the status quo but to hand on a better environment, particularly where it is degraded or socially deprived. It requires of any particular generation the wisdom: to avoid irreversible damage; to restrict the depletion of environmental assets; to protect unique habitats, high-quality landscapes, forests and other important ecosystems; and to use frugally and wisely non-renewable resources. In summary, the definition of sustainable development derived from Brundtland implies both inter- and intra-generational equity within a framework of development which does not destroy the planet's environmental support system.

Elkin (1991b) identifies four principles of sustainable development: futurity, environment, equity, and participation. The principle of futurity is seen as maintaining a minimum of environmental capital including the planet's major environmental support systems, together with the conservation of more conventional renewable resources such as forests. This is to meet the Brundtland requirement that human activity should be limited by consideration of the effect that activity may have on the ability of future generations to meet their needs and aspirations. The second principle is concerned with costing the environment. The true cost of all activities, whether they take place in the market or not, should be paid for by the particular development through regulation, and/or market-based incentives. This idea naturally leads to the suggestion that 'The polluter should pay'. It is difficult to identify the minimum environmental stock which should be maintained for future use. Elkin in the early 1990s thought that it was clear that: '... current rates of environmental degradation and resource depletion are likely to carry us beyond this level'. A decade later, there seems little evidence to show that the environmental stock has made a sudden recovery. There has been an attempt to dilute the argument by suggesting that environmental stock if used judiciously could be converted into useful capital stock for future generations. Much of the environmental stock which supports life

on this planet is irreplaceable; for example, fine buildings, their furniture and fittings do not equate with the rain forest from which they may be made. Sustainability constraints are difficult to define with any precision. It is possible, however, to identify the direction of changes in consumption patterns that are necessary to avoid breaching environmental thresholds. Which brings the discussion back again to the 'Precautionary Principle'. By applying this principle, where doubt and uncertainty exist, it may be possible to outline the type of development that is more sustainable or, more accurately, development that is less unsustainable. Elkin's last two principles, he regards as secondary; they support the first two main principles of sustainable development: like many other authors he writes about inter- and intra-generational equity. Elkin includes a further principle, that of participation. He notes, that, '... the problems of economic development without democratic participation have been made manifest time after time. Unless individuals are able to share in both decision-making and in the actual process of development, it is bound to fail'. Participation has become a common feature of development procedures, with groups of 'stake-holders' involved in consultations. How many of these exercises in participation involve real power being devolved to the general voting public is debateable.

These ideas about the nature of sustainability have been absorbed in the general literature, and have informed literature in the city design professions of architecture, planning, landscape and urban design. In architecture for example, there is Hagen's (2001) fine book, *Taking Shape*, which builds on the earlier work *Green Architecture* by Vale and Vale (1991); in planning, a good example is Riddel (2004) *Sustainable Urban Planning*; in landscape, one of the few recent contributions is *Landscape and Sustainability* by Benson and Roe (eds., 2000); in urban design, *Sustainable Urban Design* by Thomas (ed., 2003). Amongst the growing body of literature on this topic, a number of books attack the subject from the viewpoint of practice: one such authoritative book, *Shaping Neighbourhoods* (Barton *et al*., 2003), illustrates how to achieve sustainable development at neighbourhood level.

Before we leave the topic of the definition of sustainability, reference to the dictionary may shed a little more light on its meaning. The Shorter Oxford English Dictionary (1933) defines 'to sustain' in a number of ways, such as, 'to support, to keep a community from failing, to keep in being, to cause to continue in a certain state'. 'Sustenance' is a word derived from 'to sustain', and its meaning is 'the means of living or subsistence', or 'the action to sustain life by food'. From these basic definitions it would seem that the goal of sustainable development is to sustain human communities by development that does not destroy the fundamental environmental life support systems. Applying this definition to the subject matter of this book would make the basic requirements of a sustainable city self sufficiency in food, water, energy and shelter: the city would have to be able to reproduce its population, be self-sufficient in terms of its own employment, service requirements, be able to deal with its own waste products, and to do all this while enhancing environmental quality without damaging its precious life support functions. Such an agenda is a very great challenge indeed.

SUSTAINABLE DEVELOPMENT: OFFICIAL RESPONSES

Sustainable development was placed on the political agenda in 1987 with the publication of *Our Common Future: The Brundtland Report* (World Commission on Environment and Development, 1987). In Britain, the Government commissioned a report by Pearce *et al.* (1989) called *Blueprint for a Green Economy*. Pearce suggested ways in which the constraints could be introduced into the economic system of the United Kingdom. Later, the Government published a White Paper called *This Common Inheritance, Britain's Environmental Strategy* (Department of the Environment, 1990). While full of fine sentiment, the White Paper paid little attention to the argument developed in the Pearce Report. Consequently, no new lead was given in this policy area. The environmental movement was given a European dimension when the European Commission published its *Green Paper on the Urban Environment* (Commission for the Economic Communities, 1990).

The early 1990s in Britain saw the publication of a number of official documents addressing environmental issues. *Development Plans: A Good Practice Guide* (Department of the Environment, 1992a) has a section on Environmental Issues which attempts to show how concerns about environmental issues can be reflected in a Development Plan. It discusses: 'achieving a balance between economic growth, technological development and environmental considerations'. It does not attempt to define the point of balance, nor does it enter the thorny argument about development versus growth. The section on energy goes a little further, incorporating some of the ideas on energy-efficient urban form that appear in *Energy Conscious Planning* (Owens, 1991), a report prepared for the Council for the Protection of Rural England, 1992 saw the publication of *Planning Pollution and Waste Management*, which formed the basis of planning guidance (Department of the Environment, 1992b), while in 1993 *Reducing Transport Emissions Through Planning* was published: this was a document prepared jointly by the Department of the Environment and the Department of Transport (1993a). The document states that:

> In recognition of the problem of global warming the UK Government has signed the Climate Change Convention. This calls for measures to reduce CO_2 emissions to 1990 levels by 2000. If the transport sector is to contribute to this reduction, there are three mechanisms through which this could be achieved:
>
> (1) Through reductions in overall travel demand;
> (2) Through encouraging the use of more emissions-efficient modes of travel; and
> (3) Through changes in the emissions efficiency of transport.

Item (1) is simply advocating more energy-efficient urban form, and item (3) is also without political pain – it is the straightforward suggestion to improve transport technology. Item (2) was – and still remains – the area with the greatest potential for short-term reduction in CO_2 emissions. This course of action, however, causes the most difficulty for a conservative Government with a prejudice in favour of the road lobby and a propensity to support a roads solution to transport problems.

Favouring public transport rather than support for the building of more roads has proved equally problematic for the present Labour Government. Item (2) in essence means the development of an efficient, cheap and effective integrated public transport system. The development of such a public transport system means the transfer of resources from the car user to those who use public transport. The transfer of resources may take two forms. First, it may mean higher costs for the motorist in terms of petrol prices, road taxes and road pricing: this will make motoring more costly. Second, the transfer of resources takes the more direct form of the development of costly public transport infrastructure at the expense of road improvements.

Competition between our political parties means that no Government, of whatever political persuasion, can afford to alienate too many voters. Most of us living in Britain own a car: we use it daily and with it we conduct a long and tender love affair. How many voters in 'Middle England' will gladly accept the undoubted pain accompanying any restriction in car use? One simple and effective way in which the car user in this country was asked to pay for the environmental damage caused by too much petrol consumption was through the mechanism of the 'price accelerator': this was introduced by the last Conservative Government in the mid-1990s as a clever procedure to increase the price of petrol annually at each budget by an amount in excess of inflation. The Labour Government of 1997 accepted the 'accelerator', but as a policy it floundered with the threatened 'petrol strike' and the blockading of petrol stations in 1999. The Conservative opposition Party denounced the 'accelerator policy' of the Government, despite having introduced it during their period in office. The public anger about petrol prices threatened the Government's commanding lead in the polls, which caused a re-think of a perfectly reasonable, environmentally friendly, petrol-taxing policy. The Labour Government's declared moratorium on road building soon after coming to power in 1997 has taken a setback with recent announcements for further motorway-widening and other major road-building projects. For those who believe that it is impossible to build your way out of the present traffic chaos these announcements, along with transport plans, appear to weaken the resolve to tackle the apparently intractable problem of strategic transport. The introduction of road pricing in London however – and its apparent success – has made it more likely that this innovation will be introduced more widely throughout the country.

A Framework for Local Sustainability (1993) was a response by UK local government to the UK Government's first strategy for sustainable development. The report was prepared by the Local Government Management Board setting a framework for considering Local Agenda 21 for the United Kingdom: it built upon Agenda 21 signed by 178 nations (including the UK) at the United Nations Conference on Environmental Development, Rio de Janeiro in 1992. It is closer to the Brundtland report than earlier documents originating in the UK, discussing equity in these terms: 'Fairness to people now living must accompany sustainability's concern for fairness to future generations'. *A Framework for Local Sustainability* also discusses the idea of a green economy in terms close to those of the earlier Pearce report (1989): 'Economic growth is neither necessary for sustainability nor incompatible with it: there

is no necessary connection between them, or, for that matter, between growth and Quality of life'. While this report welcomed the existing government's advice, it recommended a strengthening of the planning system – a process that has continued since then in the preparation and publication of further PPGs (Planning Policy Guidance) containing specific reference to issues of sustainable development. Other important official documents appeared in 1994: *Climate Change: The UK Programme*; *Bio-Diversity: The UK Action Plan*; *Sustainable Forestry: The UK Programme*; and *Sustainable Development: The UK Strategy* (Department of the Environment, 1994a–d). *Climate Change* outlines the UK programme of measures to implement the Convention signed at the Earth Summit in Rio in 1992. The section on transport reveals the philosophy behind the then government's strategy: 'As in other sectors a market-based approach is being used, and a key element of the programme is providing the right price incentives' (Department of the Environment, 1994a). Some might say that, fundamentally, this is still the approach of the present Labour Government. We have seen the weakness of this approach in the attempted implementation of the petrol price accelerator – a policy which was a direct outcome of this philosophy. The report of the Royal Commission on Environmental Pollution was also published in 1994: it is a seminal work in the field of sustainable development spelling out in great detail the relationship between energy use, pollution and the built environment.

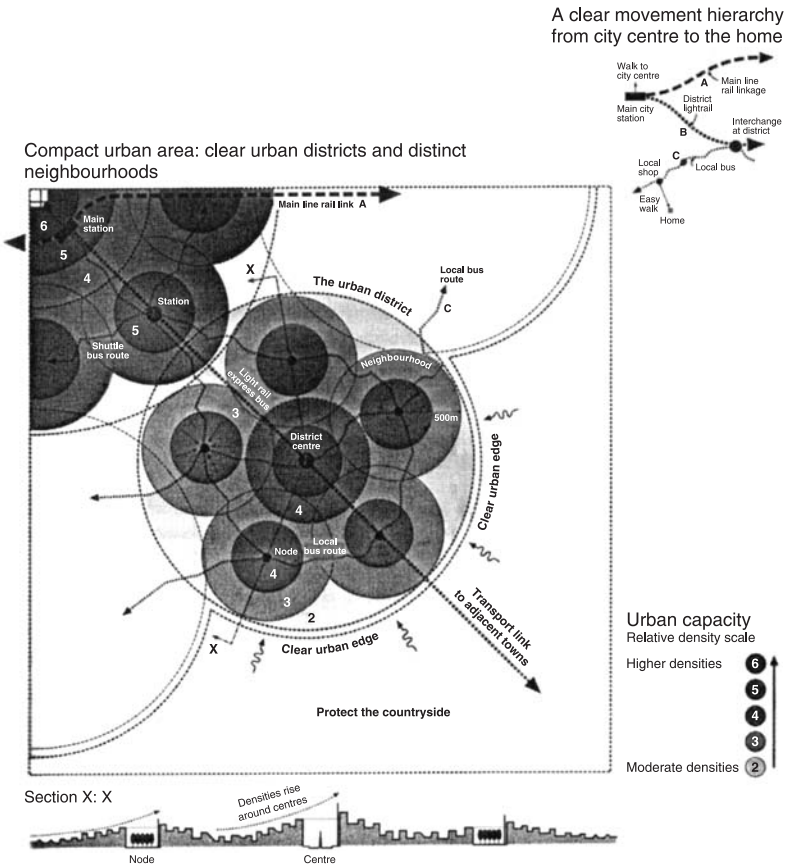

Figure 1.1 Urban structure: the compact city

The Government published, in 1999, *A better quality of Life: a strategy for Sustainable Development in the UK* (DETR, 1999) and Towards an Urban Renaissance (Urban Task Force, 1999). In *Towards an Urban Renaissance* the report of the Urban Task Force very clearly sets out the thinking on the design of sustainable urban form. The current orthodoxy sees the sustainable city or, more accurately, the city that approximates to a sustainable form, as a compact and flexible structure in which the parts are connected to each other and to the whole, with a clearly articulated public space. The public realm connects the different quarters to each other across the city, while also linking individual homes to workplaces, schools, social institutions and places of recreation. Figure 1.1 shows a possible

structure for such a compact city and Figure 1.2 illustrates the linkages for the structure. Lord Rogers' Task Force describes the compact city in this way, 'Urban areas are organised in concentric bands of density, with higher densities around public transport nodes (rail, bus and underground stations), and lower densities in less connected areas. The effect of this compact layout is to establish a clear urban boundary, contain urban sprawl and reduce car use.' The main transport structure is an integrated public transport system, which requires, for reasons of efficiency and economics, residential densities much higher than the twenty to thirty dwellings per hectare now widely used in suburban developments in this country.

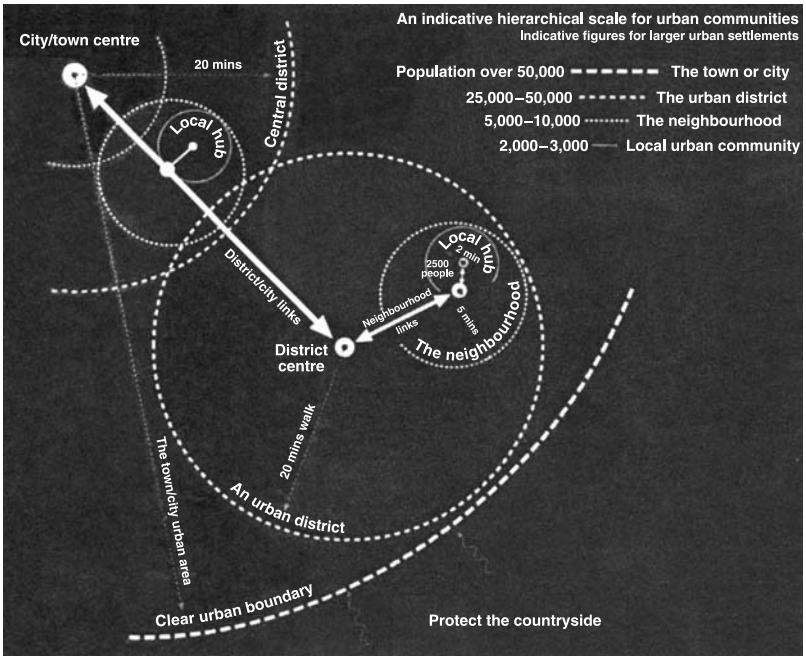

Figure 1.2 Circulation in the compact city

POLITICS AND SUSTAINABLE DEVELOPMENT

The meaning of 'sustainable development' is largely determined by an individual's ideological viewpoint. The present Labour Government in this country – and its Conservative predecessor, along with many major parties in Europe, on discovering the environment as a political issue – would consider itself steward rather than master. This view of man's relationship to the environment and the difficulties the world community faces is shared by the United Nations, the European Union and most of the scientific community, including many in the city planning and design professions. The stewardship perspective is the one that, in the main, has been presented so far in this chapter. It represents the views of those who believe that environmental problems can be solved within the present political and economic system. It is not the only viewpoint. Dobson (1990) distinguishes two diametrically opposed views on sustainability and the environment. The establishment viewpoint he labels 'green' with a lower-case 'g', while those who believe that sustainability depends on the system being fundamentally changed he describes as 'Green' with a capital 'G'. The literature on the topic however, would indicate a spectrum of greens rather than a strict dichotomy: the ideology of all those shades along the spectrum of greenness is determined by their attitude to the environment. The 'Green' ideology or 'ecologism' takes *The Limits to Growth* (Meadows, 1972) as an axiom: 'Greens will admit that the report's estimates as to the likely life expectancy of various resources are over-pessimistic and they will agree that the Club of Rome's world

computer models were crude, but they will subscribe to the report's conclusion that the days of uncontrolled growth . . . are numbered' (Dobson, 1991). Green ideology also questions the current dominant paradigm with its foundation in The Enlightenment, science, technology and the objective of rational analysis (Capra, 1985). The Green's world view removes man from centre stage:

> Green politics explicitly seeks to decentre the human being, question mechanistic science and its technological consequences, to refuse to believe that the world was made for human beings – and it does this because it has been led to wonder whether dominant post-industrialism's project of material affluence is either desirable or sustainable. (Dobson, 1990)

Ecologism goes beyond human-instrumental or paternalistic care for the natural world, and argues that the environment has an independent value that should guarantee its existence. Green ideology puts forward the idea that a new paradigm is necessary for solving the problems now faced by mankind. Such a paradigm should be based upon holism – a systems view of the world – and interconnectedness rather than the present mechanistic and reductionist view of nature.

Two most interesting books – *Greening Cities*, edited by Roelofs (1996) and *Design for Sustainability* by Birkeland *et al.* (2002) – move the tone and content of the discussion of design for sustainable development along the spectrum of greens from the paler tints associated with the establishment view towards the full-bodied saturated hue of Green associated with 'Eco-feminism': 'Feminist theory delves into the reasons for this marginalisation of people and nature in environmental design. Feminists . . . have explained how physical and social space is shaped by dichotomies in Western thought. Mind, reason, spirit order, public and permanence have been considered masculine, while ignorance (the occult), body, emotion, chaos, private and change have all been considered feminine. These dichotomies justify the repression of any subject on the feminine side, as these attributes are deemed inferior in Western patriarchal culture. This repression works by making the inferior subject, such as 'nature' conform to its relevant masculine subject, in this case 'culture'.' (Hirst, in Birkeland, 2002).

If politics – as often asserted – is the art of the possible, then the approach to sustainable development will vary from place to place and from time to time in any given place. Sustainable development policies must be politically acceptable, which in a democracy means welcomed – or at least tolerated – by the electorate. In Britain, neither party is advocating radical redistribution of wealth, though the Government's advocacy of the remission of Third World debt is a welcome move in that direction. Both main parties are committed to economic growth as the engine for sustainable development. Clearly, a pragmatic environmentalist in this political situation would advocate policies, which by 'Green' standards would be inequitable and be more or less inadequate for the purpose of sustaining the environment of the planet for long-term human occupation. While this book will be informed by political realism, nevertheless it is surely not too much to expect political leadership on issues other than war and international terror. From time to time more radical ideals of sustainable development may be advocated, or some of

the many exciting 'Green' experiments reported.

Pearce *et al*. (1989), in their report for the UK Government, *Blueprint for a Green Economy*, attempted to integrate ideas about sustainable development within the establishment viewpoint, fully accepting the political consensus aiming at economic growth: 'The call for lifestyle changes usually confuses two things: the growth of an economy, and the growth of resources used to sustain that economic growth. It is possible to have economic growth (more Gross National Product – GNP) and to use up fewer resources. There are very good reasons as to why we should prefer this solution to the problem to one in which 'lifestyle change' means reducing GNP per capita. The first is that GNP and human well-being are inextricably linked for the vast majority of the world's population. Failure to keep GNP high shows up in the misery of unemployment and in poverty. Anti-growth advocates are embarrassingly silent or unrealistic on how they would solve problems of unemployment and poverty'. A 'hair-shirt' policy – however necessary it is thought to be – has less than universal political appeal.

A major problem for sustainable development is the way that values are attached to the environment. For economists – and particularly those who espouse a neo-classical position – the starting point for the discussion is the trade-off between economic growth and environmental protection. Corrections to environmental problems, it is argued, inevitably carry costs for economic growth, and with it the level of consumption. 'This concern with the cost of environmental measures serves to disguise the problem that neo-classical economics has in acknowledging that distributional issues – both within and between generations – lie at the heart of valuation. The "willingness to pay" axiom, with which environmental goods are accorded value, sets aside the central issues which beset the policy agenda: who should pay, and when?' (Redclift, 1999). The two strategies for attaching value to the environment have problems. The first strategy has developed around ways of imputing market values to environmental costs and benefits, through instruments such as subsidies or tax breaks for environmentally friendly services, with pollution charges, and levies such as road charging for those activities that are less environmentally friendly. The second strategy is to 'internalize' externalities, an approach associated in Germany and the Netherlands with 'ecological modernization': here, environmental costs are refashioned into an environmentally friendly good or service, for example, where waste products are recycled and used to support new industrial outlets. Both strategies assume that individuals act alone to calculate their advantage from making market choices: there is no place for society in this view of the economy, reducing human actions to those stimulated by price signals. This perspective also confuses prices and values, so that we are in danger of 'knowing the price of everything and the value of nothing'.

> Externalities are not merely environmental costs which can be refashioned into an environmental good or service. They frequently have distributive consequences and causes which carry political consequences for global markets . . . environmental economics, at least in its mainstream neo-classical version, requires that we ignore the institutional context for decision-making, which in itself

> determines whether economic models are used at all. (Redclift, 1999)

Clearly, sustainable development without the political pain that would accompany a reduction of resources or a redistribution of existing resources requires some level of growth. There are two difficulties associated with measuring that growth in order to present an accurate picture of well-being and a true picture of environmental depreciation. The first is the method by which economic growth or well-being is measured. The second concerns how we measure the use and abuse of environmental resources. We have seen how difficult it is to measure the value attributed to the environment. 'Economic growth' in the past has been measured using some misleading indicators. GNP is constructed in such a manner that it does not fully express the standard of living of the population: for example, if pollution damages health, resulting in the cost of health care rising, this results in an increase of GNP. A rise in GNP of this nature would seem to be an improvement in living standards and not a decrease in the quality of life. In national accounting, the cost of the depreciation of man-made capital is recorded, while the value of the degradation in the environment or the depreciation of environmental capital is fraught with difficulty. Using up natural resources is equivalent to the capital depreciation of machines and infrastructure. It has, however, been suggested that one could be traded-off against the other, so that if natural resources are used to create man-made infrastructure useful for future generations, then the total stock of capital would be undiminished: such a proposition begs many questions, not least of which is the actual resource depleted in such action and its 'value'. Just how environmental costs are quantified and how GNP takes such costs into account or how it is adjusted to reflect more closely the development of human well-being is debatable.

The debate depicted as 'growth versus environment' is still very much a live issue in the context of sustainable development. In some cases growth may involve loss of environmental quality or a decrease in non-renewable resources. In other situations, conservation of the environment may mean the loss of the possibility of economic growth: 'but sustainable development attempts to shift the focus to the opportunities for income and employment possibilities from conservation, and to ensuring that any trade-off decision reflects the full value of the environment' (Pearce *et al*., 1989). Redclift (1999) would define this as 'ecological modernization', but still within the neo-classical economic tradition. This may be the most that is possible in the present political climate.

Traditional forestry and fishing industries have long practice in the art of maintaining sustainable yields from the environment by harvesting at a rate that is equal to or less than the regenerative capacity of the crop. Failure of the industry to conserve its capital stock would result in the disappearance of the resource, and with it the industry. This analogy is appropriate in some ways for a discussion of sustainable development: it emphasizes a concern for the future and the value of good husbandry, or living within the capacity of the supporting environment. National economies, however, do not rely entirely upon renewable resources, nor does the analogy apply

comfortably to economies which aim to grow or increase output. The over-exploited North Sea fishing grounds may be a better analogy for industrial growth without regard to stocks: a time arrives when the industry itself is in danger, and draconian measures are necessary to conserve stocks and ensure regeneration of the resource. The decimation of the British and Irish fishing fleets are witness to the greedy exploitation of a valuable 'common'. Non-renewable resources such as oil or natural gas when used for human well-being must – if sustainable development is a goal – be capable of being replaced by other renewable resources. For example, the use of fossil fuels should be accompanied by the development of renewable energy sources such as wind, water and solar power. Interesting experiments in the development of renewable energy sources – though not always welcomed by the local population – have been or are being implemented throughout Europe.

Proposals by the Crown Estate to build 250 wind turbines off the Lincolnshire coast, which form part of the world's largest programme of offshore wind farm development, aim to meet some of the objections to such turbines being located inland in sensitive areas of natural beauty. According to UK Government Minister Stephen Tims, 'These wind farms will not only put us on the path to providing 10 per cent of energy from renewable sources by 2010, but they will also help us to meet our aim of generating 20 per cent of our energy from renewables by 2020.' (*Planning*, 4th July 2003 and 9th April 2002). Projects like this are part of the UK energy strategy, but they are thought to be overoptimistic according to the report *State of the Nation 2003* (quoted in *Planning*, 11th July, 2003).

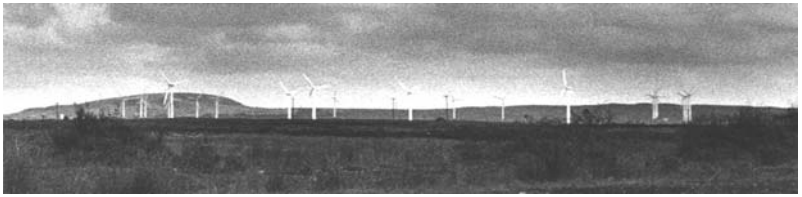

Figure 1.3 Wind farm, Bellacorick, County Mayo, Ireland. The wind farm is sited on 'cut-away-bog'

If that report's prognosis for the parlous state of UK energy supplies when North Sea gas runs out early this century is correct, then projects like this become even more important for the national interest. An earlier example of an experimental wind farm was established in Bellacorck, Mayo, Ireland, on cut-away-bogland: it is far less damaging to the landscape than its near-neighbour, a more traditional generator (Figures 1.3 and 1.4). Projects like this illustrate Pearce's line of reasoning, which leads him to develop further the definition of sustainability: 'So, sustainability means making sure that substitute resources are made available as non-renewable resources become physically scarce, and it means ensuring that the environmental impacts of using those resources are kept within the Earth's carrying capacity to assimilate those impacts.' (Pearce *et al.*, 1993).

Figure 1.4 Power Station, Bellacorick, County Mayo, Ireland. The power station is fed by local peat bogs

ENVIRONMENTAL IMPACT

Central to sustainable development is the assessment of urban projects in terms of their environmental impact. A useful tool used to determine negative environmental impacts is an Environmental Impact Assessment (EIA). The European Community Directive 337/85 on environment impact assessment specifies the types of project for which an EIA is mandatory; these include large-scale projects such as oil refineries, power stations and motorways. This directive has been absorbed into Planning Law in the UK. The further European Community Directive 97/11/EC has led to the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999. The regulations broaden the range of development projects that need an EIA to include projects that fall within the scope of urban design. In addition to the large-scale projects, an EIA is always required if the project is included in Schedule Two of the Regulations; or if threshold criteria are met; or the project is sited in a 'sensitive area'; and is likely to produce 'significant environmental effects'. Moreover, an important innovation introduced in this Regulation is the introduction of statutory size thresholds, which have been reduced to half an acre. Environmental considerations have now become important for projects such as shopping centres, car parks, multiplex cinemas, leisure-centres and sports stadia. Figure 1.5 shows the checklist for assessing impacts of urban developments. The EIA procedure is potentially of great significance for achieving a sustainable urban environment of quality (Moughtin *et al.*, 2003a).

Figure 1.5 Checklist for assessing impacts of urban developments

1 **Local economy**
- Impact on public finances
- Impact on businesses
- Impact on employment
- Change in land values
- Impact on support grants of other agencies
- Impact on land tenure

2 **Local environment**
- Impact on air quality
- Impact on water resources (surface/ground)
- Changes in noise and vibration
- Impact on greenbelt and open spaces
- Impact on natural habitats, species and vegetation
- Changes in land use and densities

3 **Aesthetic and cultural values**
- Impact on urban patterns
- Visual impacts and effects on buildings
- Impact on cultural heritage and designated areas
- Impact on amenity and personal security
- Impact on community cohesion and identity
- Impact on minority groups and equal opportunities

4 **Infrastructure**
- Impact on public utilities
- Impact on public services and facilities
- Impact on emergency services
- Impact on traffic conditions
- Impact on public transport
- Impact on health and safety

CONCLUSION, URBAN DESIGN AND SUSTAINABLE DEVELOPMENT

The objectives for an agenda of urban design in a regime of sustainable development would emphasize conservation of both the natural and built environments. There is a need to use already-developed areas in the most efficient and effective way, while making them more attractive places in which to live and work. Principles of sustainable urban design would place

1.6

1.7

1.9

Figure 1.6 Cushendun, Northern Ireland. Conservation area
Figure 1.7 Cushendun, Northern Ireland. Group of buildings designed by Clough Williams-Ellis
Figure 1.8 Cushendun, Northern Ireland. Group of buildings designed by Clough Williams-Ellis
Figure 1.9 Cushendun, Northern Ireland. Group of buildings designed by Clough Williams-Ellis
Figure 1.10 Cushendall, a model for Clough Williams-Ellis

priority on the adaptation and re-use of existing buildings, infrastructure and roads, together with the re-use of recycled building materials and components. The concept of the conservation area, which has been so successful in the past in places such as Cushendun and Cushendall, Northern Ireland and in Wirksworth, Derbyshire, may need to be extended to less visually noteworthy existing areas of cities and towns, for reasons other than narrowly aesthetic (Figures 1.6–1.13). Where new development is necessary, the pattern of such development and its structures should

1.8

1.10

Figure 1.11 Wirksworth, Derbyshire. Conservation area

Figure 1.12 Wirksworth, Derbyshire. Conservation area

Figure 1.13 Wirksworth, Derbyshire. Conservation area

minimize the use of energy consumed in travel between essential activities and also in the operation of the buildings. Sustainable development places a premium on the conservation of natural resources, wildlife and habitat protection. Sustainable development also assumes high degrees of self-sufficiency at all levels of settlement structure. Part of this self-sufficiency is in food production and waste disposal. It may be prudent to conceptualize urban structure as integral to the bioregion and the countryside as integral to the urban structure, in which case the countryside – along with its capacity for food production – would be considered to penetrate right to the heart of the city.

ENERGY, BUILDINGS AND POLLUTION

2

INTRODUCTION

It is generally accepted that global warming is happening, and that the protective ozone layer remains in danger. Much of the atmospheric pollution – which in part is responsible for global warming – is caused by the burning of fossil fuels in the creation of energy to support city life. Global warming and its possible effects on, for example, European ski slopes, the submerging of populated islands, the loss to Britain of our climate-moderating Gulf Stream and the increasing occurrence of violent storms, is common knowledge. However, these are by no means the only environmental hazards stemming directly from current urban lifestyles on the planet. Other hazards include: contamination of water sources, overloading of environmental sinks such as the great river estuaries, acid rain, and air pollution in cities. Much of the pollution causing environmental damage can be attributed directly to the building process. For example, 50 per cent of the world's fossil fuel consumption is directly related to the servicing and use of buildings. In addition, energy is used to make building materials, to transport them to the site, and in their erection as part of the building. The servicing and use of buildings alone, results in the production of 50 per cent of the world's output of carbon dioxide, amounting to about one-quarter of the greenhouse gases.

Designers, developers and users of buildings – through the careful choice of environmentally friendly materials, the use of an ecological design approach, and sensible care and use of the building – could reduce considerably the quantities of pollutants entering the environment (Birkeland, 2002). Many examples of energy-sensitive building designs will be referred to throughout this book. Such design starts from an understanding of the building's 'energy footprint'. The simplest meaning attached to the term 'building's footprint' is the amount of site it covers. The 'energy footprint' uses the analogy of the building footprint, and extends the concept

to include the energy necessary to sustain the structure throughout its life. It includes the following components:

(1) The environmental capital inherent in the construction – that is, the energy and resources expended in the manufacture and transportation of the materials, the energy required to prepare and service the site, and then construct the building.
(2) The energy footprint extends to include the energy used to sustain and maintain the development and its daily service requirements once it is occupied. This energy which Vale and Vale (1991) call 'revenue energy', may be as much as three times the energy used in construction, the 'capital energy'.
(3) A further component of the footprint is the energy that the occupants expend in moving between the development and the rest of the city, together with the energy required to feed the occupants.
(4) Finally there is the energy required to demolish the development and clean the site once it has reached the end of its useful life.

2.1a

2.1b

2.1c

Figure 2.1 Pollution caused by the car. (a) Quarry to provide the materials for road construction; (b) estaleiro: storage of materials for road building and infrastructure development, once the site of an extensive vineyard; (c) dump for used cars

Building operations affect the environment in another important manner. The extraction and processing of raw building materials has an immediate and clearly visible effect on the landscape. The quarries for the production of aggregate for concrete, and those for brick-making clay, have a particularly devastating effect on the environment. They can remain eyesores for decades, often in the most impressive landscapes. The routes to and from such quarries can expand the devastation into surrounding areas (Figure 2.1). Hidden from immediate view is the effect of imported materials: hardwood, for example, when taken from the great rain forests, does damage to an irreplaceable resource, which in turn provides an environmental service as a vast carbon sink helping to cleanse the atmosphere of man's polluting waste.

The complete nature of the energy impact of a development is indicated by an analysis of the construction's 'energy footprint', and this is the starting point for the design of sustainable buildings.

A TIMELESS WAY OF BUILDING

We do not have to search far for ideas for sustainable building: they are all pervasive in our lost constructional traditions. The solutions to present environmental problems, however, are probably not to be found in the traditions of 'great architecture'. It is more likely that they will be associated with the 'prose of architecture', as Summerson called the everyday buildings that have always formed the greater part of towns and cities. Monumental architecture of the past with its profligate use of resources does not act as a suitable model for Green Architecture for the twenty-first century (Vale and Vale, 1991). It is the vernacular or 'A Timeless Way of Building' to which the urbanist must turn for inspiration and guidance (Alexander, 1979a). Good urban design – that is, the organization of public space – results not necessarily from the juxtaposition of great works of architecture, but often from the pleasant arrangement of the homes of the not so powerful, together with the structures that house commercial, educational and other institutions which make the city work. One aim of this chapter is to discover the lessons that can be learned from the timeless ways of building that can be found in the native traditions of the vernacular. Such building traditions in the past have produced many delightful urban environments, which have formed the backcloth for an occasional glittering monument (Figures 2.2–2.5). This is not a treatise in pursuit only of a functional design philosophy, important though that may be: it is concerned also with the poetry of sustainable development or the quality of the environment.

2.2a

2.2b

Figure 2.2 Vernacular architecture. (a) Cottage in Chipping Campden; (b) Main Street, Chipping Campden

CONSERVATION

In pre-industrial society, with the exception of the monumental buildings of political, civic or religious importance, construction work was carried out very much as a case of necessity. A new structure, the replacement of an existing structure or its extension was

2.3a

2.3b

Figure 2.3 (a) The Guildhall of the Holy Trinity, King's Lynn; (b) Steep Hill, Lincoln

a development not undertaken lightly. This is still the case in the vast squatter cities of the Developing World. This seems to contrast markedly with conditions prevailing today, or in the recent past in countries of the West such as Britain. Built-in obsolescence appears to be a feature of the current ethos of a society, which changes some of its buildings and their styles with as much ease as it changes its clothes to suit the latest fashion. Clearly, construction work still requires a perceived need and an economic justification before it is undertaken. Nevertheless, in our consumer society the growth in the economy is, to some extent, driven by the individual's desire and ability to acquire the latest model in cars or higher space standards and equipment in the home. 'Keeping up with the Joneses' ensures the rapid replacement of comparatively new equipment, last year's model being consigned to the dustbin, often when it still has many years of useful life. This attitude permeates the construction and development industry where buildings are designed to meet immediate business requirements and are located on the most convenient site with easy access for the motor car. One of the reasons given for changing the current planning system is to help business to achieve its potential. 'There will be a fundamental change in planning so

2.4a

2.4b

Figure 2.4 (a) Derbyshire; (b) Kettlewell, Yorkshire

2.5a

2.5b

Figure 2.5 (a) Hawkshead, Cumbria; (b) Speke Hall, Liverpool

that it works much better for business' (DTLR, 2002). Little seems to have been learned from the Canary Wharf experience, where similar planning arrangements were made. The use of environmental assessment limits possible damage inflicted on the environment from any proposed developments: however, it still remains to be seen how successful this technique will be in a business-friendly environment. Some of the headings shown in Figure 1.5, 'The checklist for assessing impacts on urban developments', act as surrogates for the energy inputs into the project. Nevertheless, a knowledge of the effects on the environment would be greatly enhanced by a full evaluation of a project's energy needs over its lifetime.

One principle of Green Development is: not to build unless it is absolutely necessary, as other ways of meeting the need should be examined, in the first instance. The onus for proving the desirability of new development in a sustainable city would be on the developer. Conservation in these circumstances would be the natural outcome of a development philosophy that has sustainability as its primary goal. Conservation includes extending, adapting and finding new uses for existing buildings wherever feasible: demolition would occur only after a detailed environmental and energy appraisal (Figures 2.6 and 2.7). The reason for giving priority to conservation as opposed to demolition and replacement is the pursuit of policies for the efficient and frugal use of resources, particularly energy from non-renewable resources.

The answers to the questions: 'to build or not to build?' and 'to conserve, or demolish and reconstruct?' are not as straightforward as they would appear from the last paragraph. Existing structures embody quantities of energy capital: their demolition usually means the loss of that capital, unless some of the material can be re-used, usually in a low-grade capacity as hardcore or land-fill. An existing building, however, may require energy capital inputs in terms of maintenance, new equipment and insulation, or it may consume costly energy revenue to keep a worn-out structure operating. A new structure replacing an old building disposes of energy capital on demolition and uses energy capital for the replacement building. If the new structure is super-insulated and is served by passive or solar heating, it will use little or no energy revenue from non-renewable sources. The analysis of an energy audit covering the lifespan of the

Figure 2.6 The Lace Hall, Church conversion, Nottingham

Figure 2.7 Church conversion to shops, Stamford

Figure 2.8 Eighteenth-century façade, Stamford

development would make it possible to judge the outcome most likely to accord with the principles of sustainability and be more closely in tune with the public good.

Numerous examples of the re-use of, refurbishment and extension of structures can be cited from the past. In the pre-industrial city a building, however renowned, was remodelled for its new purpose without the sentiment we now attach to this process. An examination of many English parish churches, for example, reveals a mixture of many styles developed over many centuries. Old walls, details and materials were re-used, while extensions in the then latest style were woven into the existing fabric without regard to the destruction of the architectural integrity of the original building. The result is often a fine building that is much loved and admired by succeeding generations. The most common feature of the medieval city, the dwelling, was recycled in a number of ways. Parts of a timber-frame structure from an earlier building were commonly used again when a replacement building was necessary, while in towns such as Stamford whole medieval structures lie buried beneath a later façade dating from the eighteenth century (Figure 2.8). Even in that most classical of structures, the Parthenon, parts meant for an older temple were re-used in the building that presently occupies the site on the Acropolis in Athens (Carpenter, 1970). The lessons that such examples teach is a respect not for the aesthetic form, although the results are often great works of architecture, but a common-sense approach to the idea of the stewardship of property and the good husbanding of scarce resources: in the case of buildings, the scarce resource is the hard-won material from which the structure is made. How different is this attitude from that which underpins some

of today's conservation. Often a façade of questionable aesthetic value is shored up at great expense in terms of time, money and energy inputs (Figures 2.9–2.11). Behind the protected shell the inner building is gutted and remodelled for its new purpose. Such is the sentimental approach to conservation. If energy conservation suggests the external remodelling of a façade – which is often the case for the purpose of installing effective insulation – then this factor would take priority over aesthetic considerations for the purposes of achieving a high degree of sustainability. Sadly, it would appear that

Figure 2.9 Façade conservation, Amsterdam

Figure 2.10 Façade conservation, Nottingham

Figure 2.11 Façade conservation, Nottingham

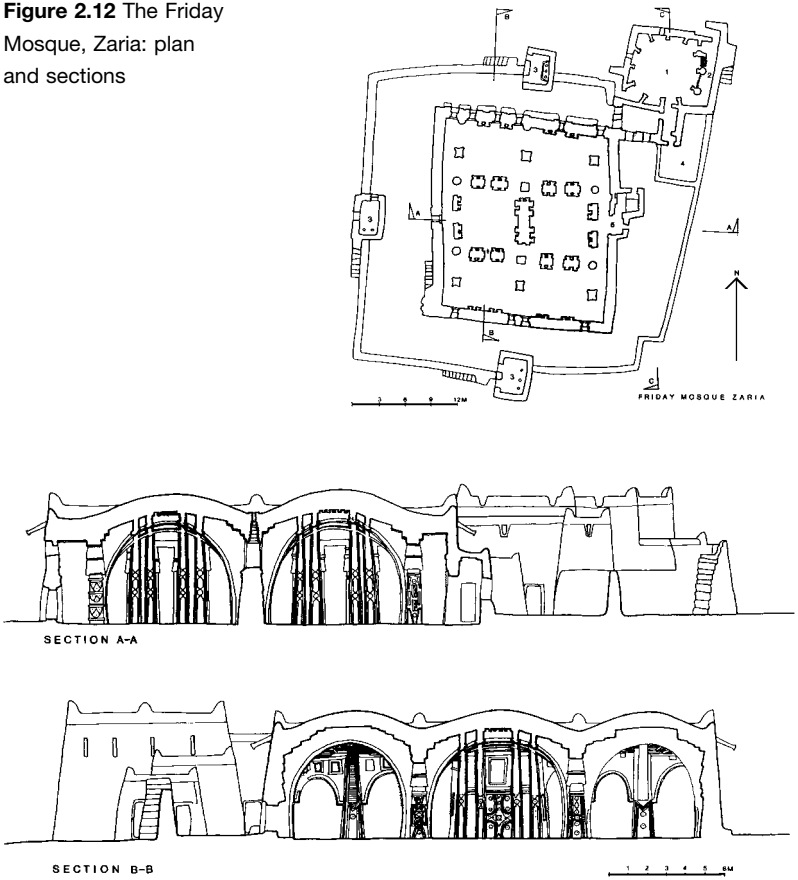

Figure 2.12 The Friday Mosque, Zaria: plan and sections

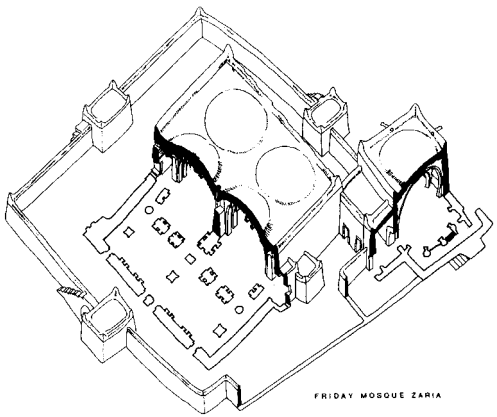

Figure 2.13 The Friday Mosque, Zaria: axonometric

there is little confidence in the ability of modern urban design to achieve solutions to equal those of city builders in the past. Where can we find a better model for conservation than Stamford, where whole frontages were remodelled in the eighteenth century to make the buildings more modern but also more fireproof – an important consideration after the destruction to timber-framed buildings caused by the Great Fire of London in the previous century.

BUILDING MATERIALS

All building materials originate in the earth. Some materials such as clay and mud require only man's efforts to make a structure from them. Most people on this planet live in buildings made from earth (Moughtin, 1985). Earth building can achieve great heights of structural and aesthetic achievement, such as the engineering feats of the Hausa people of Nigeria (Figures 2.12–2.14). Earth can be used in a variety of ways which encompasses a wide range of architectural styles and aesthetic appeal (Williams-Ellis *et al*., 1947; Guidoni, 1975; Dethier, 1981). Earth has also been used as a building material to house the poor in the slums of the burgeoning cities of the developing world. Building from earth does least damage to the environment: it is close to the building site and so does not involve transport energy costs. Moreover, when no longer required, the building decomposes naturally and without pollution, returning to the earth from whence it came. Amongst the Hausa people it is customary for the occupier of a hut to be buried beneath it when he or she dies. The hut eventually collapses, forming the burial mound. This is possibly

Figure 2.14 The Friday Mosque, Zaria: interior

the ultimate form of sustainable building, although it is not presented as the model for life and death in central London. Nevertheless, it can stimulate the imagination as an analogy for sustainable development. The sod or earth roof has a long history reflecting the value of soil and turf as shelter from heat, cold and rain. The earth roof still has great potential in future urban centres of the developed world where it forms valuable open space in dense developments; it can improve air quality, modify microclimate, retain rainwater and provide the base for urban agriculture (Osmond, in Birkeland, 2002).

Timber is another building material that has served man well in the past and has been associated with great architecture and wonderful decorative

Figure 2.15 Kristiansand, Norway: timber building

effects (Figures 2.15 and 2.16). It is also a material eminently suited to recycling when the building, of which it forms a part, is defunct. Timber can be 'farmed' – that is, it can be planted, grown, harvested and

Figure 2.16 Kristiansand, Norway: timber building

replaced in a managed landscape. Once its useful life is complete, like clay, if not burned, it returns to the land without pollution. In Medieval Britain timber was a local home-grown product. Nowadays, timber for construction is largely imported at great cost in terms of the expenditure of energy for transportation. It would take some time to develop in Britain the native forests from which a sustainable harvest of timber can be obtained for the construction industry. Nevertheless, if Britain is to boast a sustainable society this must be one of the country's long-term objectives: until such times it is possible to specify the use of timber from sustainable sources, a common occurrence. (For a good example of environmentally sensitive urban design, using timber, see The University of Nottingham, Jubilee Campus, in Moughtin *et al*., 2003a; pages 90–97 and Figures 4.21–4.30.)

Most building materials are not as environmentally friendly as earth when unbaked, or timber – particularly when taken from a local sustainable source. Deciding which combination of building materials causes least environmental damage is complex and a question of balance between competing factors. All constructions are *per se* damaging to the natural environment, some more than others.

In choosing a building material the first consideration is the amount of energy used in its manufacture. 'As a rough guide, however, the energy intensiveness of a building material will act as a guide to its greenness' (Vale and Vale, 1991). Building materials can be classified into three broad groups according to energy content: low, medium and high (see Table 2.1). The energy content of materials shown in Table 2.1 is measured in kilowatt-hours per kilogram. In construction work, low-energy materials such as sand and gravel are used in bulk, while high-energy materials such as steel or plastic are used in small quantities, often precisely and economically dimensioned. Clearly, the weights of each building material must be known if the designer is to estimate the total energy content of the completed construction. Table 2.2 shows the estimated energy content of three building types, which seems to indicate that small-scale traditional domestic type buildings are by far the

Table 2.1 Energy content of materials (Vale and Vale, 1991)

Material	Energy content: kWh/kg
Low-energy materials	
sand, gravel	0.01
wood	0.1
concrete	0.2
sand-lime brickwork	0.4
lightweight concrete	0.5
Medium-energy materials	
plasterboard	1.0
brickwork	1.2
lime	1.5
cement	2.2
mineral fibre insulation	3.9
glass	6.0
porcelain (sanitary ware)	6.1
High-energy materials	
plastics	10.0
steel	10.0
lead	14.0
zinc	15.0
copper	16.0
aluminium	56.0

Table 2.2 Energy intensity of three building types (Szokolay, 1980; quoted in Vale and Vale 1991)

	kWh/kg
domestic buildings	1000
office buildings	5000
industrial buildings	10000

least energy-intensive structure. This might suggest that the more traditional scale of built form is more appropriate for the sustainable city.

The energy content of a building material is connected with the nature of the process of refinement. For example, the energy content of earth, mud or clay is zero, while in its burnt form as bricks the figure is 0.4 kWh/kg. Generally, the low-energy materials tend to be the least polluting as less energy has been used in their manufacture. It could be argued that for purposes of achieving sustainable structures, low-energy materials should be used in preference to those of high energy content. This oversimplification has to be qualified with a strong proviso. Some forms of insulation are high in energy content, but being light result in lower energy density. More importantly, an insulating material like this – when used in the correct manner – may reduce considerably the energy demand during the lifetime of the structure. The consideration of insulation may become of increasing importance if, as feared, global warming, over the next few decades, increases the length and severity of winters in this country.* It may be prudent to prepare for this possibility and aim to 'super-insulate' all new buildings, working to the highest standards applied by our northern European neighbours with triple glazing as the norm.

Another consideration in the choice of green building materials is the energy expended in their transportation to the place of manufacture and from there to the building site. As we have seen with timber, the energy used in importing timber into this country may outweigh its advantages in terms of its low energy content. It may be useful to examine the building traditions, which pre-date the industrial revolution, when we seek a green alternative to present procedures: not it must be said in nostalgia for a return to a mythical golden age of the past, but simply to assist in the difficult search for sustainable urban forms. This country has a rich and fine-grained history of vernacular or regional architecture. The regional architecture of Britain is deeply embedded in the landscape and its underlying geography (Clifton-Taylor, 1972). The architectural landscape ranges from the timber and plaster facades of Chester, the red brick of Kent, the honey-coloured stone in the Cotswolds, to the dour stone of Yorkshire (HRH, The Prince of Wales, 1989). It is not, however, the intention here to extol the aesthetic and appealing virtues of this intricate web of vernacular architecture, which can also be found in other European countries, but to understand why it developed in that way and to see if any of those conditions might prevail in communities seeking a more sustainable future (see Figures 2.2–2.5).

Until the later stages of the industrial revolution in the nineteenth century, settlements were constructed largely from building materials obtained close to the site. Bath, for example, was constructed in the eighteenth century from Bathstone found in the quarries of Ralph Allen, one of the

*It has been suggested that with the melting of the ice cap the future of the Gulf Stream, which modifies Britain's climate, is threatened. Britain's climate, as a result of global warming, may therefore paradoxically be colder and resemble more closely conditions found in Northern European countries or Canada which are on the same latitude.

developers in that city. The city of York, including its great Minster, is built of Yorkstone, while Edinburgh, like the rock that supports its castle, rises in grey granite from a Pre-Cambrian foundation. The reason for the use of local building materials is not difficult to see. At a time when travel was difficult and transportation costs high in relation to other costs, it would seem reasonable to build with those materials close to hand. Within the structural limits of local materials the latest style in architecture was freely and imaginatively interpreted. Special or non-local materials were sometimes used but, being scarce and therefore precious, they were kept for ornamental work (Moughtin *et al*., 1995). Brick became the common structural material used throughout this country, particularly for domestic work; nevertheless, local brickworks supplied local markets. Nottingham with its bright red, almost vermilion, hard-pressed brick, or the ubiquitous of the softer brown brick in London, are evidence of a regional variation and use of this common material. Clearly, a green approach to the choice of building material for urban developments would be conditioned by a strong preference for materials originating in the local region: it would tempered by other considerations such as the availability of suitable local materials and the balance of capital energy inputs from transportation as opposed to the energy content from manufacture. In a more fully developed sustainable society than exists today – and one which may be some way in the future – regional markets in building materials may become a possibility, so stimulating a regional pattern of architecture (Amourgis, 1991).

Materials such as stone – and to some extent brick – require labour to form, dress and erect them. This often labour-intensive work involves entirely renewable energy, and furthermore extends work and remuneration to additional numbers in society, fulfilling one aim of a sustainable society, which is to pursue more equitable policies: 'A fundamental Green principle is that labour is a renewable source of energy. It follows that its substitution in the form of craftsmanship for high-energy expenditure on materials and manufacturing processes, is environmentally desirable. Another principle is that energy should be expended as closely as possible to its need. The original village or noble estate supplied its own blacksmith, farrier, dressmaker, hairdresser, carpenter, joiner . . . and so on, and a great deal of its own food'. (Fox and Murrell, 1989).

A return to the feudal system is not being advocated here. Nevertheless, the model for a sustainable building industry may have more in common with the scale and structure of the black building economies currently responsible for the massive expansion of Third World cities than the Developed World's corporate engineering industry which in this country has been responsible for, and is still engaged in, the expansion of the motorway system. Clearly, the sustainable building industry of the future is unlikely to be engaged in the mass construction of those high-rise housing estates typical of the last century.

Because of the need to minimize carbon dioxide emissions, it is most appropriate to invest in new buildings with a long life and low energy use. There are a growing number of such buildings throughout Europe, a good precursor for a green future. Many such buildings are, in themselves exciting, architectural statements (see for example The

Queens Building, School of Engineering and Manufacture, De Montfort University, Leicester and NMB Bank Headquarters in Amsterdam; Figures 2.17–2.21). Buildings such as these make great savings in the energy used during the lifetime of the building, which offsets the one-off investments in materials with a high embodied or capital energy cost. Since trees take up carbon dioxide from the atmosphere, then to some extent the capital energy content of the building, that is, some of the damage done to the environment by it, could be defrayed or mitigated by the planting of trees. By balancing the planting of trees, in sufficient numbers, with the estimated emission of carbon dioxide during manufacture of materials for development, it would be possible in theory to develop a sustainable building industry. For example, 'A typical three-bedroom house has materials with a capital energy content equivalent to the generation of 20 tonnes of carbon dioxide and would need about 20 trees to offset this over a 40-year period'. (Vale and Vale, 1993). The linking of the planning of new development with tree planting would be, in effect, an environmental tax and would be a valuable move in the direction of sustainable development as, indeed, would a labour-intensive building industry dependent upon regional building materials.

Reducing or minimizing embodied energy in a building, together with its operating energy, has considerable environmental benefits. However, energy consumption is only one of the environmental impacts of building materials. Ecological sustainability involves a more holistic evaluation of the environmental impacts of building materials. Sustainable natural processes are characterized by their cyclical nature and by

Figure 2.17 Queen's Building, School of Engineering and

Figure 2.18 Queen's Building, School of Engineering and Manufacture, De Montfort University, Leicester

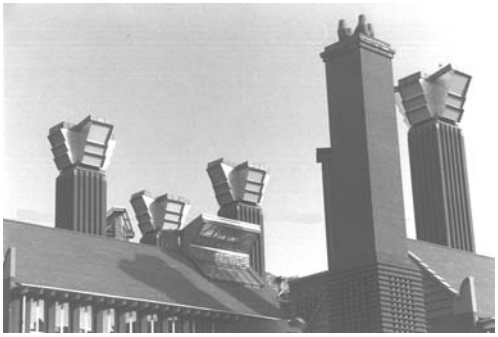

Figure 2.19 Queen's Building, School of Engineering and Manufacture, De Montfort University, Leicester

Figure 2.20 NMB Bank Headquarters, Amsterdam

Figure 2.21 NMB Bank Headquarters, Amsterdam

the production of very little waste. The analogy of the cyclical nature of natural processes has been the impetus for the development of Life Cycle Assessment techniques (LCA). LCA or 'cradle to death and rebirth' analysis of buildings is a form of 'design for deconstruction' and, being wider in its remit than purely energy considerations, is the holistic method most appropriate for ecological design.

BUILDING DESIGN

A number of factors other than the building materials from which it is made, determine the degree to which a building is green. The shade of the green label which can be assigned to a building reflects its sustainability over a long lifespan with low energy inputs. It is dependent upon the location of the building in relation to its accessibility, the geometry of the building envelope, the relation of the building to its site, and also on the ways in which the users and the builders themselves are affected by the building.

Access to buildings will be dealt with more thoroughly in Chapter 3, in which transportation in the city is examined. It is sufficient to point out here that the 'green building' set in a park on the periphery of a city served only by roads used entirely by the private motor car is a contradiction in terms. Any energy savings made by the greening of the building would be lost during the building's lifetime through the expenditure of energy in maintaining the essential links with the users. The first requirement of the green building – however pale the shade of green – is a satisfactory location; that is, it should be in close proximity to the public transport system and sited within walking and cycling distance of important connected activities. Any other location is less sustainable because it increases transport energy costs.

A building which can be used for many different purposes and is easily adapted to serve many different activities during its lifetime has a flexibility that reduces the need for demolition and rebuilding to serve changing needs (Bentley *et al.*, 1985). Buildings are usually designed to meet the specific requirements of one particular owner or organization. This results in highly specialized buildings created by a designer for his or her clients. During the building design process, thought may be given to the current users and their needs, but very little to the general public and none at all to future generations. A building designed in this way

to accommodate specialized activities is often difficult to adapt to changing needs. This is in marked contrast to the flexibility that is often a feature of traditional building design. Behind the ordered classical facades of the Georgian and Regency terrace is an interior which, despite the constraint of a load-bearing structure, has proved flexible enough to be adapted for offices or for multi-family occupation. Such flexibility in internal planning has been termed 'robustness'. A fine example of 'robust' design is Abercrombie Square, Liverpool, where three sides of the square's Georgian terraces have been converted for the use of The University of Liverpool (Figure 2.22). The green approach to urban design supports and fosters architectural solutions that exhibit the flexibility typical of the Georgian terrace – that is, building designs – which, because of their geometry and internal structural organization, are capable of a variety of uses.

Achieving a sustainable and flexible built form poses a great challenge to the designer: an examination of some of the traditional forms developed in the past, both in the temperate climatic zones and in the tropical regions of the world may present some useful ideas as a starting point in the search for an innovative but essentially simple urban architecture.

The first limitation imposed by a strict interpretation of the discipline of sustainability is a maximum building height normally of four stories: there may indeed be cases for exceeding this limit in the centres of some of our great cities, but generally speaking if sustainability is the aim, then four storeys is a reasonable maximum building height for most urban development. At this height, most activities — including residential — can be accommodated without the need for the able-bodied to use a lift. It

Figure 2.22 Abercrombie Square, Liverpool

may, however, be necessary to organize the structure so that those with special needs are catered for on the ground or first floors. The width of a building in temperate climates should be determined by the conditions necessary to achieve good natural lighting in all main rooms. Since the best-lit areas in the building are within 4 metres of the external walls, the optimum width of the building is between 9 and 13 metres (Bentley *et al.*, 1985). A 9-metre-wide building permits the planning of two well-lit rooms on either side of a corridor, while a building greater than 13 metres wide with deep floors has an excessive amount of badly lit space in its middle section. A plan shape, 9 to 13 metres wide, is capable of a number of different arrangements, and so can accommodate different activities. Incidentally, plan shapes of these dimensions not only ensure good lighting conditions but can also be ventilated naturally.

A number of authors have suggested that the sustainable city is one where mixed land uses is the norm, as opposed to the

'modernist city' where urban functions were separated in the form of large zones of single use (Vale and Vale, 1991; Owens, 1991; The Urban Task Force, 1999). The vitality of the city can be enhanced further if a mix of activities occurs within buildings, in addition to those that occur at the scale of the neighbourhood or locality. The mixing of functions within buildings is likely to maintain activity in the streets at all times in the day. Buildings designed for a combination of, for example, flats and office space are more likely to be successful if the width of the block is about 10 metres; building blocks wider than 10 metres are unsuitable for double-aspect residential accommodation, which is the most flexible housing type in the British climate, where it is important for sunlight to reach all the main rooms. With the double-aspect home, most orientations are acceptable. One of the standard building blocks of the northern European city is, therefore, 9 to 13 metres wide and about four stories high: it has a traditional pitched roof to protect it from snow and rain, while at the same time providing an opportunity to insulate the building adequately. The three- to six-storey linear building block is found in many European cities: as the standard urban built form it serves the purpose well and is capable of many interpretations.

In contrast, other building forms have developed appropriate to conditions in tropical regions of the world. In the harsh climate of the humid tropics, conditions are such that good natural ventilation is critical. These conditions impose certain requirements on the plan form of a building and its cross-section: ideally, buildings should be one room wide and have an access veranda along one side with openings in both long facades to ensure cross-ventilation; this is essential if air-conditioning is to be avoided. In contrast again, the traditional building form in arid tropical regions is often deep with internal spaces that are lit and ventilated from secondary sources or from deep-shaded courtyards (Moughtin, 1985; Koenigsberger *et al.*, 1973).

A key element in the design of green or flexible buildings, which are capable of modification for different activities, is the staircase and associated facilities. The staircase, landing and service ducts are usually grouped to serve a number of units on different floors. When a building changes use and is remodelled internally, these shared facilities – since they serve the same function for the new use – remain unchanged. Because this service element is so expensive to change during modification or refurbishment, it is often referred to as the 'hard zone'. 'Usually these spaces are 'hard', and . . . must be positioned where they will not restrict the use of the remaining space'. (Bentley *et al.*, 1985). The optimum position for such hard zones is at intervals of 10 or 20 metres; at these intervals a variety of spaces can be arranged, including small or double-aspect office units and also larger floor areas of open office space. Such distributions of service core, or hard elements can also be used for residential purposes. For example, in buildings that have hard zones 10 metres apart it is possible to accommodate a single floor flat (*apartment*) of 50 square metres, a two-storey maisonette (*duplex*) of about 100 square metres, or a three-storey town house of 75 square metres.

The building envelope – that is, the external walls and roof together with the ground slab – is the part of the building where heat loss is registered. It is here also that the building must be made weatherproof in other ways. A building which has the

lowest ratio for the area of the envelope to the usable floor area, not only costs less to build for any given building volume (assuming the same materials are used in the construction), but also uses less energy to construct and is more efficient in terms of energy use during its working lifetime. Energy costs – both the energy expended in the construction and in the running of the building – tend to increase as the ratio of the area of the building envelope to the usable floor area increases. A sustainable building is, therefore, one where its envelope is the smallest for a given usable floor area. The single-storey square plan has an advantage over the elongated rectangular plan shape, but two-, three- and four-storey buildings are more effective than both in terms of energy conservation.

The relationship of energy expenditure and building geometry has been considered so far for buildings standing in isolation as three-dimensional forms in space. In cities this is not always the case. It has been argued elsewhere, in this series of books on urban design, that the city comprises of spaces surrounded and formed by buildings (Moughtin, 2003). In terms of energy conservation there is much to commend this built form. By grouping small units together, the semi-detached house rather than two detached houses, or the terrace rather than semi-detached houses, it is possible to make savings in the area of external walling or envelope. Furthermore, if the plan shape of each unit is changed from a square to a rectangular one with a narrow building frontage, then additional savings in the area of the external wall can be made: there is then a corresponding conservation of energy. By composing the individual units into three- and four-storey blocks of flats or *apartments*, additional savings in the size of the building envelope is possible without the energy expense of providing lifts. This rather oversimplified argument presupposes that disadvantaged or special needs groups are allocated ground-floor accommodation.

Further energy savings can be made by designing the building to work well within the conditions set by the local climate. The vernacular tradition has much to teach in the art of relating the building to its site. The traditional dwelling in countries with colder climates is often sited just below the brow of a hill on a southward slope: it is protected from the cold northerly winds by the hill, which is often augmented with a shelterbelt of trees and bushes. The northern face of the building usually has few openings, and if it is a farmhouse it may be further protected from the weather by outhouses. The southern façade contains the main windows maximising the benefit of any sun. This common-sense approach to the location of a building on its site and the organization of the building elements to mitigate the worst effects of a cold winter climate has valuable lessons for the greening of building design. It would seem from this model that the ideal orientation for a building in our climate is with its long axis running east to west. The northern façade should be fronted by accommodation not requiring good views or good lighting, and by rooms where the highest levels of heating are not necessarily desirable – that is, this wall acts a barrier between the cold outside world and the snug interior living rooms. The type of accommodation facing north would be circulation space, storage, toilets and, possibly, working kitchens. In contrast, the rooms with a southern aspect would be the living rooms and bedrooms. Large windows are desirable in the southern face of the

Figure 2.23 The Orangery, Wollaton Hall, Nottingham

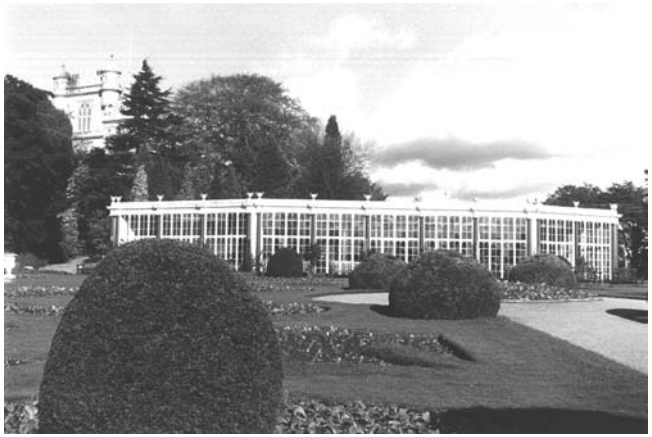

Figure 2.24 The Orangery, Wollaton Hall, Nottingham

building to provide not only light but also passive solar heating.

Passive solar energy can provide up to 20 per cent of the annual space heating required for a well-insulated building, but it does have implications for the orientation of the building. For effective solar gain, window openings should be in walls with an orientation within 30 degrees east or west of south with a southern orientation being the optimum position. There are, however, problems with large south-facing windows in domestic buildings in this country where we place great emphasis on privacy: it is usual, particularly in residential areas, for frontages to face frontages. An arrangement where the front of one house overlooks a neighbour's backyard is generally unacceptable in 'Middle England'. A north–south orientation for the long axis of terrace housing is more suited to British conditions. With this orientation it is possible for the front of one house to face the front of the house opposite while both living rooms receive sunshine, one side in the afternoon and the other side in the morning. Large south-facing windows designed to generate solar heating, if overlooked, will be unacceptable to the occupant in this country and will be draped in net curtains to re-establish privacy, so defeating the original purpose. In buildings not dominated by the cultural need for privacy, such as schools, universities and offices, it may be possible to give greater priority to an orientation which maximizes the use of passive solar heating.

The conservatory – a common feature of many Victorian and Edwardian villas (Figures 2.23 and 2.24) – is becoming increasingly popular with home owners. It is a reasonably low cost and culturally acceptable method of passive solar heating in the home. It also forms a useful buffer between the external climate in winter and the interior of the building. The conservatory is most appropriately placed on the south, east or west walls. If not properly designed, the conservatory – even when well sited – can be a source of heat loss in the winter and cause overheating in the summer: adequate ventilation is essential, and the wall on which it is placed should be well insulated and fitted with double-glazed windows. Buildings

designed specifically for use with a conservatory or sunspace offer great scope to create comfortable spaces, and energy saving. The conservatory also facilitates food production, its traditional role in the past. In addition, the sunspace or conservatory offers an opportunity for innovative design. The glass atrium and the street arcade are both features which, like the conservatory, modify the internal climate. They also enhance natural lighting within a building complex while being exciting visual additions to the urban realm (Figures 2.25–2.28).

It may appear from the previous paragraphs that the application of the principles of sustainable development will result in an urban form comprising a blanket of four-storey blocks arranged in serried ranks of parallel rows in order to maximize solar gain and energy efficiency. Energy efficiency in built form is, however, only one (albeit important) aspect of sustainable development. Other factors such as food production, landscape protection, maintaining biodiversity and energy-efficient movement of goods and people are also important considerations in the planning and design of the sustainable city. Each new addition to the city is designed for a specific site. The existing patterns of development condition the ways in which the principles of sustainability are applied. Additions to the city will be located along particular street lines and about specific neighbouring properties. It is this context, which sets the parameters for new development and to which the discipline of energy conservation must be applied. Even on greenfield sites, which in a sustainable city would be avoided if possible, the urban designer is not presented with a *carte blanche*. The urban designer cannot ignore contours, special

Figure 2.25 Leadenhall Market, London

Figure 2.26 Leadenhall Market, London

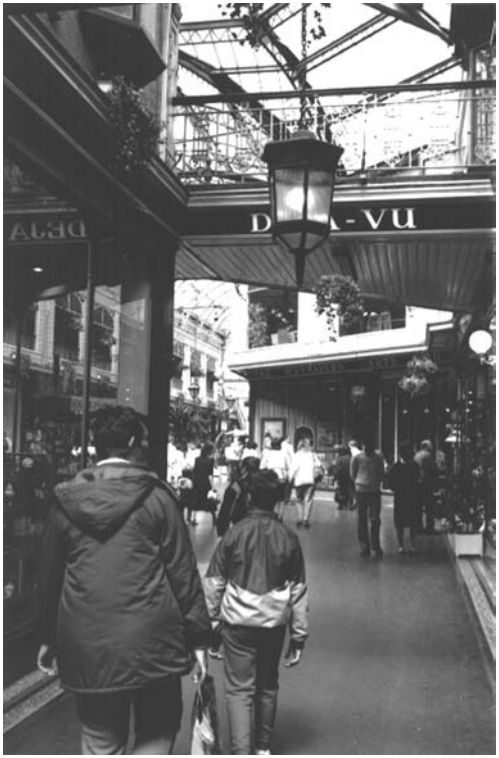

Figure 2.27 Shopping Arcade, Southport
Figure 2.28 Atrium, London wall

landscape features and local architectural form: these factors are the stimulus for the development of culturally acceptable solutions whereby the general principles of sustainable development can be applied for a site-specific purpose.

CONCLUSION

Traditions of vernacular architecture have many lessons for those seeking sustainable forms. There is much to commend the common-sense approach to energy conservation and environmental protection practised, however unknowingly, by many builders in the past. The first principle gleaned from a study of past practice is the priority given to the conservation and re-use of buildings, infrastructure and materials. The second principle is the use of local regional building materials for construction work: where possible, it is preferable to use materials requiring low inputs of non-renewable energy in fabrication, transportation to the site and in the construction process itself. Preference should be given to those materials obtained from a source, which is managed in a sustainable way – that is, where the traditional ethic of good husbandry and stewardship governs attitudes to their farming or extraction. Those materials, which are labour-intensive rather than energy-intensive in their extraction, dressing and

erection being more environmentally friendly and equitable in terms of the distribution of resources, are more acceptable for purposes of sustainability. Where possible, materials which cause environmental damage such as unsightly spoil heaps, massive quarries or denuded rain forests should be avoided. The third principle is to mitigate the effects of any environmental damage. All new buildings cause environmental damage, no matter how carefully they are designed. New developments should, therefore, be linked with tree-planting schemes in an effort to offset some of the effects of pollution caused by the manufacture of the building materials. The fourth principle is to relate the development to the local environmental context. In cold European climates – and there is some reason to believe that the climate in this country may become colder as the greenhouse effect gains strength – it is important to insulate buildings to the highest standards; to reduce the amount of external wall surface; to orientate the building towards the sun; to organize the interior of the building so that a buffer of storage rooms and similar accommodation faces north; and to arrange for conservatories and sun spaces or solar catchments to be sited on the south, east and west facades. Buildings set into the hillside with some accommodation below ground and with the roof covered by earth and vegetation fit unobtrusively into the landscape: they also make great use of the insulating properties of the earth itself. There are a growing number of projects of this type: the Visitor centre at Navan Fort, the ancient seat of the Ulster Kings in Armagh are of particular interest in the context of sustainable development. The Visitor centre fits snugly into the landscape, leaving the great earth mounds of the ancient fort to dominate the scene (Figures 2.29–2.31).

Figure 2.29 Navan Fort, Armagh. Ancient capital of Ulster

Figure 2.30 The Navan Visitor Centre: the building is buried within a grass-covered mound and is centrally lit with clerestory lighting

Figure 2.31 The Navan Visitor Centre

The fifth principle is to design buildings for flexibility so that a mix of uses can be accommodated under the same roof and so that floor plans are 'robust', in the sense that they can be adapted for different uses during the lifetime of the building. Finally, buildings should be located on public transport routes and with close connections to other parts of the urban structure, which is a major theme of the next chapter.

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ENERGY, TRANSPORT AND POLLUTION

3

INTRODUCTION

This chapter examines the relationship between transport, energy and pollution. The chapter begins with a critique of a transport policy based upon the idea of free and, if possible, the unimpeded movement of the motor car; investment priority being given to the road-building programme, which remains the desired option of the motoring public in this and most other developed nations. It then outlines the features of a sustainable transport system giving priority to walking, cycling and public transport. The chapter concludes with a discussion of the regional and local political and administrative structures necessary for achieving a sustainable transport system, emphasizing the need for public participation in the design, development and management of the system. This chapter leads directly into Chapter 4, the regional context for sustainable development.

TRAFFIC IN TOWNS

Forty years ago, *The Buchanan Report, Traffic in Towns* (Buchanan, 1963) set out clearly the problems for urban areas of the then projected increase in traffic. Buchanan was also asked to examine the effect of traffic on the quality of the local environment, and in particular to study the problems of noise, fumes, smell, the effect of vibration on buildings, accidents and visual intrusion. It did not, however, include the wider remit of examining the effects of pollution on the climate, nor were the effects of energy constraints so apparent at the time. Buchanan's prognosis revealed the strong possibility that saturation in motor car ownership would be achieved by the year 2010. By saturation of car ownership was meant a car being available for anyone wishing to use it. According to this definition, the total number of cars on the road by 2010 would be 37 million, or half the

then forecast population for 2010 of 74 million. Buchanan warned that there was nothing more dangerous than underestimating the demand for personalized transport and the effects it would have on the environment – a warning that is still appropriate today.

Buchanan accepted the motor car as an inevitable fact of life. It was assumed that numbers of cars on the roads would increase and that the use made of them would also increase: 'There are so many advantages in a fairly small, independent, self-powered and highly manoeuvrable means of getting about at ground level, for both people and goods, that it is unlikely we shall ever wish to abandon it.' Buchanan went on to add that the car may change in a number of ways but: '... for all practical purposes it will present most of the problems that are presented by the motor vehicle of today ... given its head the motor vehicle would wreck our towns within a decade ... the public can justifiably demand to be fully informed about the possibilities of adapting towns to motor traffic before there is any question of applying restrictive measures' (Buchanan, 1963a). It is difficult to say with any certainty if Buchanan's unquestioning acceptance of the growth in car ownership was born of a realism later proved in all essentials to be correct, or that the projections he and others in the field made, simply informed the policy agenda and so, in effect, became a self-fulfilling prophecy.

In his case study of Norwich – a city with a fine architectural heritage – Buchanan did point out the basic incompatibility between demand for unrestricted accessibility and the preservation of a good quality environment: '... the main principle is abundantly clear – if the environment is sacrosanct, and if no major reconstruction can be undertaken, then accessibility must be limited. Once this simple truth is recognised ... then planning can be started on a realistic basis. It becomes a matter of deciding what level of accessibility can be provided and how it can be arranged, and then it is a question of public relations to ensure that the position is clearly understood'. In Leeds, his study led him to conclude that: '... there is no possibility whatsoever, in a town of this size and nature, of planning for the level of traffic induced by the unrestricted use of the motorcar for the journey to work in conditions of full car ownership.' It is his study of a part of London, Marylebone, which is sometimes used as the basis for criticism of the findings of the report on Traffic in Towns. The urban motorways, which now devastate many towns, are believed by some critics as originating in the ideas formulated in Buchanan's study. It was for Marylebone that he developed the concept of the environmental area, a district of about 4,500 feet square. The environmental area, while not pedestrianized, was to be a high-quality environment with restrictions placed on the moving vehicle and the pedestrian given priority. It was to be surrounded by high carrying-capacity roads interrupted infrequently by junctions so that traffic moved freely at speed. Buchanan calculated that an environmental area of this size would generate a maximum capacity of 12,200 cars per hour, which could be absorbed by the surrounding network of major roads. It was, however, this particular system that he found to be impractical for Leeds and totally unsuitable for a city such as Norwich. As Houghton-Evans (1975) quite rightly concludes, 'He had proved that, beyond a certain size, it was impossible to design for mainly "private" transport, and that for our

larger cities at least, we had to continue to place considerable reliance upon a public service. In the practice of urban renewal, regrettably little understanding has been shown of the principles he was urging – in spite of much lip-service. Regrettably also, he misleadingly pursued this discovery concerning public transport in terms of still trying to please the motorist.'

OPPOSITION TO ROAD BUILDING

The physical impossibility of meeting the demand for the unrestricted use of the motor car was being strongly argued by a number of scholars and activists in the 1960s and 1970s. The simple thesis being propounded was that the act of building new roads, far from solving the problem, actually generated additional traffic and also diverted the congestion to other parts of the road network, thus exacerbating conditions. Despite the influential book by Jane Jacobs (1965), *The Death and Life of Great American Cities*, the traffic-engineering fraternity continued with expensive origin and destination surveys to feed into basically flawed computer models. Such models were then used to justify the demolition of valuable city infrastructure and more destructively to scatter the communities housed there. Instead of this attrition of the city by the motor car, Jacobs was advocating its strict control by making footpaths wider, slowing the traffic down and discouraging traffic intrusion in areas where it is not required. These suggestions, made forty years before the traffic-calming policies being actively pursued in most cities in this country, are the forerunner of the *voonerf* in Holland and the 'home-zone' where pedestrian interest is paramount (Figures 3.1 and 3.2). The ideas of Jacobs also presaged the projects for major road narrowing schemes in cities such as Oslo (Moughtin *et al*., 2003a).

Figure 3.1 The voonerf, Amsterdam

ROAD TRAFFIC AND POLLUTION

There is a strong case for limiting accessibility of traffic in urban areas, on the grounds that the problem of mobility and

Figure 3.2 Traffic calming, Letchworth

movement within the city cannot be solved by building more roads at great cost, their non-acceptability in social terms, and because such a procedure will not in the end solve the problem. The case for a change in attitude to the problem of the movement of people and goods within and between urban areas has been strengthened by studies of pollution caused by, amongst other things, the use of fossil fuels for transport. The result of this pollution increases the effects, as we have seen, of global climate change. Local pollution caused by heavily used roads also affects the local environment, resulting in health hazards. The report of the World Commission on Environment and Development in 1987 and the Earth Summit in 1992 outlined some of the dangers from pollution, while in this country the eighteenth report of the Royal Commission on Environmental Pollution (1994) states, 'The unrelenting growth of transport has become possibly the greatest environmental threat facing the UK, and one of the greatest obstacles to achieving sustainable development.' Twenty years earlier, it had already become clear to the Royal Commission (1974) that it would be dangerously complacent to ignore the environmental damage caused by the increasing numbers of both motor vehicles and commercial flights. According to the Royal Commission, '. . . it was becoming increasingly apparent that it was not possible to cater for the unrestricted use of vehicles without engineering works on a scale that is socially unacceptable.' The growing volume of official reports dealing with mobility in cities together with a more vocal environmental movement, outlined the problems associated with pollution caused by transport, while suggesting broad measures for dealing with it and with energy conservation. These measures included fiscal proposals for taxing the polluter, suggestions for encouraging the development of improved technologies, together with suggestions for urban structuring which reduces the need for movement relying on greater use of public transport, cycling and walking for any necessary mobility. Blowers (1993) suggested that the following four principal types of mechanism are necessary to achieve a sustainable transport strategy:

(1) Regulatory mechanisms aimed in particular at restricting pollution levels to prescribed limits.
(2) Financial mechanisms through taxes and incentives, notably energy taxes, whereby each travel mode accounts for its true overall cost (including the environmental cost), thereby favouring modes which consume less energy and which produce less pollution.
(3) Inducements to encourage research and development into more fuel-efficient vehicles and alternative transport technologies.
(4) Planning – a greater emphasis on the integration of land use and transportation planning, key aims being to minimize travel distances, to encourage the use of modes other than the car and to improve accessibility to facilities.

The following quotation from the Report of the Royal Commission on Environmental Pollution (1994) makes it abundantly clear that such a strategy is necessary to avoid the problems associated with unchecked growth in traffic:

> Over two-fifths of the petroleum products used in the UK are used in road transport . . . . In all,

> surface transport causes 21 per cent of the carbon dioxide emissions produced by human activities in the UK, or about 24 per cent if emissions from refining and electricity generation for transport are included. Road transport accounts for 87 per cent of the emissions attributable to surface transport .... On the basis of the forecast growth in road traffic, carbon dioxide emissions from the transport sector will show further substantial growth over the next 25 years .... Significant environmental damage has been caused over recent years by the construction of transport infrastructure ... there is much concern about the effects the present trunk road programme would have in damaging the landscape, causing loss of habitats or species, and damaging historic buildings and archaeological features. Providing sufficient road capacity to carry the levels of traffic predicted in the government's 1989 forecasts would require a massive programme of road building and improvement.

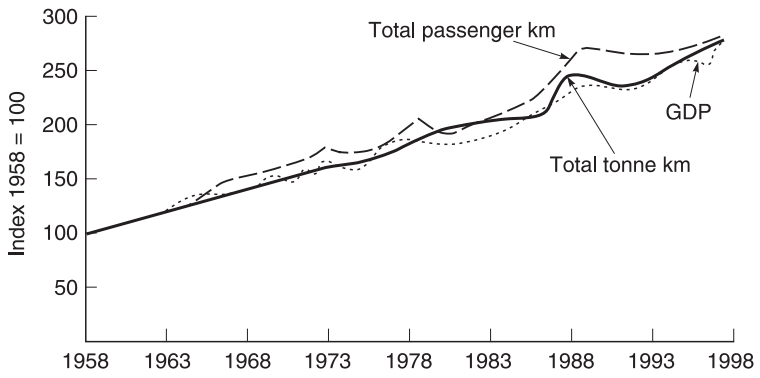
It seems that the current received wisdom for those working the field of urban design and planning is a philosophy advocating policies and plans, which wean the general public from its love affair with the motor car. The Royal Commission on Environmental Pollution (1994) set out a list of eight objectives for achieving a sustainable transport policy, a transport agenda still appropriate for the twenty-first century. They are:

(1) To ensure that an effective transport policy at all levels of government is integrated with land use policy and gives priority to minimizing the need for transport and increasing the proportion of trips by environmentally less damaging modes.
(2) To achieve standards of air quality that will prevent damage to human health and the environment.
(3) To improve the quality of life, particularly in towns and cities, by reducing the dominance of cars and lorries and providing alternative means of access.
(4) To increase the proportions of personal travel and freight transport by environmentally less damaging modes and to make the best use of existing infrastructure.
(5) To halt the loss of land to transport infrastructure in areas of conservation, cultural, scenic or amenity value, unless the use of land for that purpose has been shown to be the best practicable environmental option.
(6) To reduce carbon dioxide emissions from transport.
(7) To reduce substantially the demands which transport infrastructure and the vehicle industry place on non-renewable materials.
(8) To reduce noise nuisance from transport.

The Royal Commission specified each objective in detail using combinations of quantifiable standards, sets of principles and firm recommendations. This is, indeed, a formidable agenda, which the Royal Commission thought necessary to avoid serious environmental damage, while preserving access for people needing to pursue their livelihoods and leisure activities. A sustainable future requires a fundamentally different approach to transport and planning policy and radical modification, perhaps even reversal, of recent trends. No longer is it seen as inevitable that the motor car and its requirements will dictate city form in the

future. It is a small step from here to the acceptance of the notion that a good public transport system is necessary for sustainable development, and that its provision is a legitimate concern – perhaps it will be one of the most important concerns of city government in this century. The urban designer, working within a philosophical framework for sustainable development, does not plan or design urban structure specifically for the free movement of the private motor car, with public transport taking low priority; nor does the urban designer manipulate public transport to conform with an unsympathetic urban form which has been designed for the needs of the motor car. The form of the city under the imperative of ensuring sustainable transport is designed for public transport, the bicycle and the pedestrian, with the motor car playing a subordinate role. The change in the perception of the role of private transport will, in the medium to longer term, induce a major cultural shift, which will have a far-reaching effect on urban form.

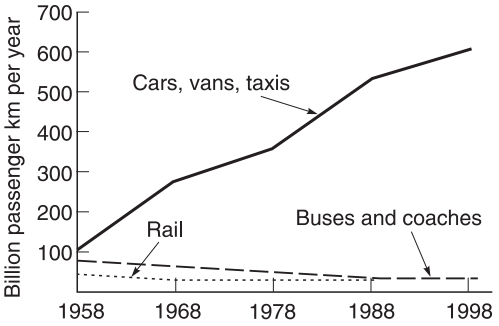
Figure 3.3 Overall growth in passenger transport and freight transport compared to GDP



TRANSPORT COSTS

The problems caused by the growth in traffic – particularly in the use of the private motor car – are in part connected with success. Increased economic activity and the growth of personal incomes generate higher demands for personal travel. This is as true for the rapidly developing countries of Asia as it is for the older developed countries such as the United Kingdom and our European partners. Figure 3.3 shows the close relationship, in this country, between the growth in both passenger transport and freight transport and the growth of GDP. Even though transport costs have risen more slowly than disposable income, households spend 70 per cent more in real terms on transport than they did a decade after Buchanan was writing. In Europe, between 1970 and 1995, the total number of cars per capita increased more rapidly than economic activity. 'In 1970, the average car ownership in all current (1995) European Member States was 181 cars per thousand persons. By 1995, the average car ownership in Europe was 428 per thousand persons: an increase of 137 per cent over 25 years.' (Bannister, 2000). In the same period, the increase in car ownership in the UK was slightly lower, at about 100 per cent.

People's choice of transport is influenced by convenience and cost. Cars are sometimes the only real choice where public transport is inadequate or non-existent: for those on low incomes, the old, the infirm, the severely incapacitated, public transport is the main means of mobility. The majority of personal transport is by road (93%), and as the car has become the dominant mode of travel public transport has declined (Figure 3.4). An equitable transport policy – that is, one



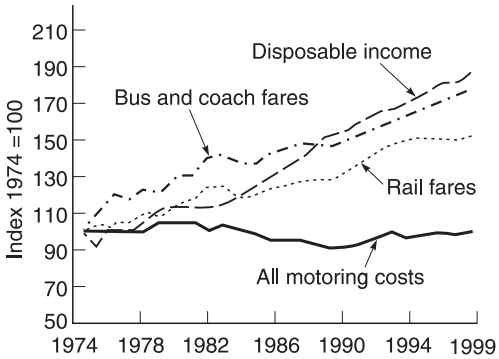


Figure 3.4 Passenger transport by mode

Figure 3.5 Real changes in the cost of transport and in disposable income. Note: 'All motoring costs' includes petrol and oil costs, and cost of vehicle purchase

that is sustainable – would be aggressively trying to reverse this trend: a trend that is, in part, the result of the decline in costs of car use while public transport costs have risen. Between 1974 and 1994, rail and bus fares increased by 50 to 70 per cent in real terms (slightly faster than the growth in disposable income), while the cost of private motoring has fallen by 2 per cent in real terms (RCEP 1997). Figure 3.5 shows the relationship between the changes in the cost of transport and disposable income. It shows quite clearly that motoring has become cheaper relative to disposable incomes and to public transport alternatives. Moreover, the cost of buying a new car also fell in real terms during the same period, having a knock-on effect on second-hand cars: the decline in the cost of new cars, to some extent, widened the range of people who can acquire cars, so reducing the potential market for the public transport industry. Even during the years when the 'fuel tax accelerator' was operating, this trend – which favours private motoring – continued. Indeed, between 1993 and 1995 while petrol and diesel costs increased by 4 per cent in real terms, overall motoring costs fell by 1 per cent. In contrast, public transport fares increased by 0.5 per cent for buses and by 3 per cent for rail.

KYOTO AND THE 10 YEAR PLAN

Transport 2010: The 10 Year Plan (DETR, 2000) identified the key challenges for transport planning until 2010. Amongst these challenges are: road traffic growth and congestion; overcrowding and congestion in London; and inadequate public transport across England. The Plan forecast that traffic, measured in vehicles/kilometre would grow by 22 per cent between 2000 and 2010. Congestion was forecast to grow by 15 per cent across the network, and by 28 per cent on the inter-urban trunk roads. Some 75 per cent of those people working in central London travel to work on overcrowded public transport: on four out of five commuter rail services the operators exceed overcrowding standards, while road congestion in London before the introduction of road pricing was three-and-a-half times the average in England. In the rest of the country, public transport does not offer an attractive alternative to the private motor car, while bus patronage has declined by two-thirds since 1990. It is these challenges – in addition to the Kyoto commitments to reduce greenhouse gases – which forms the context for transport

planning and urban design in the twenty-first century.

In conformity with the Kyoto agreement, each EU country has pledged to cut its emissions of greenhouse gases to help achieve the Union's collective goal of reducing 1990 emissions by 8 per cent before 2010. Only two of the fifteen countries will achieve that target. Britain's greenhouse emissions will be cut by just under 10 per cent by 2010. In contrast, eleven of the countries are expected to increase emissions considerably. The EU is one of the supporters of the Kyoto climate change pact, which therefore appears to be in considerable disarray. The Kyoto protocol is actively opposed by the USA, the world's largest polluter, and it also receives a less than effusive welcome from Russia, the fourth biggest polluter. An adviser to Vladimir Putin is reported as saying 'In its current form the Kyoto protocol places significant limitations on the economic growth of Russia' (*The Guardian*, 3rd December, 2003). There are, however, recent signs that Russia may soften its stance on the Kyoto protocol.

The Kyoto agreement may be in difficulty, but the problem of climate change has not gone away. As Hoskins points out, 'What we know is that, given standard physics we can all trust, then in today's climate carbon dioxide actually does play an important role in the energy balance in the planet . . . The increase in the carbon dioxide in the atmosphere has corresponded to about half of what we have emitted and all our calculations suggest that the increase we have already put in there is having an important change on the energy balance of the planet . . . The climate system has always varied and that is without us taking part in it. What we are doing is taking the earth's climate at a time when it is relatively warm and we are turning the heat up' (House of Commons, Environment, Transport and Regional Affairs Committee, Minutes of Evidence, 5th July, 2000). Road transport's contribution to the UK's CO_2 emissions is large and growing. So where does the UK go from here? The aim of the Government is to reduce emissions by 20 per cent by 2020 – a brave goal indeed, and a much more daunting task than the 8 per cent by 2010: the painless savings will all be made before 2010. The Royal Commission for Environmental Pollution, however, urges the Government to work towards a 60 per cent reduction of CO_2 emissions by 2050.

Why should the British Government be following a policy that reduces pollution in this way and possibly affecting negatively the country's economy when few other developed nations are responding to the global environmental crisis? Furthermore, why should this country adopt these policies when climate change may be so far in the future? These questions represent one line of questioning at the evidence taken before the Environment, Transport and Regional Affairs Committee of the House of Commons of Great Britain of 5th July, 2000. As Butler put it at that meeting: 'How on earth would a 60 per cent reduction in UK production of CO_2 be effective in the great scheme of things . . . ?' The reply by Professor Blundell makes a good case for the UK adopting this target: 'By definition you must be right that if it were just the UK it would be a marginal consequence. It does need leadership and I think we have to be quite clear that we have to move according to our own conscience. In the future it will affect our grandchildren and future generations.' He also went on to say that the reductions in emissions in fifty years'

time '... need changes in the way we live at the present time'. For example, the infrastructure for roads and public transport, together with the town extensions we build, will be with us for at least fifty years and will strongly influence the ways in which we consume energy. Patterns of future energy consumption are also determined by the strategies we now adopt for energy generation and investment in research for new energy technologies.

The current British Labour Government and the former Conservative Government, on this global issue of pollution, have both taken a creditable stand – one of leadership – despite the unpopularity of aspects of the policy with the electorate. However, following a policy radically to reduce the quantity of greenhouse gases is not all 'bad economic news'. There is much waste of the energy that is produced in power stations and used in the home, or that used in our vehicles and the way we move around in cities. Avoiding such waste must lead to an efficiency gain, making this country more competitive against those not engaged in the activity of sustainable development. Developing new technologies for waste management, alternative more efficient energy sources and greener transport will give to the UK a 'first in the field' advantage for future exploitation of the new technologies by those who are now reluctant to make those necessary changes.

DEVELOPING SUSTAINABLE TRANSPORT

Top of the list of objectives for achieving sustainable transport in this country, as we have seen, set out by the Royal Commission on Environmental Pollution (1994) was the integration of transport and land use policies at all levels of government so that there would be less need for transport and so that a greater proportion of movements would be made by environmentally friendly modes of travel. The publication of *A Guide to Better Practice: Reducing the Need to Travel through Land Use and Transport Planning* (DOE, DOT, 1994) set the scene for the revised *PPG 13 Transport* (DETR, 2001a). These documents were fine in principle, and appeared to place the integration of these two policy areas at the centre of government thinking. The Government's *10 Year Plan for Transport* (DETR, 2001c) however was not met with universal acclaim: it has been criticized in particular by those lobby groups supporting the environment, public transport and more generally by those espousing the ideals of sustainable development.

It is widely agreed that:

- The UK has the most congested roads in Europe.
- That over the next decade this congestion is likely to grow by between 11 and 20 per cent.
- The congestion will affect both the strategic network and local roads in towns and cities.
- That congestion costs the UK economy about £20 billion each year.
- That 71 per cent of UK households have one car, and 25 per cent have two or more cars.
- That roads journeys account for 93 per cent of passenger travel within the UK (*Planning*, 18th April, 20-02, 'Planning Going Nowhere Slowly').

Furthermore, the National Office for Statistics' latest survey reveals that the

average household spends more than £59 per week on transport, which is nearly 50 per cent more than it spends on food (*The Guardian*, 20th February, 2002). This is in the average weekly spending budget, and probably reflects the burgeoning costs of public transport and the greater use made of the car. Unless reversed, this trend is likely to continue. 'The cost of travelling by bus or train will rise by more than 20 per cent by 2010, whereas the cost of running a car will fall by a fifth over the same period' (*Planning*, 1st August, 2002). The weight of evidence reveals continuing public support for motoring backed by a powerful road lobby supported by a revived opposition party espousing road building. This suggests that, in terms of practical politics in the run up to an election, road building is back on the agenda.

The UK Government's response to the pressure from the road lobby was to lift or ease its moratorium on new road building with the unveiling of forty major road schemes costing £6 billion in December 2002. This was the biggest proposed expansion of road capacity for more than a decade (*Planning*, 13th December, 2002 and 11th July, 2003). Road widening was suddenly in fashion again with major schemes for the M1, M11, M18 and M25. The 10 Year Transport Plan suffered severe criticism from the Commons Transport Committee: 'The Government cannot continue to pretend that investing in infrastructure alone, even at levels far above those currently seen, while allowing car use to rise unchecked can reduce congestion' (*Planning*, 18th April, 2003).

There are signs, however, that 'all is not lost'. There have been some significant achievements. The Commons Transport Committee, though critical of some aspects of the 10 Year Plan, did praise the professional and expert multi-modal studies – an integral part of the plan – which were launched to examine the most intractable congestion and safety problems on the strategic road network. An earlier government White Paper had pledged that building new roads was only to be considered after all plausible options had been considered. Many of the multi-modal studies backed the funding for railways and local transport schemes (*Planning*, 1st August, 2003 and 10th October, 2003). Most activists and professionals in the field of transport advocate road pricing as a viable method for reducing congestion. The success of the congestion charge in central London has given further support for the whole idea of road charging throughout the country in places where it might be viable. The first anniversary of road charging in London saw the release of a number of surveys. Cars entering the zone are down by nearly 40 per cent, and the average speeds for both cars and buses have improved. The mayor of London, recently re-elected, is considering the extension of the charging zone. In addition the first motorway toll road, around Birmingham has been opened and is operating, with other similar proposed motorway toll roads under active consideration. A recent white paper on the future of transport also suggests that road pricing could be implemented in the UK over the next 10 to 15 years (*Planning*, 23rd July, 2004).

THE 'WAY TO GO'

The 10 Year transport plan is under review. A campaign has been launched that aims to put the plan on a greener footing. The 'Way to Go' campaign is a coalition of ten or

more environmental and social justice groups: its members include Transport 2000, Age Concern, Friends of the Earth and the National federation of Women's Institutes. The campaign has twelve demands, ranging from a 'cycle-friendly' road network and safe routes to school for children, to lower speed limits, improved public transport and pay-as-you-go road user charging (see Figure 3.6). The 'Way to Go' complains that the (10-year) plan favours large-scale, environmentally damaging infrastructure over small-scale improvements to public transport and schemes to encourage walking, whereas the campaign points out that all of the measures that it espouses have been tried and tested in the UK or elsewhere. It also calculates that they could all be funded by reallocating public expenditure in the current plan plus the additional revenue from road user charging (*Planning*, 13th February, 2004). The measures that the campaign group are proposing are all inexpensive when compared with road widening, and would improve the environment for all users, including the motorist. Those advocating road charging are 'pushing at an open door': it is now a question of when road charging will be introduced, what form it will take, and where it will operate. A far-reaching system of road charging is necessary for dealing with the expected rise in congestion, and also as a contribution to the reduction in the production of greenhouse gases. For it to be effective, road charging should be introduced as soon as possible and, if necessary, used to replace the present system of road tax for cars: this may be seen by the motorist as an acceptable compromise and a more equitable method of sharing the burden. Furthermore, if those road charges were to be allocated specifically to improvement of the transport system, it may make the charge more palatable – a strategy which was unfortunately overlooked when the unpopular 'fuel tax accelerator' was introduced in the 1990s (*Planning*, 21st June, 2002; 'Charge of the Toll Brigade'). There have also been other notable innovations in local transportation planning. In Manchester, the Metro; in Sheffield, the Supertram; and in Nottingham, the Express Transit, lead the way in the development of public transport systems which will change the ways in which people will move about in the city of the twenty-first century (Moughtin, 2003; see also Chapter 7). Unfortunately plans to extend Manchester's Metro link and light rail schemes in Leeds and south Hampshire have been rejected because of escalating costs (*Planning*, 23rd July, 2004). Edinburgh has put in place an integrated transport strategy aimed at mitigating the effect of the estimated doubling of congestion in the city by 2021: plans have been completed for tram routes linking the west and north of the city. A referendum is to be held on proposals for a congestion-charging scheme in the city, which is a good test of popular opinion about this vital policy area.

- A cycle-friendly road network and cycle training for all.
- Streets, lanes and paths made more pleasant for walking.
- Services and facilities brought closer together to reduce need to drive.
- Increased funding for public transport, particularly in rural areas.
- Quality standards for bus and rail services.
- Expand bus lane networks.
- Greater emphasis on safe routes to schools.
- Standard 20 mph speed limits in residential areas.
- Discounts for national railcards.
- Grants for rail freight projects.
- Greater incentives to buy smaller, less-polluting vehicles.
- Pay-as-you-go road user charging.

Figure 3.6 The 'Way to Go' campaign demands

EQUITY AND THE POLITICS OF SUSTAINABLE TRANSPORT

Equity – both inter- and intra-generational – together with local participation in decision-making, are two of the cornerstones of a green philosophy and the essential foundation for sustainable development. For example, the imposition of a tax on the use of petrol or a pricing structure for heavily used roads, if implemented in isolation, would be regressive. That is, it would place a heavier burden on the poorer sections of society and widen the levels of mobility between poor and rich. Such policies without the development of public transport would be contrary to the principles of sustainable development. Sustainable development is possible only when policies are fully understood by the community and when they are legitimised through popular acclaim: 'The problems of "economic development" without democratic participation have been made manifest time after time. Unless individuals are able to share both in decision-making and in the actual process of development, it is bound to fail' (Elkin *et al.*, 1991b). Only by empowering people is it possible to improve the environment. Successful planning – whether for housing or roads – begins with the people, their aspirations and their perceived needs – it is a bottom-up process. Macdonald (1989) suggests that: '... unless people can, in some way, create, manage, change or participate in activities that affect their lives, dissatisfaction, alienation and even illness are likely outcomes'. Movement towards sustainable development will revive the idea of community, public provision of basic services and also planned intervention to ensure an equitable distribution of resources. This agenda, however, requires the political will and commitment to make radical changes to the way in which society is governed and organized: it means a shift in power from central government to the regions, cities and, above all else, to the local community.

A progressive feature of development procedures is the 'community strategy' – a plan for the improvement of the economic, social and environmental well-being of residents that all local authorities are required to prepare under the Local Government Act 2000. How far such plans influence local transport remain to be seen. It is common practice to hold public meetings for the discussion of planning proposals and to mount planning exhibitions to inform the public about such proposals. There are, indeed, examples of residents engaging more actively in planning based upon games such as Planning for Real (Gibson, 1979). Many urban developments are funded by a combination of public and private finance involving partnerships between a number of collaborating authorities and organizations. Stakeholders in such ventures make important contributions to the development planning process, so widening the involvement of the community. Such widening of community participation is a welcome feature of development procedures.

CONCLUSION

Transport, in addition to bringing benefits to society, also involves large costs. Some of these costs, such as pollution and noise, are incurred directly or indirectly by the users or by those passively affected by developments. Other costs are the result of environmental damage. Many of these costs – particularly

from road-building programmes and the resulting increase in traffic – have fallen on the community rather than the developers of the transport system or its users. The price signals, such as road construction costs and cost of petrol, given by the transport market, because they ignore environmental costs, mislead the users into believing that personal mobility is cheaper than it really is. The depressed costs have therefore resulted in transport decisions harmful to the community. Individual transport users and developers will continue to make similar decisions – that is, they will continue to make greater use of the roads than real costs would support, until national governments increase fuel pricing and/or introduce road pricing to an extent where the price of road use reflects the true environmental costs. Tax measures of this nature should be preceded by, or accompanied by, proposals for improving public transport. Taxes gathered from road users should be earmarked for public transport initiatives. If tax proposals are implemented before public transport improvements, the effect would be felt by the poorer sections of the community – that is, those less able to pay extra taxes. Such a tax in that case would be regressive and counter to the main thrust of sustainable development.

In addition to measures outlined above, and in parallel with them, the aim of planning policies and urban design solutions must be to reduce the need for movement. Past planning policies and the resulting urban forms have been based on the notion of unrestrained movement and maximum mobility of the individual in his or her private car. Planning and designing urban forms for the reduced need for mobility is a longer-term solution to the problems facing society. It depends upon individuals gradually changing their lifestyle to one which is less dependent on the private car for mobility. The later chapters in this book aim to outline urban forms and policies which conform to the philosophy of sustainable development: they are directed towards exploring the new design paradigm for city planning where urban design is viewed as a component of a holistic programme of policies covering all aspects of the culture of city life.

The unrelenting growth of transport has become one of the greatest environmental threats facing the UK, and a great obstacle to achieving sustainable development. Thirty years ago it was already clear that it was dangerously complacent to ignore the possible environmental damage caused by increasing numbers of motor vehicles on the roads: it was becoming increasingly apparent even then that it was not possible to cater for the unrestricted use of vehicles without engineering works on a scale that was, and still is, socially unacceptable. It is as clear today as it was thirty years ago that limitations on the use of the private motor car must be imposed in order to safeguard the local environment from noxious fumes, noise and visual degradation, in addition to reducing the stress being placed on the climate by greenhouse gases.

The twin problems of congestion on the roads and environmental pollution refuse to go away: they are still with us in the twenty-first century, and conditions may get worse before they improve. The message – that creating more roads is not the solution to traffic problems in urban areas – has been known for many years: the problem, however, for a democracy is one of convincing the electorate that a painful solution is necessary. This requires the same

qualities of political leadership that can take a sceptical country to war. As Prime Minister Blair noted, climate change is a greater threat than international terrorism.

The process of developing the sustainable city of the future will involve a major cultural change, which for many will mean a change in lifestyle, one which is no longer dependent upon the motor car. A feature of this necessary cultural change is a holistic perspective of the city region, its people and the technology that supports and sustains their social, economic, political and physical infrastructure. This new paradigm – or way of viewing the city as a series of overlapping and interconnected systems – if it is to be successful, will result in planning mechanisms, which comprise sets of interrelated and mutually supportive policies. The paradigm for sustainable development is akin to the holistic or synoptic method of the Geddesian planner rather than to the sectoral approach used in resource allocation or the limited solutions offered by traditional road engineering to discretely defined traffic problems. For the purposes of the discussion that follows in Chapter 4, the nature of sustainable urban transport will be analysed within the framework of the city and its region. However, it is clear that sustainable urban transport requires the support of a balanced combination of pricing measures to promote public transport, in addition to changes in governance, advances in transport technology including recycling of materials, and new initiatives in the design and structuring of all future urban developments.

THE REGION AND SUSTAINABLE DEVELOPMENT

4

INTRODUCTION

The present patchwork of local authorities outside London does not foster the implementation of sustainable development, nor does it assist in achieving a balanced approach to an integrated transport provision for the country. Devolution of power to Scotland, Wales and the suspended assembly for Northern Ireland, together with the election of a powerful Mayor of London, does however auger well for a future pattern of devolved government that could begin to tackle the main problems associated with assuring the Nation of a sustainable future. Furthermore, the prospect of elected regional assemblies and strong city executives with London-type elected Mayors may further strengthen a system eminently suited to achieving sustainable development based on popular support.

COMMUNITY

Definitions of sustainable development are built on a premise that recognizes the virtue and necessity of grass roots community activity in the development process. 'Think globally, act locally', is a catch phrase often used in any debate on sustainable development. Citizen participation in development and the political structures which sustain it is clearly an essential requirement of local and regional government in a sustainable world. It can be argued that the lowest level or tier of government should be the local community which occupies a clearly defined district or quarter of the city. 'Community' in the twenty-first century, however, is not necessarily associated with a physically identified place. Many associations, friendship patterns and communities of interest extend far beyond the confines of the local neighbourhood: they form a rich web of overlapping communities. It is not the intention here to dispute this explanation of community, nor is it the intention to suggest the need or desirability to change this particular aspect of urban culture. It is, however, asserted that people see the city partly in terms of named and clearly identifiable districts. The district,

quarter or neighbourhood may not be essential for some social relationships, but it is, along with the main paths people use and centres they visit, an essential mental construct. The neighbourhood: '... is no longer the space within which people know each other because they live next door, but a space which is commonly defined and given a name, and within which people find it relatively easy to band together when things get dangerous' (Lynch, 1981). Among such threats is; pollution; the destruction of local environmental quality by proposals for road improvements; together with the ramifications of climate change.

A basic consideration in city design is the question of political control. Since citizen participation is a key concept in the pursuit of sustainable development, the question arises as to the precise areas of management which might properly be placed under community control. Accepting the concept of 'subsidiarity' – that is, taking appropriate decisions at the lowest practicable level or tier of government – raises two important questions. Which service provision should be delegated to the very local or community level of government, and how much power should be vested in those authorities? The power of communities to say 'no' to all developments would lead to stagnation and not necessarily to sustainable development. The city government has been the main actor in the field of urban infrastructure development since the earliest civilizations. To some extent that power was weakened during the last half of the twentieth century. The importance of the city is being overshadowed by the growing might of the state. This was in evidence particularly in Britain during the last decades of the twentieth century, when policies seemed to be designed to strip power from local government. The ability to develop a sustainable infrastructure, including the transportation network, must be returned to the city.

REGIONAL STRUCTURES

Clearly, ideas about sustainable urban form are located both conceptually and theoretically within the field of regional planning. The main concern of regional planning is the development of a network of sustainable metropolitan areas, cities, towns and villages. It is also concerned with the development of the rural areas – not only as places where people live and work but also as places which provide the urban population with food, water and areas for leisure. In addition, the rural areas surrounding the towns and cities provide environmental services in the form of pollution control and are important for maintaining the nation's biodiversity which contributes to the well-being of the global ecological system.

Sustainable transport, in addition to having a powerful influence on urban form and city design, is also a vital strategic element in the regional pattern of development: 'In principle, it is obvious that urban form will affect patterns of transport, which in turn will affect fuel consumption and emissions. By the same token, the viability and patronage of public transport facilities, and also consumption and emissions, will be affected by urban form. Such form may also affect rates of conversion of land from rural to urban uses, and by extension, the loss of habitats for flora and fauna' (Breheny and Rookwood, 1993). The foundation for a sustainable urban transport system is the regional administrative and political structure which

underpins the implementation of policy. This point, however, raises fundamental questions about regions and regionalism. There are divergent views about the nature of regions and the effectiveness or even the need for regional planning. It may now be appropriate to return again to, and to review regional planning in the light of the current debate about sustainable development. This is particularly true in Britain after a number of years of government which eschewed all notions seeking an equitable distribution of resources throughout the country: political dogma has dismissed intervention in the market for the social objective of regional balance. To some extent this question is being addressed obliquely with current suggestions about the re-deployment of some government departments into the regions, but little is being done to reduce or stem the flow of population to the south-east.

REGIONAL CLASSIFICATION

Before discussing regional structures for sustainable development, some clear idea about the nature of regions is a fundamental requirement. Indeed, is there such a phenomenon as a region, or is it merely a mental construct? (Glasson, 1978). At one level any idea, method of classification or definition is a mental construct. Of great relevance for regional planning is the degree to which a region has homogeneity in both human and ecological terms. Relevant, too, is the degree to which the homogeneity is a sound basis for political and administrative purposes. Since the main purpose of such a polity is sustainable development, it is clear that the region should have meaning for the group of people who occupy the area within their boundary: the regional boundary should, therefore, be the mental construct of the region held by its constituent members.

There are two main methods of regional classification (Glasson, 1978). The first main type is the 'formal region', the other being the 'functional region'. The earliest definitions of the region were based mainly on the physical characteristics of the landscape, early geographers believing that the survival of man was dependent upon his adaptation to the environment. Later developments in the ideas about the definition of the formal region included an analysis of economic activities. Economic activities such as the types of industry or agriculture were used as criteria for regional classification. A classic amongst such systems of regional classification is the work of Dudley Stamp in Britain (Figure 4.1) (Stamp and Beaver, 1933).

Geographers such as Herbertson (1905), Unstead (1916, 1935) and Vidal de la Blanche (1931) – using criteria such as topography, climate, vegetation and population – divide the world, continents and countries into natural regions. All such approaches have as a philosophical basis the idea of environmental determinism, the physical features of the planet and its climate determining, to some extent, the pattern of settlement and to some degree the functions of those settlements. The extent of man's occupation of the planet today, particularly in the economically advanced countries of the West, gives the impression that anything is possible. The limit to settlement, apparently, is not nature but man's will.

Opposing man and nature in this way is artificial – man and the natural world are one. The present climatic crisis, problems of pollution and the rate of finite resource depletion are a result of this schism which

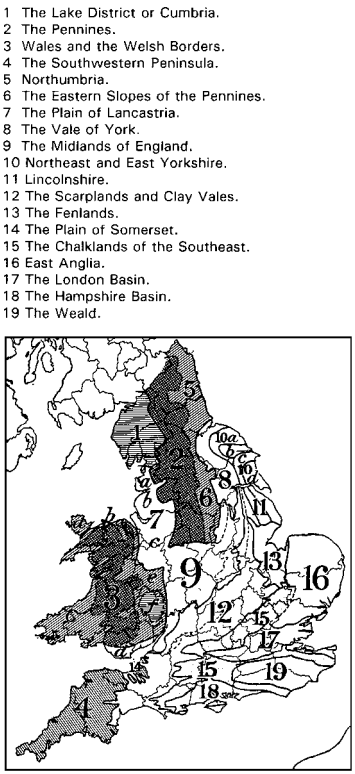


Figure 4.1 The agricultural regions of England and Wales (Stamp and Beaver, 1933)

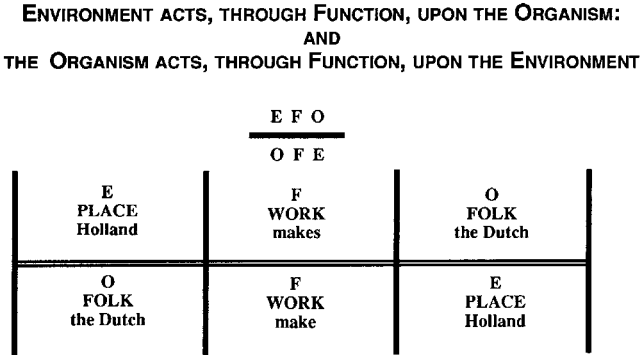


Figure 4.2 Geddes' diagram: Place–Work–Folk (Geddes, 1949)

divides nature and man. This philosophy undervalues the natural environment and leads to its exploitation. The exploitation extends beyond the 'natural world' to include man; the poor and vulnerable occupying areas at risk from flooding and drought. It may be appropriate to give greater weight, in regional definition, to the physical environment and its ecology, and in particular to the role of the environment in sustaining the local population. Maintaining a more balanced relationship between a community and its local environment may be of great importance in this and succeeding centuries.

In contrast to the formal region which is defined in terms of homogeneity, the functional region is concerned with areas which display an interdependence or interrelationship of their parts. The functional region may consist of heterogeneous components such as cities, towns and villages but which are functionally related. The relationship of the parts is usually measured in the form of flows, such as journey-to-work, shopping patterns and bus services. The analysis of the functional region is mainly concerned with the movement of people, goods and messages. As such the concept of the functional region is important for any discussion of sustainable development, including transport planning, waste control, pollution and urban support systems such as food supply. One of the founding fathers of planning in Britain, Patrick Geddes, was aware of the importance of the interdependence of components within the region. His diagram 'Place–Work–Folk' (Figure 4.2) and his phrase 'City Region' illustrate perfectly this understanding (Geddes, 1949). In Europe, Christaller (1966) developed a central place theory based upon a hierarchical relationship between

centres in southern Germany. This theory of Christaller is a seminal work in the development of ideas about the definition of the region (Figure 4.3).

THE CITY REGION

Two tiers of regional administration, adopting features from both systems of geographical classification may prove necessary for a political structure which will give legitimacy to programmes for local sustainable development. Since Geddes first coined the term, city region, the concept has become a part of the planner's language, used frequently by many authors. Howard's earlier idea of the Garden City was in effect a proposal for a city region. It comprised clusters of cities linked to each other and to a central city by a strategic transport network. The basic idea was the development of a functional arrangement of settlements with clearly defined physical identity but with social and economic interdependence (Howard, republished, 1964). It is ideas such as the city region which hold out a prospect for managing some aspects of a sustainable city, such as its transport network. This concept has been developed further by the Town and Country Planning Association. The term used by the Town and Country Planning Association is the Social City Region (Figure 4.4) (Breheny and Rookwood, 1993). If a country such as Britain is seeking sustainable development as a major goal, then the city region would be the chief unit of local government: it would be the main provider of local public services and it would be responsible for managing the environment including the immediate rural hinterland. Clearly the city region would be the polity responsible for the management

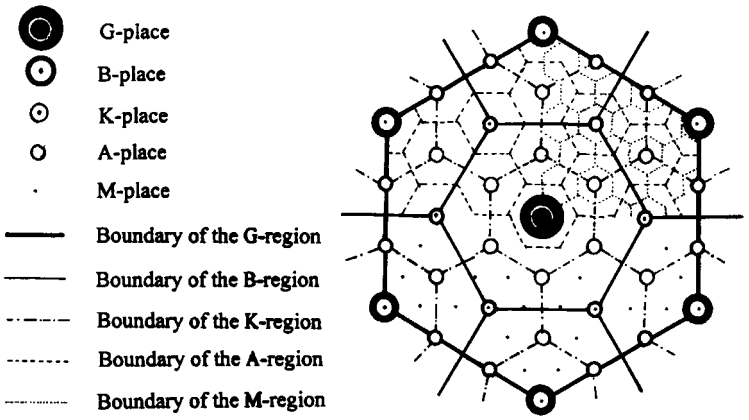


Figure 4.3 Christaller hierarchy of settlements (Christaller, 1966)

and development of the transport system. This would include achieving the balance between different modes of transport and the relationship between public and private provision. The management of

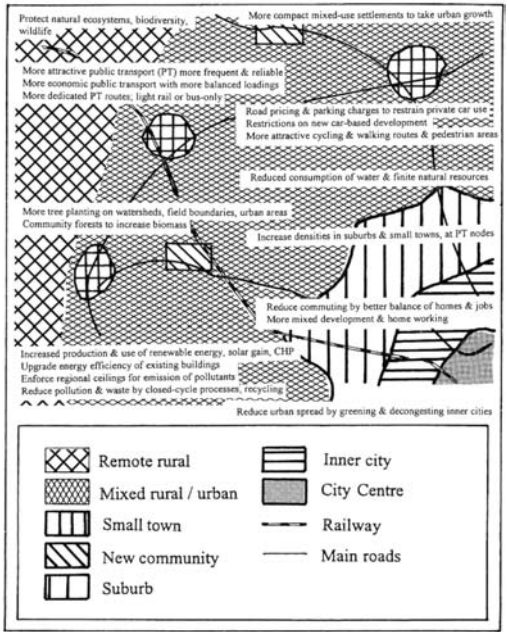


Figure 4.4 The Social City Region (Blowers, 1993)

transport at city region scale facilitates the implementation of continental innovations such as regional, annual and family ticketing of public transport, and the coordination of the timetable for different transport modes. These are some of the features that make the use of public transport in some German cities a pleasure. Proposals such as these would, or course, involve a radical re-think of bus deregulation and rail privatization, with greater emphasis being given to public service rather than private gain in the transport sector.

THE SIZE OF THE CITY REGION

A debate on regional government often returns to the question of the correct size for a city region. There is no one correct size for a city region is the short answer to this question. The idea of the city region has many similarities with the Hellenic city-state. The literature on city size dates back to the fifth century BC when Plato proposed that a 'good city' should have a population of 5040 landowners or citizens. This number was to be maintained by emigration – that is, by the founding of colonies, and also through the laws of inheritance. Plato failed to explain why this particular number was ideal but presumably, for him and his fellow citizens it had symbolic meaning (Plato, republished 1975). Aristotle was far more circumspect when discussing city size. He said: '... ten people would not make a city, and with a hundred thousand it is a city no longer'. His idea was that the city should be big enough and self-sufficient enough for its citizens to lead a good political life. It should, however, not be too big for citizens to lose personal touch with each other so that offices of state could be allocated according to merit and to men known to the citizens (Aristotle, republished 1981). The model for the city region, the polis, Hellenic Athens, may have had about 40 000 citizens with a total population, including slaves, of about 250 000. Many other Hellenic city-states of the time were, of course, much smaller than Athens.

The discussion about city size has changed considerably since the times of Plato and Aristotle. The political system in Athens at the time of Athenian dominance of the Aegean was a participatory democracy. All free citizens in Athens were involved in major decisions concerned with governing the state and also in the election of office bearers. Our system of government is quite different. It is a representative democracy, that is, the citizens elect representatives who in turn take decisions on behalf of the electorate (Pateman, 1970). This fundamental difference between the modern democratic system and that of Hellenic Athens, to some extent, reflects the greater complexity of governing the larger cities of today.

Writers and planners deliberating about ideal city size tended to increase this size as the twentieth century developed. Howard, at the end of the nineteenth century, was suggesting satellite cities of 32 000 and a central or core city of 58 000 people. The planned sizes of new towns built after the Second World War were increased progressively from 50 000 to 250 000. While arguments about the ideal size of cities have occupied the minds of some scholars, cities – particularly in the developing world – have grown at a very rapid rate, so that cities having a multi-million population are now common. Mexico city is an exemplar of the city that will become common as this century

develops: it has a population of about 25 million people with its sprawling suburbs enveloped in a pall of pollution.

Lynch (1981) sums up the position on city size concisely: 'Unfortunately, the evidence that there is a general optimum city size is weak indeed'. It is not the aim here to dispute this view, although the philosophy of sustainable development may add a new dimension to the discussion. The aim of these paragraphs is to discuss the nature of the political and administrative unit best able to manage the environment and to deliver sustainable development: subsumed within this general goal is an interest in the type of authority best able to organize, for example, transport. The city region appears to be the structure most appropriate for the delivery of some aspects of sustained and sustainable development. The size of the city region to some extent is irrelevant. The flexible proposition suggested by Aristotle to determine city size may well be appropriate today for the city region: it should be big enough and self-sufficient enough for the citizens to lead an active political life. Aristotle's upper limit for the city of 100 000, however, would appear to be at the lower end of the scale of population size for a city region in a complex modern democracy (Senior, 1965). More important than crude size is the population's sense of belonging to the place and to a particular polity, so that meaning is derived from citizenship. The other important aspect of Aristotle's prescription for the 'good city' – face-to-face contact or the knowledge of fellow citizens – would be a feature of political life in the neighbourhoods or quarters through the work of agencies such as community or parish councils.

THE REGIONAL PROVINCE

Regionalism has many meanings (Glasson, 1978). It is used in this book to mean an intermediate level of government and administration between the city region and the state. The prime reason for this additional government structure is to make planning for sustainable development more effective by devolving power and decision-making closer to the population. Being larger in population terms than the city region, such provinces provide a stronger counterbalance to central authority. One key to effective regional management of environmental resources lies in legitimising actions and decisions through the election of the governing body. Non-elected bodies and quangos such as Regional Economic Councils, Regional Advisory Commissions or even bodies such as the East Midlands Regional Assembly are no real substitute for an elected regional government. Regional boards, commissions or assemblies are capable of fine work (see for example, the *Revised Regional Planning Guidance for the East Midlands to 2021*). Nevertheless, they lack the political will and muscle to implement sustainable development with all its ramifications (Government Office for the East Midlands, 2003).

Like the city region, it is difficult to determine an optimum size for a regional province. Cultural identity is more significant than size in determining boundaries. Now that there are elected assemblies for Scotland, Wales and a suspended one for Northern Ireland, there is a strong case for regional provincial assemblies in England, which is so necessary for an effective national programme of sustainable development. The Fabian

Society, for example, in 1905 advocated the formation of seven large-scale regions or provinces for England with each province containing several counties (Sanders, 1905).

Later, Fawcett (1961) divided the country into twelve provinces. Some of Fawcett's principles for the regional sub-division of the country may still be appropriate this century (Figure 4.5). He suggested that the regional boundaries should interfere as little as possible with the ordinary activities and movement of people. He thought that each province should have a definite capital city easily accessible from all parts of the province. Fawcett was quite circumspect about the size of the province, placing the lower limit at one million but harking back to Aristotle's definition of city size by suggesting that the province should contain a population sufficiently numerous to justify regional self-government. In terms of population size, he added a further caveat recommending that no province should be large enough to dominate the others. The growth of London and the South East since Fawcett wrote would now make this principle difficult to implement. Two of Fawcett's principles which seem particularly appropriate for sustainable development are: first, his suggestion that regional boundaries should be drawn near watersheds not across valleys, and rarely along streams; and second that boundaries should pay regard to local patriotism and traditions. The first of these principles could be considerably strengthened for purposes of sustainability by the inclusion of ecological factors other than watershed boundaries, such as patterns of soil and vegetation.

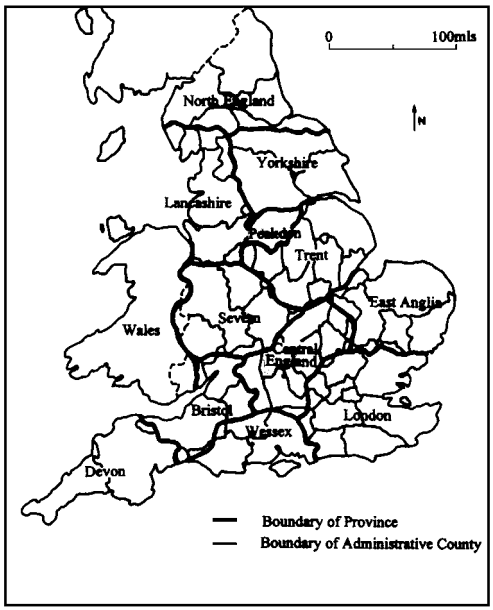


Figure 4.5 Fawcett's regional structure (Fawcett, 1961)

In mid-twentieth century Britain the Second World War provided the impetus for government action on regional organization. An effective war effort required an effective administration for the country. Perhaps the threat of losing a war in the 1940s is a parallel for the present situation in the early twenty-first century with the ever-present environmental threat hanging over mankind like the 'Sword of Damocles'. In the 1940s, Regional Commissioners were appointed to control the affairs of nine Civil Defence Regions. Ministries had representatives in the regional capitals to coordinate regional transport and other aspects of the regional economy in order to maximize efficiency for the war effort. The 'command economy' for the moment is not the 'flavour of the month': draconian measures acceptable in wartime may not appear appropriate in peacetime unless the perceived threat of climate change and environmental degradation become more immediate. Nevertheless, there is much that can be learned about regional planning from the 1940s.

The development of regionalism in Britain after the war, with the exception of Scotland, is one of vacillation, confusion, compromise and neglect. The wartime regional framework was maintained by the Attlee Government as Standard Treasury Regions. The main purpose of the regional framework was to facilitate post-war reconstruction. Also in the 1940s and 1950s several Statutory Boards with their own regional boundaries were established. These Boards dealt with hospitals, railways, gas, electricity and coal: all were major components of the economic and social life of the country. After a period of stagnation in the 1950s there was a re-awakening of regionalism in the early 1960s that culminated with the establishment of the Regional Economic Planning Regions under the Labour administration in 1965. The new planning regions were similar in geographic structure to the original post-war Standard Regions with the exception of an enlarged south-east region and an integrated Yorkshire and Humberside (Figure 4.6). Under the Conservative Government from 1979 onwards regionalism, indeed local government itself, was out of favour and declined in influence. There was a growing shift of power to the centre, that is, to the national government until 1997. The Conservative Government's attitude to regionalism was clearly illustrated in its dissolution of the Greater London Council at a time when its 'Fair Fares' policy was a first step towards an integrated and sustainable public transport system for the capital. It is too early to determine if the current proposals to re-invigorate civic leadership by instituting the concept of elected mayors and local city executives will be successful in reviving the spirit that launched the local innovations in social provision for which the nineteenth-century

Figure 4.6 The Standard Region 1975 (Glasson, 1978)

municipalities in this country are known. Poor relief, hospitals, clean water supplies, schools and subsidized housing were often, in the nineteenth century, the result of local initiatives. The same process and spirit are needed to serve the requirements of sustainable development centred upon civilized cities. The case of London and its elected Mayor does give reason for optimism.

The privatization of water, gas and electricity, the possible break-up (as some would assert) of the National Health Service, the deregulation of bus services together with the disastrous privatization of the railways all have great consequences for regional planning. Delegation of power to the anarchy of the market or, at best, to the tyranny of the boardrooms is counter to ideas formulated in the European Union and

elsewhere about sustainable development. The pursuit of unwanted and wasteful choice in service provision will do little to achieve sustainable development with all that term implies for inter- and intra-generational equity (Schwartz, 2004). Regionalism, decentralization and devolved power is once again on the political agenda holding out the prospect and opportunity for Britain to organize the political and administrative structure of the country so that the result of development is more likely to be sustainable regions comprising cities, towns and villages maintaining a closer balance with the rural hinterland.

THE BIOREGION AND HUMAN SETTLEMENT

The sustainable settlement is one that is in ecological balance with the territory on which it is located. That is, the ecological footprint of the city and the boundary of its hinterland is coterminous. For this reason no large metropolitan city or group of related cities can be sustainable in the long term without considerable ecological inputs and services from beyond its boundaries. The past is the story of the rise, decline and fall of successive civilizations: many former magnificent cities now lie in enigmatic ruin hinting at a glorious past. The wonderful archaeological sites of the cities of the great civilizations of meso-America are evidence of once-powerful regimes: some in less than three generations were deserted. Magnificent Mexican cities such as Monte Albán and Teotihuacan, built over centuries by hand labour without the use of the wheel or the beast of burden, declined, no longer able to sustain their activities. The riches endowed by the environment, if overexploited, can soon be withdrawn and natural vegetation soon envelops even the greatest of structures (Figures 4.7–4.9; see also Figure 6.7). Nearer home in North Africa the 'food basket' of the Roman Empire is now the inhospitable Sahara: it should be a salutary lesson.

Figure 4.7 Teotihuacan, Mexico

URBAN METABOLISM

The world's cities occupy about 2 per cent of global land surface, but they use 75 per cent of the world's resources and release about the same percentage of global wastes (Giradet, 1992). It has already been noted that more than 50 per cent of the world's population will soon be living in cities, contributing to a massive consumption of global resources. The modern city is an 'open system'. That is, cities are not self-contained, they are maintained by exchanges of materials, energy and information with areas

beyond their periphery. The concept of 'metabolism' can be used to form an understanding of this process. As applied to people, metabolism refers to the processes which we use in producing food and energy to conduct our daily lives. 'Urban metabolism refers to the material and energy inputs needed to meet the living and non-living components of urban systems. . . . When we have used these inputs, we have what is commonly referred to as waste' (Keen, in Birkeland, 2002). In natural ecosystems such as the rainforest, the waste from one process becomes a resource input for another process. For example, animal droppings and rotting vegetation serve as nutrients for plant life. The wasteful process associated with city metabolism is linear in form. That is, the city consumes goods, energy and food at high rates and pollutes the environment heavily with organic wastes, noxious fumes and inorganic wastes (Figure 4.10). It has been suggested that this linear urban metabolism should be converted to a form of 'circular metabolism' through the actions of design and management (Figure 4.11) (Giradet, 1996; Roelofs, 1996). Circular metabolism approximates to the systems found in nature where waste products are integrated into the wider ecosystem – that is, new inputs of energy and output of waste are minimized through the process of recycling.

THE BIOREGION AND THE COMPACT CITY

Rogers suggests that it is the 'compact' or 'dense city' model that can be adapted to a circular metabolism, that is, 'where consumption is reduced by implementing efficiencies and where re-use of resources

Figure 4.8 Monte Albán, Mexico

Figure 4.9 Uxmal, Mexico

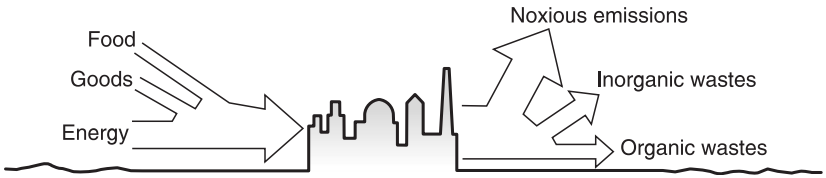


Figure 4.10 The city: linear metabolism

Figure 4.11 The city: circular metabolism

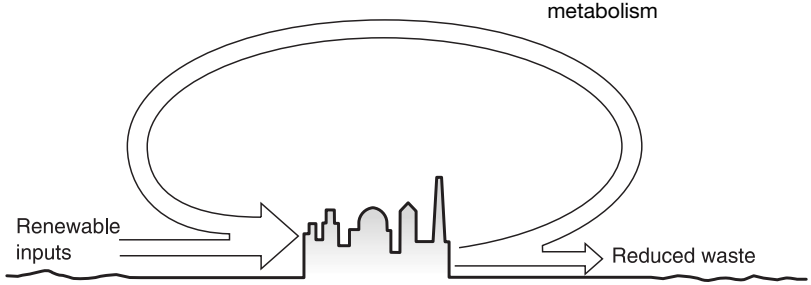
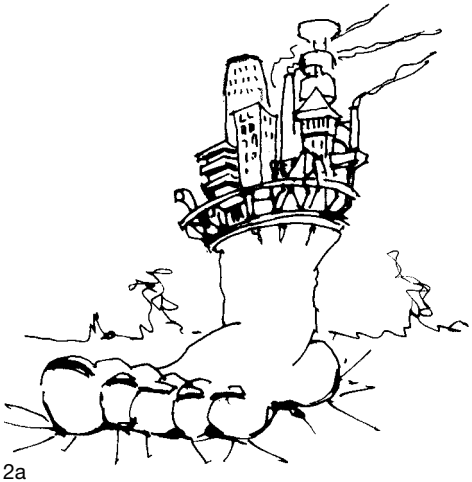


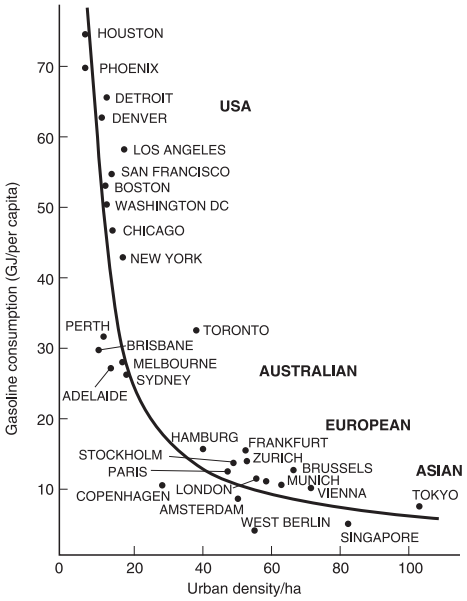
Figure 4.12 (a) Ecological footprint; (b) 'Densification'



4.12a

4.12b

Figure 4.13 Urban density and petrol consumption. Note the increase in petrol consumption particularly when the density drops below 30 people per hectare (ha)



is maximised' (Rogers, 1997, 2000). Increasing densities is not universally accepted as necessarily the only or the best way to reduce the ecological footprint of the city (see Figure 4.12). Increasing urban density is often associated with savings in energy for transport by increasing the viability of public transport and by reducing distances between facilities so encouraging walking and cycling. Figure 4.13 illustrates the relationship between petrol consumption and density: normally, the higher the city density the lower its citizen's per capita use of petrol. This, however, is not a universal truth. For example, Brussels is more than twice as dense as Copenhagen, yet it consumes more petrol than the Danish capital (Bamford, in Birkeland, 2002). There are also obvious savings in land with increased density. But there is also a downside to increasing urban densities. For example, as population densities increase in urban areas, home food production declines and with it the ability to recycle organic waste. 'The contribution that lower densities can make to the productive capacity or output, efficiency and flexibility of the household economy is substantial. Lower densities can also increase the scope and quality of domestic and neighbourhood recreational or social pursuits, and better meet changing household preferences and life circumstances.... Whether space is

wisely allocated in our cities depends on, among other things, what that space is, or can be, used for and what values are fostered by such use' (Bamford, in Birkeland, 2002). The importance of the household economy in urban development should not be undervalued as a study of any city in the developing world would show; see for example, Shalaby's study of 'Income generation by Women in Egypt' (Moughtin *et al*., 1992).

Density alone is a crude instrument on which to base a theory of sustainability. Advocating the compact city or the 'densification' of existing settlements as a panacea for present environmental ills may turn out to be an oversimplified reaction. It may be far wiser to apply to each case the principle of circular metabolism and to attempt to reduce each urban footprint in the most appropriate way. By applying the principle of circular metabolism to the city in its regional setting, and attempting to balance the ecological footprint at this scale, may be more realistic and incidentally may lead also to a more balanced view of the relationship between town and country and between man and his environment (see Figure 4.14).

It has been argued that the bioregion is the proper setting for managing environmental resources for sustainable human settlement (Brunkhorst, 2000). Mumford was advocating bioregional planning as early as the 1930s: he was equally critical of the suburb and the giant metropolis. He thought that suburban sprawl desecrated the landscape and produced stunted communities without an economic or cultural base: they were, according to Mumford, simply sleeping quarters. The metropolis on the other hand is, in Mumford's analysis, a place where

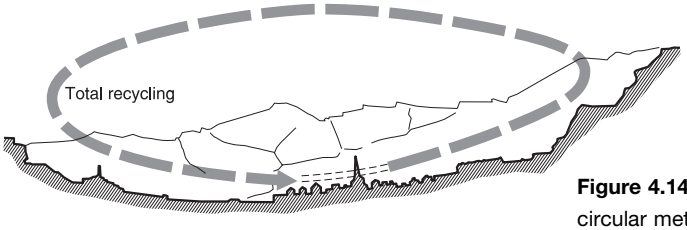


Figure 4.14 The bioregion: circular metabolism

excessive capital investment in transportation systems and other services only increased congestion, forcing up the cost of land which in turn, generated a more intensive use and further congestion: neither metropolitan centralization nor low-density suburban fragments could substitute for community building within a regional structure (Mumford, 1938). Mumford's frame of reference, to some extent, echoed the earlier pronouncements of Ebenezer Howard and the concept of the 'Garden City' and also the regional planning movement inspired by Patrick Geddes (Howard, 1965; Geddes, 1949).

THE BIOREGIONAL BOUNDARY

What is a bioregion? How is its boundary defined? There is no easy or universally accepted answer to these questions. Starting with Mumford, who says, 'The human region, in brief, is a complex of geographic, economic, and cultural elements. Not found as a finished product in nature, not solely the creation of the human will and fantasy, the region, like its corresponding artefact, the city, is a collective work of art.' In terms of regional size and boundary definition, Mumford is circumspect: he sees, 'as a consequence of this recognition of the organic: that is, the disappearance of the boundary walls between the inner and outer, the conscious and unconscious, the external

Hierarchy level	Name	Planning and management area
I	Ecodomain	global biosphere, inter-continental
II/III	Ecoregion	continental/ sub-continental
IV	Bioregion	regional landscapes
V	Landscape	sub-regional, landscape ecosystems
VI	Patch	ecosystem component

Figure 4.15 Hierarchical framework of ecological units

and internal'. Later, he applies this organic way of thinking specifically to the natural region: 'Unlike the old-fashioned political areas they have not – except in the case of isolated islands, oasis, or high mountain areas – any definite physical boundaries. The region may be defined and delimited in thought; but this is largely a practical convenience.' As far as regional size is concerned, Mumford seems to echo the views of Aristotle on city size: 'In conceiving of a region, then, it is necessary to take an area large enough to embrace a sufficient range of interests, and small enough to keep those interests in focus and to make them subject to direct collective concern' (Mumford, 1938, pages, 367, 303, 315 and 314.)

Recent writers are divided on the nature of the bioregion. One school of thought sees natural regions as a series of nesting bioregions while others see them as a series of overlapping functional regions. Brunkhorst supports the idea that natural forms, whether they are coastlines or organisms, reflect miniscule, self-similar building blocks: 'These basic elements of form are called fractals by those who study geometric shapes in nature. Fractal geometry is based on the remarkable relationship between form and its elementary building block.' Brunkhorst cites as an example the fern frond, where the elements of the frond are smaller and smaller groups of similar frond-shaped forms (Brunkhorst, 2000). He suggests the following regional ecological framework, starting at the largest unit the 'Ecodomain' or global biosphere; the 'Ecoregion' at the scale of the continent or sub-continent; the 'Bioregion' or the large regional landscapes; the 'Landscape' or sub-regional landscape ecosystem; and finally the smallest building block, the 'Patch' or the ecosystem component (Figure 4.15).

This view of a system of nesting ecological units, whilst offering a neat and elegant explanation of natural forms, is nevertheless not universally accepted as being practically useful by many espousing a green philosophy. Birkeland (2002) suggests that the idea of overlapping and fluid boundaries represent the actual state of ever-changing ecosystems as opposed to rigid human-constructed boundaries. Such boundaries set in stone may be an impediment to a true analysis of the relationship between man and his use and abuse of natural resources. It is argued that bioregional planning to be truly effective for sustainable development must be based on boundaries that reflect the transient realities and characteristics of ecosystems. From this starting point, it appears that it would be better to map critical issues of sustainability such as water, energy, waste treatment or those factors considered to be the most fundamental limiting systems in the region. Using Geographic Information Systems (GIS), it is now possible to map these crucial systems separately and analyse areas of conflict and potential synergies.

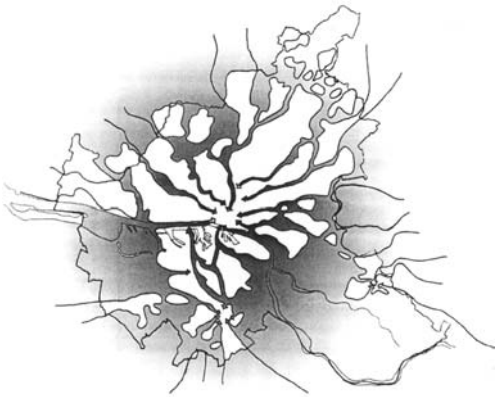
BIOREGIONAL PLANNING

Despite differences in approach, in general terms bioregional planning begins from a different premise from that of conventional planning. Conventional planning is a process for choosing between developments according to the best or most economic use of land, accommodating growth in the sense of transforming nature, though the process may attempt to accommodate some conservation if the price is acceptable or if it is politically expedient. In contrast, bioregional planning starts from, '... the recognition that humans are biological entities and therefore need systems for living that are designed to meet their cultural, economic, and physical needs, but in ways that foster symbiotic relationships with complex ecological systems in the bioregion. Human cultures have co-evolved with nature, a relationship which has been integral to both human survival and biological evolution. Thus, humans are dependent on the integrity of the food chain (e.g. without the bacteria in our stomachs, we might be unable to live). Therefore, lifestyles, cultures, industry and even systems of governance are rooted in and should conform with, the natural conditions of the region' (Birkeland and Walker, in Birkeland, 2002). The basic differences in emphasis between conventional and bioregional planning is illustrated in Figure 5.2.

Almost by common agreement, the region is seen as a flexible concept and its size and boundaries vary according to its purpose. Any regional system of government, therefore, will have its anomalies. For good governance fixed boundaries are necessary, and for continuity they should have a degree of permanence. In this country, eight to ten elected regional governments would serve the purpose of sustainable development: the boundaries associated with the areas served by the Regional Government Offices seems as reasonable as any other option (see Figure 4.6). Within these regional governments, ideally there should be a further set of subsidiary administrations based on thirty to forty city regions similar to those advocated by Senior in 1965. Such city regions would be well suited to structure and manage a sustainable public transport system serving commuter movements. Even a cursory examination of Regional Guidance in this country illustrates the need for, and the possibility of, considering small special environmentally fragile areas within a large region or those areas and issues of sustainability that extend beyond regional boundaries (GOEM, 2003). The demarcation of a fixed regional boundary for administrative purposes should, therefore, cause few problems for governance in the pursuit of sustainable development.

Sustainable development in rural areas of the bioregion cannot be considered in isolation from the total rural and urban settlement pattern. If one takes a narrow homocentric stance, the *raison d'être* of the rural hinterland is to service the urban settlements: a 'deeper green' view would emphasize sustaining the biosphere of which human beings and their settlements are but a part. The city of Hamburg has embedded a landscape strategy into the planning of its urban structure: landscape corridors stretch from all directions deep into the heart of the city (see Figure 4.16). *Towards an Urban Renaissance*, articulates

Figure 4.16 Landscape strategy for the City of Hamburg, Germany



this idea and recommends that local authorities should '... prepare a single strategy for their public realm and open space, dealing with provision, design, management, funding and maintenance', and that a national programme be introduced '... to create comprehensive green pedestrian routes around and/or across each of our towns and cities' (Urban Task Force, 1999).

THE PRIMACY OF THE LANDSCAPE

Urban centres are normally considered as the positive elements of the regional landscape: often, they are given the greatest planning attention. In some mapping conventions the urban area is depicted as darker, the positive element, set against the surrounding countryside, which is largely white. Figure 4.17 uses Hamburg in Germany to illustrate this image of a city seen against a landscape backcloth. Being beyond the day-to-day remit of planning, large parts of the countryside in this country were known in the planning profession as 'white areas'. In Figure 4.18, the tonal values for town and country are reversed. The map now shows landscape as black and the urban area as white. A different picture emerges. The regional landscape is seen in a new perspective. All mapping is a simplification of reality and this way of depicting regional landscape is particularly so. However, with the change of viewpoint, the new image, does

Figure 4.17 Figure-Ground Study. City as the Figure, Landscape as the Ground

Figure 4.18 Figure-Ground Study. Landscape as the Figure, City as the Ground

4.17

4.18

serve the simple purpose of emphasizing the rural hinterland: it now becomes the positive element in the picture. For sustainable development the regional setting is the primary consideration.

The function of the bioregion and its landscape is to maintain environmental services including waste management, water, energy and food supplies for the regional populations together with the maintenance of biodiversity, a cornerstone of sustainable development. For too long monoculture has dominated the rural landscape: its role has been to support the global food markets, seeking justification in the presentation to the population of a spurious choice of food products. Clearly, the very shortest supply lines, serving local markets with good quality, fresh produce would seem to be both in the people's best interests and to be a more sustainable system in the long term. An assumption of urban landscaping is that the city is not, apart from a few token allotments, the place where food is grown. The city is not the location for trees and bushes bearing fruit, where groundcover is edible, or where vegetables are used as decoration. Mollison (1996) suggests that we, 'Replace energy hungry parkland lawns (requiring frequent mowing, fertilizing, and weed control with health damaging pesticides) with edible and decorative understorey species such as blueberry, comfrey, lavender, strawberries and so on, depending of course on climate. Nut trees could replace barren hedges. In the industrial zones, greenbelts and undeveloped city land, urban woodlots could be created. These could include native trees to attract birds and productive insects, as well as orchards. . . .' In Portugal, for example, it is usual for the city squares to be lined with orange trees which are perfumed when in flower and lovely, and potentially useful when in fruit (Figure 4.19).

Figure 4.19 Fruit trees as decorative features: Villa Real De Saint Antonio, Portugal

CONCLUSION

The sustainable city or bio-city is one that is in balance with its region; in synergy with its natural environment, an active part of the larger ecosystem of which it is a vital component. For this to happen, the landscape in which the city is located must be accorded its due attention and not remain the 'Cinderella' of political decision-making: the space left over after economic and urban development priorities have been met. This is not to argue that the city in its bioregion must be entirely independent of the national or global economy, either now or in the future. The city is a place of exchange of both goods and ideas. That

role does not conflict with the goal to achieve a sustainable future by increasing the ecological balance between the city and its bioregion. This is not advocating a return to some glorious past when the town was an appendage of the countryside simply serving the main function of marketplace: the bio-city is a vital component set in overlapping regional ecosystems.

THE URBAN PARK

5

PETER SHIRLEY

INTRODUCTION

Land use is fundamental to nature conservation, urban environmental management and sustainable development. Since cities first developed provision has been made for formal and informal open spaces, either for the privileged classes or for the mass of the people. In the United Kingdom, the rapid growth of towns and cities in the nineteenth century soon led to calls for parks to be provided for the health of factory workers. An early example, perhaps, of what we now call sustainable development, with benefits to the economy (healthier, happier and therefore more productive workers), social life (people relaxing and meeting in the parks) and the environment (as open spaces were created amongst the streets, mines and factories).

The late nineteenth and early twentieth centuries saw the development of the science of ecology and the growth of the nature conservation movement. Three main phases in the development of nature conservation in Britain may be identified. First, it was almost exclusively about land use and management, although the land concerned was rarely in towns. The National Trust was formed in 1895, and its remit included the promotion and protection of 'places of natural beauty and historic interest for the benefit of the nation'. Most wildlife trusts came into existence to acquire and manage land: by the 1990s the nation's forty-seven wildlife trusts owned or managed over 2500 nature reserves. Second, in the last quarter of the twentieth century, these and other organizations expanded their work to include substantial education, interpretation and advocacy programmes. This combination of conservation management and engagement with people and policy-makers put the conservation organizations in an ideal position to contribute to sustainable development. As this concept took root, they were ideally placed to demonstrate the links between the natural world, social equity and economic development, thus entering the third, and current phase.

In the 1990s the nature conservation organizations were also able to embrace and promote the new idea of 'biodiversity'. This is defined as the variety of species,

their genes and their communities and interactions. The term first came to public notice following the Earth Summit in Rio de Janeiro in 1992. One of the outputs of the Summit was the Convention on Biological Diversity – a commitment to conserving and improving global biodiversity signed up to by many countries, including the United Kingdom.

One more thing was necessary to open the way for biodiversity to play its rightful role in improving towns and cities. This was the acknowledgement that wildlife and its habitats are just as important in towns and cities as in rural and remote areas. Although there are still people who think that nature can only thrive in the countryside, and that somehow the wildlife of towns and cities is second rate, or a poor imitation of 'proper' wildlife, there is increasing recognition of the part that properly functioning ecosystems play in improving both urban environments and people's quality of life. This recognition has grown out of the activities of the vigorous urban nature conservation movement which sprang up in the late 1970s and included, in 1980, the formation of what is now the Wildlife Trust for Birmingham and the Black Country, and the London Wildlife Trust.

Wildlife in towns all over the world has to contend with typical urban characteristics. For example, towns and cities are generally warmer and dryer than the surrounding countryside because increased energy-flows warm buildings and hard surfaces. This 'heat island effect' is linked to the fundamentally arid nature of towns. Rainfall runs over sealed surfaces into drains rather than being gradually absorbed into the ground, as in the countryside. Other common characteristics include the presence of exotic species and 'urban specialists', such as feral pigeons, brown rats and house sparrows, the masking of the soil profile by the remains of previous development, and the unique assemblages of species which occur when cosmopolitan nature expresses itself on 'brownfield sites'.

If the nature conservationists have arrived, bright eyed and bushy-tailed, in our post-modern metropolises, what sort of welcome are they getting from the eclectic mix of urban regeneration professionals or 'urbanists'? Not much of one – judging by government pronouncements about, and activities related to, the urban renaissance. This seems to be almost entirely focused on social and economic developments. There are references to 'the physical environment', a determination to rid towns of eyesores and derelict land, and a desire to improve streets and squares to encourage socialising. Even so, there is no breadth of vision, or depth of understanding, of the relationships which should be recognised and nurtured between people and the natural world.

Since the break up of the Department of the Environment, Transport and the Regions (DETR), responsibility for 'the environment' has been separated from transport, regional development, planning, and local government. These functions are now split between four ministries (the Office of the Deputy Prime Minister, and the Departments of Transport, Trade and Industry, and Environment, Food and Rural Affairs). This has serious repercussions for sustainable development which demands integration and strategic thinking in these areas. At least local authorities still combine the necessary functions and, moreover, have a discretionary power under the Local Government Act 2002 to 'do anything they consider likely to promote the economic,

social or environmental well being of their local area'.

AMONGST THE BUILDINGS

Typically open spaces take up about one-third of urban areas. Whether there by design or default, they may contribute to, or detract from, sustainability. The resources needed to manage them, such as energy, chemicals and finance may – or may not – be compensated for by the economic and social values they provide. The resources will be offset to a greater or lesser extent by the free ecosystem functions provided, especially by informal, semi-natural and natural greenspace. The matrix of open spaces performs many such functions for both people and wildlife with its vegetation, permeability and varying degrees of connectedness and isolation within the town, and between the town and the open countryside. These functions include flood defence, improving air quality, providing shelter and shade, places for recreation and wildlife habitats, and enhancing property values.

One way of classifying greenspaces is shown in Figure 5.1. This simple typology recognizes four landscape types. In two of them natural processes predominate, while in the other two human activities predominate.

Working landscapes are crucially important to sustainable development. The amount of locally grown food, on farms or in private gardens (although these belong in the next class) or public allotments, should be a sustainability indicator. Many people living in deprived urban areas have difficulty obtaining fresh fruit and vegetables. Locally grown produce helps to address this deficiency, as well as making good use of open land, providing recreation and exercise, and saving on transport and fuel. Although reducing in number, there are more farms within towns than is generally realized. Walsall MBC owns several farms close to the town centre, and neighbouring Sandwell runs its own dairy farm, complete with milk quota, less than two miles from West Bromwich town centre.

Areas of urban forestry are increasing thanks to the work of the National Forest in the Midlands, community forests such as the Forest of Mercia, mainly in Staffordshire, and the Red Rose Forest in the North West,

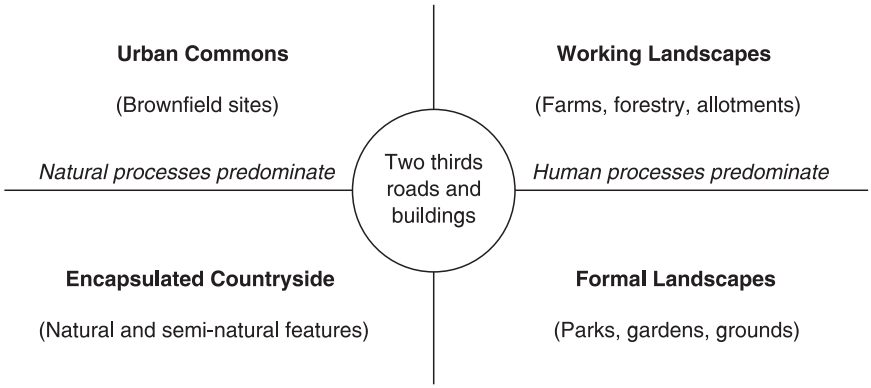


Figure 5.1 Urban landscape types

and the National Urban Forestry Unit. The Unit promotes the values of a strategic approach to woods and trees in urban areas. This approach takes account of existing woodlands, street trees, trees in parks and gardens and the opportunities to create new woodlands, the whole being 'the urban forest'. They also encourage developers and regeneration agencies to undertake structural planting as part of land reclamation. Boundary and screening trees, planted perhaps years before development takes place, add value to vacant land, improve the urban landscape and contribute to biodiversity.

Formal landscapes comprise parks, cemeteries, private gardens, institutional grounds, the gang-mown prairies around high-rise flats: anywhere in fact where high inputs of labour and materials are used to create an effect, ornamental or otherwise.

Encapsulated countryside includes river valleys, ancient and other woodlands, unimproved grasslands, heathland and wetlands. It is more common than is generally recognized, and often comes close to, or in the case of rivers, through city centres. (The River Thames in central London may not have much of a floodplain now, and its Strand is a busy street well away from its modern banks, but its aquatic ecosystem has been largely restored in the past twenty years.) Places like Hampstead Heath in London and Sutton Park in Birmingham are examples of substantial pieces of countryside which have survived urban encroachment. In general the land in Sutton Park has never been cultivated or enclosed. It is now a National Nature Reserve and the largest park of its type in Europe.

Urban commons, a neutral rather than pejorative term (Gilbert, 1989) to cover brownfield sites, vacant land, wasteland, backland, informal open spaces and derelict land, often perform valuable functions. In its final report, the Urban Task Force (1999) gave a new acronym to some brownfield land – SLOAP, or 'Space Left Over After Planning'. It was described as 'soulless, undefined places, poorly landscaped, with no relationship to surrounding buildings'. These leftover plots between roads, houses and factories, which no one appears to own, and often for which no one wants to take responsibility, can be death traps for children, valued community green spaces, relics of industry or designated wildlife sites. Sometimes they are a combination of these and other attributes.

The Government has now targeted such land for development, and want 60 per cent of all new houses to be built on it (or to be provided by the conversion of existing buildings) in order to 'save the countryside' (Urban White Paper, 2000). Whilst the desire to bring this land into productive use is meritorious, the narrow thinking which sees it only for building on is not. The various uses, functions and values of urban commons need to be understood, assessed and integrated into urban design and planning. According to the Urban White Paper the Government itself wants '. . . everyone to have access to well-maintained and safe parks, play areas and other open spaces close to where they live and work'. Building on all available brownfield sites will make this aspiration more difficult to achieve.

The Urban Greenspaces Task Force (DTLR, 2002b) provides a more sophisticated typology than the simple one given above (Box 5.1 shows an extract), although here the urban commons are reduced to 'wasteland'. This typology, based

Box 5.1 Urban Open Space and Green Space Typology

Urban Open Spaces	
Typology suitable for planning purposes and open space strategies	More detailed classification for open space audits and academic research
Green spaces	
Parks and gardens	Urban parks
	Country parks
	Formal gardens (including designed landscapes)
Amenity greenspace (most commonly, but not necessarily, in housing areas)	Informal recreation spaces
	Housing green spaces
	Domestic gardens
	Village greens
	Other incidental space
Allotments, community gardens and urban farms	Allotments
	Community gardens
	City (urban) farms
Natural and semi-natural urban greenspaces, including woodland or urban forestry	Woodland (coniferous, deciduous, mixed) and scrub
	Grassland (e.g. downland and meadow)
	Heath or moor
	Wetlands (e.g. marsh, fen)
	Open and running water
	Wastelands (including disturbed ground)
	Bare rock habitats (e.g. cliffs, quarries, pits)
Green corridors	River and canal banks
	Road and rail corridors
	Cycling routes within towns and cities
	Pedestrian paths within towns and cities
	Rights of way and permissive paths

on land use, is problematic because many open spaces have more than one use. For example, 'country parks' usually contain natural and semi-natural greenspaces such as woodland and grassland, provide cycle and pedestrian paths, often have outdoor sports facilities, and may also be part of green corridors. Although designed for use as a strategic planning tool, the typology has serious limitations because of its reductionist and compartmentalized thinking.

It is better to think of the open spaces of a town or city as a multi-faceted matrix, performing a variety of functions and having a variety of uses. We do, after all, think of networks of roads and complexes of buildings, so why not a matrix of open spaces?

MULTI-FUNCTIONAL GREENSPACE

Decrepit, unattractive urban open space conceals its values from all but the specialists, but some greenspaces display these values like peacocks. Hyde Park and Regent's Park in London, and Central Park in New York are good examples. Almost uniquely Central Park defines and characterizes Manhattan in equal measure to iconic buildings, such as the Chrysler and Empire State. New York's

city fathers were far-sighted when they put aside the blocks taken up by Central Park so that they remained undeveloped, and this in a place with very high land values. It is now a playground, nature preserve, green lung and sports field rolled into one. I once arrived there after three weeks travelling through the north eastern states, and saw more birds, and more species of birds, in Central Park in one day than I had seen in all the rest of the trip.

In a report on the multiple uses of green networks in urban areas, Barker (1997) reviews their history and relevance to people, their importance to society, their benefits to urban landscapes, nature conservation and air and water quality, and discusses related strategic planning issues. He defines green networks as '... natural, or permanently vegetated, physically connected spaces situated in areas otherwise built up or used for intensive agriculture, industrial purposes or other intrusive human activities. They may include land to which there is no general access, such as private gardens and estates'. (Individual greenspaces are themselves defined by Box and Harrison (1993) as 'Land, water and geological features which have been naturally colonised by plants and animals and which are accessible on foot to large numbers of residents.')

Barker also says that "Green networks with multiple uses and values in urban areas go beyond the early ideas that they are important simply for recreation and for beauty. They also address the needs of wildlife, flood control, improved water quality, outdoor education, community cohesion, local transport and many other urban infrastructure needs.' These and other functions place green networks firmly in the field of sustainable development, indeed they epitomize the integration of economic, environmental and social factors which underpins the concept.

With regard to accessibility to urban greenspaces the Report gives English Nature's recommended standards for providing such access. These standards are being promoted, and variations of them are appearing in planning policy documents, such as the Birmingham Nature Conservation Strategy (Birmingham City Council, 1997) and Draft Regional Planning Guidance for the West Midlands Region (WMLGA, 2002).

The recommended standards are that:

People living in towns and cities should have:

- An accessible natural greenspace less than 300 metres (in a straight line) from home;
- Statutory Local Nature Reserves provided at a minimum level of 1 hectare per thousand population; and
- At least one accessible 20-hectare site within 2 kilometres of home; one accessible 100-hectare site within 5 kilometres of home; and one accessible 500-hectare site within 10 kilometres of home.

It seems unlikely that many people in British towns and cities enjoy this level of access to open spaces. The standards are designed however to provide a yardstick against which current and future provision can be measured, a rationale for dedicating new, or keeping existing, open spaces in the face of development pressures, and an aspiration for local authorities.

In 2002, a report published on behalf of the London Brownfield Forum (London Wildlife Trust, 2002) pointed out that many supposedly 'derelict' sites are valuable for

biodiversity and provide green open space for many people. In a foreword, the then Chair of English Nature says: 'London's brownfield sites host a wide range of animals and plants, some of them nationally rare and many of them truly characteristic of a cosmopolitan London. This ''unofficial countryside'', now under pressure from development, is as much part of the living London as Hampstead Heath, Richmond Park and Epping Forest.' (He could have added that those three sites are part of the same continuum of open spaces in London as the brownfield sites. These different sorts of open spaces, varying as they do in size, attractiveness, ecological richness and history, are functionally interconnected. Birds which nest in the mature trees of Richmond Park are likely to forage amongst the pioneer plants and tall herbs of more informal open spaces nearby.)

Robert Costanza *et al*. (1997) have attempted to take our understanding of the multiple functions provided by natural ecosystems a stage further by ascribing monetary values to them. Although controversial, their work suggests that for the entire biosphere the value of seventeen ecosystem services (such as waste treatment, pollination, soil formation, and nutrient cycling) is $33 trillion per year. This is largely discounted by conventional market economics which provide a figure for the global gross national product of about $18 trillion per year (this figure was later revised to $25 trillion; Costanza *et al*., 1998). The figures can be debated, but the point is that whatever resources may be devoted to providing and managing urban open spaces are likely to be more than repaid by the values of the functions those open spaces provide.

PLANNING TOOLS FOR NATURE CONSERVATION IN URBAN AREAS

This leads on to a consideration of some of the planning tools at the disposal of those promoting biodiversity in urban areas. If many wildlife-rich places have survived or evolved in towns and cities by default, there is a growing realization that they can be retained and improved by design. Some of the key tools are listed here, space not permitting anything other than a brief mention.

(1) The UN Convention on Biological Diversity (CBD): Given expression in the United Kingdom through a structured programme of identifying priority habitats and species, and developing biodiversity action plans (BAPs) – see below.
(2) The Conservation (Natural Habitats &c) Regulations: European legislation which provides for the designation of sites of European importance: Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). One of the most powerful provisions is Regulation 37, which 'requires every Local Planning Authority to include development plan policies.... which encourage the management of features of the landscape which are of major importance for wild flora and fauna' (Oxford, 2000). These 'features of the landscape' might include hedgerows, rivers, canals, wildlife corridors and networks of green spaces.
(3) Planning Policy Guidance Notes (PPGs) (now becoming Planning Policy Statements (PPSs) in England and Wales): Amongst the most significant of

these for biodiversity and open spaces are PPG3 Housing (DETR, 2000a), PPG9 Nature Conservation (DOE, 1994) and PPG17 Sport, Open Space and Recreation (ODPM, 2002).

PPG3 Housing is particularly useful in any discussion of green networks, high-quality urban green spaces, or the uses of brownfield sites. It not only enshrines the Government's targets for building **on** brownfield land, it contains a government definition **of** brownfield land. Most usefully it also provides guidance as to what is excluded from this definition. This is the definition, contained in Annexe C:

> There are various definitions of previously developed land in use. For the purposes of this guidance, such land is defined as below:
>
> Previously developed land is that which is or was occupied by a permanent structure (excluding agricultural or forestry buildings), and associated fixed surface infrastructure. The definition covers the curtilage of the development. Previously developed land may occur in both built-up and rural settings. The definition includes defence buildings, and land used for mineral extraction and waste disposal where provision for restoration has not been made through development control procedures.

And this is what is excluded from the definition:

> The definition excludes land and buildings that have been used for agricultural or forestry purposes, and land in built-up areas which has not been developed previously (e.g. parks, recreation grounds, and allotments – even though these areas may contain certain urban features such as paths, pavilions and other buildings). Also excluded is land that was previously developed but where the remains of any structure or activity have blended into the landscape in the process of time (to the extent that it can reasonably be considered as part of the natural surroundings), and where there is a clear reason that could outweigh the reuse of the site – such as its contribution to nature conservation – or it has subsequently been put to an amenity use and cannot be regarded as requiring redevelopment.

This exclusion seems to have gone largely unremarked, although it has been used to prevent development (Dodd versus the Secretary of State for the Environment, Transport and the Regions, 2002).

PPG17 Sport, Open Space and Recreation calls for 'robust assessments of the existing and future needs of communities for open space, sports and recreational facilities', and 'audits' of those facilities as they now are. More crucial for the current discussion is this:

> Existing open space, sports and recreational buildings and land should not be built on unless an assessment has been undertaken which has clearly shown the open space or the buildings and land to be surplus to requirements. For open space 'surplus to requirements' should include consideration of all the functions that open space can perform.... an applicant for planning permission may seek to demonstrate through an independent assessment that land or buildings are surplus to requirements. Developers will need to consult the local community and demonstrate that their proposals are widely supported by them.

Taken literally, this guidance would probably stifle all development on urban green spaces. For example, *'consideration of all the functions that open space* can *perform'*, rather than the functions a particular site 'does perform', could cover many things, only some of which are touched upon in this chapter. Similarly, commissioning independent studies and gaining the wide support of local communities are potentially time-consuming activities many developers will prefer to avoid. Nevertheless, for these and many other reasons, PPG17 should be in the brief case of every sustainable development practitioner engaging in urban regeneration.

(4) Nature conservation strategies: In the 1980s these became relatively popular with planning authorities. A typical strategy describes an area's nature conservation resources, outlines their merits and importance, and sets out aims and priorities to protect and enhance them, and ensure their proper management.
(5) Local Biodiversity Action Plans (LBAPs): See the case study below. Although they are not mandatory, government guidance indicates that local authorities should take them into account, and incorporate them into their Community Strategies (see below).
(6) Community strategies: The Local Government Act 2000 places a duty on every local authority to produce a 'Community Strategy' for the improvement of the economic, social and environmental well-being of its residents. The link to biodiversity comes through the Rural White Paper (DETR, 2000e) in which the Government says:

> We will expect all local authorities to incorporate planning for local action on biodiversity in the integrated community strategies which they are required to prepare under the Local Government Act 2000.

This gains in importance when considered alongside the move to rationalize the multiplicity of plans local authorities are required to prepare. A circular from the Office of the Deputy Prime Minister (ODPM, 2003b) advises that:

> By the end of 2005/06 ... there will be just six major plans ... in addition to the Best Value Performance Plan and the Community Strategy.... A series of plans can be integrated with Community Strategies ... (including Local Biodiversity Action Plans).

(7) Planning Conditions and Obligations: Conditions may be imposed by planning authorities, or they may enter into agreements about obligations with developers (usually under Section 106 of the Town and Country Planning Act 1990). These may cover protection of the natural environment, reduction of the impact of a development on local wildlife or habitats, and compensation for the loss of valuable habitat.

SUSTAINABLE DEVELOPMENT

For a subject which has a government strategy (DETR, 1999d) all to itself,

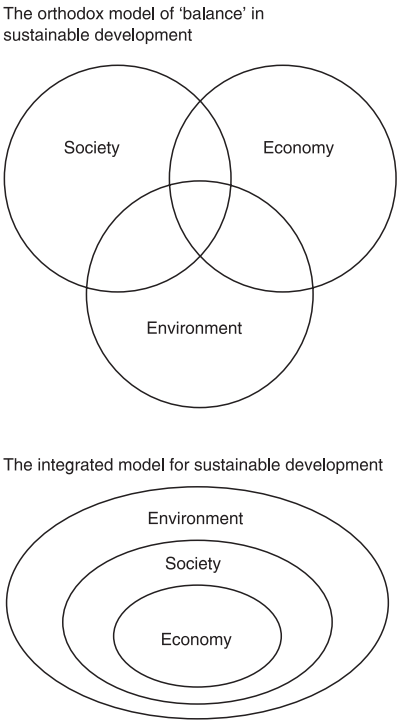


Figure 5.2 Sustainable development (source unknown)

sustainable development has proved to be an elusive concept. It is everything and nothing – one moment the fig leaf of respectability for otherwise damaging policies, the next underpinning key initiatives related to climate change or social inclusion. At its simplest of course it is common sense – living our lives in ways which do not compromise the lives of others and wherever possible improve the world which we all share, and which our children will inherit.

One of the problems with sustainable development is that it was first promoted and identified as a process to help 'balance' economic, social and environmental factors. This implied that losses in one area could safely be traded for gains in another, and in particular that economic development, being part of sustainable development, could continue unfettered. Hence one of the Government's four sustainable development objectives is 'the maintenance of high and stable levels of economic growth and employment'.

It is much more useful to approach the subject with integration rather than balance in mind (Figure 5.2 shows the difference in diagrammatic form). The integrated figure places the three elements in their correct relationship – economic activity is subsumed within society because it is one of many forms of social activity. Social life is then placed within the environment, because all activities take place within an environment of some sort. This approach would justify changing the above objective to 'achieving appropriate levels of economic growth coupled with high and stable levels of employment'. This is a subtle but significant difference which maintains the distinction between ends and means.

Another of the four objectives is 'effective protection of the environment'. Although this is very broad, it is widely recognized that the state of, and trends affecting, the natural environment and biodiversity are key indicators relating to this objective.

Design and planning incorporating sustainable development principles would incorporate the social and economic needs of people, whilst at the same time making provision for the high-quality natural, semi-natural and built environments which contribute to those needs.

In considering the various aspects of people's relationship with nature, David Nicholson-Lord (2002) says, 'Ever since human beings created cities, we have tried to escape them. We have moved out – to

suburbs and more recently to distant villages and small towns. We have moved the countryside in – as parks and gardens.' He points out that the Hanging Gardens of Babylon were built to resemble the mountainous country so beloved of Nebuchadnezzar's queen.

In discussing the current fashion for increasing housing densities and building on brownfield land, he also says '... the new orthodoxy is profoundly mistaken. For all the inspiring talk of sustainability and urban renaissance, our obsession with compact cities risks another great planning disaster – a new era of town cramping which, by ignoring human relationships with nature, will do nothing to secure the long-term stability of the city. By recognising those relationships, however, it's possible to envisage a city which is genuinely sustainable, because it fulfils human needs, and a countryside which, while altered, may be greatly improved.'

Nicholson-Lord goes on to propose a Manifesto for Green Cities which includes:

- Scrapping the indicator that measures sustainability by the proportion of brownfield sites redeveloped.
- Having a new sustainability indicator measuring people's satisfaction with the urban environment.
- Having a target for the proportion of managed urban land in designated greenway strategies.
- Mandatory standards for the quantity and accessibility of urban open spaces.
- More imaginative greenspace design.
- Habitat creation.
- River and wetland restoration and sustainable drainage.

CASE STUDIES

HARMONY FLORIDA

One disadvantage encountered by those trying to change established practices, or 'retro-fitting' new ideas and principles to existing towns, is that they may have to work with centuries of infrastructure. In a typical city, up to 90 per cent of the buildings that will be there in thirty years' time already exist. Their vices and virtues have to be accommodated within any new planning and management regimes. The luxury of designing and building completely new settlements is given to few now. Even the British new towns of the mid-twentieth century were based on existing towns, and places like Port Sunlight and Bournville were more suburb than independent towns.

In Florida, however, there is a new town being built called Harmony. Describing itself as 'a new conservation community', Harmony's developers plan to build 'a model for how communities can accommodate a growing population in environmentally intelligent ways'. Half an hour from Orlando, Harmony is set in 11 000 acres of meadows, wetlands and pine woods, and has two 500-acre natural lakes. The first of up to 7000 houses and apartments were occupied in 2003 after a new school was built, and after some streets, a golf course and 'dark skies' street lighting were installed. Residents (18 000 are planned for) will share their land with, amongst other things, deer, bobcats, sandhill cranes, ospreys and owls. No development will be allowed along the lakes' shores or, unusually on or around the golf course. Neither will powered boats be allowed on the lakes. The town's layout will facilitate and encourage walking and cycling,

and everyone will live within 3 minutes' walk of a park.

Harmony is the brainchild of Martha and Jim Lentz. Jim is one of the developers, and emphasizes that this is a commercial development that has to pay its way. Martha runs the Harmony Institute, a charitable organization which is pioneering, monitoring and reporting on the environmental aspects of the town and the lives of its residents. Advisers include Roger Ulrich, Director, Centre for Health Systems and Design at Texas A&M University, who has suggested (1984) that people with a view of the natural environment recover from surgery more quickly than those without such a view, and that merely entering a semi-natural urban greenspace immediately reduces a person's heartbeat and stress levels.

Another adviser is John Hadidian, Director, Urban Wildlife Programs, the Humane Society of the United States. John's special contribution has been the authoring of Harmony's 'Community Covenants and Restrictions'. Every resident has to sign up to this 22-page document, the full title of which is: '*Harmony Residential Properties Restrictions, Guidelines and Goals Concerning Companion Animals, Habitat and Wildlife*'.

The Harmony covenant lays down what is probably the most detailed framework and mandate for the relationship between a town's inhabitants and its wildlife anywhere in the world. It begins: 'The overall goal of Harmony is to promote the peaceful coexistence of (these) human and animal residents within the community while striking a balance between the preservation, use and enjoyment of Harmony's natural areas. Underlying these objectives are the values of fostering respect for the land, the protection of wildlife and the sensible use and enjoyment of Harmony's abundant natural and manmade amenities by its residents'.

Restrictions include no trapping of or keeping wild animals and no hunting – although fishing is allowed. Some of the contents may seem surprising, for example: 'Removal of wildlife shall not be conducted simply because a homeowner considers the mere presence of a wild animal to be a ''pest'' or ''nuisance'' or because a homeowner wishes to favour a species or group (such as songbirds) over another that competes with it (such as squirrels)'. There are also sections on environmental management (which includes encouragement to cultivate native plants), preserved area management and companion animals (pets). Subjects within these sections encompass the use and disposal of anti-bacterial agents, the use of low intensity outdoor lighting, fences, the height of mowers (at least 2 inches) and the use of chemicals.

MERSEY BASIN CAMPAIGN

This was launched in 1985, and describes itself as ''. . . a 25-year government-backed partnership which brings together local authorities, businesses, voluntary organizations and government agencies to deliver water quality improvements and waterside regeneration throughout the Mersey Basin river system'. It was one of a number of environmental initiatives flowing from Michael Heseltine's intervention after the Toxteth riots in 1981 (the Groundwork movement being another). It is one of the longest-running environmental management programmes in Britain. More importantly, it is unusual in being based on the natural boundaries of a river basin rather than the artificial boundaries of one or more local authorities.

The River Mersey and its tributaries, including the Irwell and the Irk, flow through the heavily industrialized and urbanized north-west of England between Manchester and Liverpool. Those three rivers are inextricably linked to the Manchester Ship Canal, which was partly created from them. The old docks in Manchester, which include Salford Quays, form the largest inland harbour in the UK. Until recently it was heavily polluted but, thanks to the development of a unique oxygenating process, it is now supporting aquatic life throughout the year. The re-oxygenation is scheduled to continue for ten years, after which it is anticipated that natural processes will have been restored.

In tackling water quality issues virtually from source to sea in a major river basin, the Campaign has not only generated and harnessed major resources (£3 billion will be spent between 2002 and 2005 alone), it has been able to direct those resources in a coordinated way. The vertical silos of different funding sources in the public, private and voluntary sectors, their different objectives and time scales, and the needs of their various stakeholders, have been integrated in ways which cut horizontally across their respective boundaries. It is a model of sustainable development – using an environmental platform the Campaign has been involved in social inclusion and development through activities, events and recreational provision, and has underpinned the major regeneration programmes of Manchester, Liverpool and other towns.

The Campaign's work was recognized when, in 1999, it was awarded a £45 000 prize for the best river clean-up programme in the world, at the World River Symposium in Brisbane. In the eighteenth century, the Mersey was a famous salmon river, and in the twenty-first century it may be again.

BIRMINGHAM AND THE BLACK COUNTRY BIODIVERSITY ACTION PLAN

The Plan was put together by a partnership including the five local authorities, the local biological records centre, English Nature, the Environment Agency, the Royal Society for the Protection of Birds, the University of Wolverhampton and the local Wildlife Trust. More than sixty organizations in total were involved in the Plan process, including Business in the Environment, Walsall Local Agenda 21, British Waterways, the Countryside Agency, the National Federation of Anglers, the Forest of Mercia, Groundwork Black Country, and various local natural history societies and species- and site-based groups. This wide-ranging involvement in the Plan should help to ensure effective implementation and ownership. It demonstrates just how many people and organisations are involved and interested in biodiversity in one of Britain's most industrial and heavily populated areas.

By commissioning the Plan, the Partnership recognized and acknowledged that nature conservation requires a strategic approach and is not tied to political boundaries, even in densely populated areas.

In the Foreword the then Chairman of Advantage West Midlands (the regional development agency) says: 'Advantage West Midlands recognises that a pleasant and natural environment plays a crucial part in stimulating economic development and regeneration. In this respect the West Midlands Economic Strategy – Creating

Advantage – identifies the need to promote economic activities that will also help to afford appropriate protection to the environment and natural resources'.

As well as the usual habitat and species accounts and action plans, the Plan also includes a 'Framework for Action' – an excellent context setting section which should serve as a model for other plans. It covers the need to conserve biodiversity, the characteristics and history of, and current trends affecting, the biodiversity of Birmingham and the Black Country, legislation, partnerships and resources, and themes for action. There are also overarching 'Issues Action Plans' for site and species protection, species and habitat management, maintaining biological records, and environmental education.

The urban environment and its green space network in the West Midlands conurbation is evident in the 'vision for main habitats and land-uses' which, as well as the expected focus on habitats like woodland, grassland and wetland, includes sections on urban 'wasteland', parks, playing fields and public open space, gardens and allotments, and buildings and the built environment.

SUSTAINABLE MAINTENANCE

The management of urban greenspace should be sensitive to natural features and seasonal changes, physical attributes, the needs of wildlife, current and potential land use, the local community's needs, and the strategic position of sites in the local network of open spaces. All urban greenspace requires resources for its management, restoration or development. The provision of these falls upon the owner and/or manager, whether they are in the private, public or voluntary sectors. Understanding the land's environmental properties, functions, and relationships to the local community is essential to effective and efficient application of the resources.

Not understanding or acknowledging this has led to a decline in, for example, parks and gardens over the past forty or so years. A Countryside Agency report (2001) for the Heritage Lottery Fund estimated that there are 27 000 parks in Britain, and that although £630 million is spent on them each year, this is far less than twenty years ago. The cumulative loss of revenue is estimated at £1.3 billion. The situation has been made worse by the frequent separation of the social management of parks and open spaces (involving for instance rangers, wardens and play leaders) and their physical management. The latter has generally suffered from the contractor/client split within local authorities, and the contracting out of closely specified but inflexible and badly supervised management activities.

Crucial to sustainable land management is understanding the various functions of the land in question. Where these functions conflict (for example, dinghy sailors may want wind-blocking trees cut down around a lake, whereas nature conservationists may want them retained), then managers will need to exercise social skills to achieve an acceptable solution. This is where a consideration of the strategic position of the site might be important. If this is the only water in the area suitable for sailing, then that may have to take precedence. Alternatively, if the wetland fringing the lake is a priority habitat in the LBAP that might be more important.

Maintenance costs are, of course, dictated by end use. Ornamental landscaping usually

requires intensive and relatively expensive maintenance, whereas more informal, semi-natural treatments tend to incur lower costs. Judicious tree planting, management of existing features such as grassland or wetlands, protecting natural watercourses, and working with the grain of nature rather than against it is likely to result in economic, social and environmental benefits. Water courses are particularly important. They connect to other sites, provide a linear habitat, and are part of the local flood prevention system. Channelling and culverting in one place may well cause increased flows or flooding elsewhere.

A FRAMEWORK FOR A SUSTAINABLE CITY LANDSCAPE

Modern lifestyles in the developed world mean that many people can choose where to live and work. Increasingly during the second half of the twentieth century this has meant commuting between town and country, getting the best of both worlds. The main plank of urban policy now is to halt and, if possible, to reverse this trend by making towns attractive enough for people to want to live in them. Hence the talk of an urban renaissance and the need to develop sustainable communities.

In order to succeed in this endeavour, many changes in thinking, action and perceptions are needed. This chapter concentrates on just one aspect of the problem, the provision of high-quality and varied open spaces. In relation to this, the West Midlands Wildlife Trusts suggested in their submission to the Examination in Public of Draft Regional Planning Guidance for the West Midlands (2002) that the desired urban renaissance should ensure that towns and cities:

- Are managed with some understanding of ecology and environmental systems and functions.
- Provide a sense of health and well-being to their populations.
- Should be integrated with the surrounding countryside, not separated from it.
- Should be moving towards self-sufficiency and reduction of their ecological footprint.
- Contribute not just to people's welfare but to that of the natural world.
- Contribute to the integration of social progress and equity, environmental improvement and protection, and economic development.

Starting from these, or similar principles, it is possible to develop the vision and values needed to provide a policy context for the provision and management of green networks. When appropriate policies have been devised, some of the tools and mechanisms outlined above can be used to secure the necessary resources and carry out the work. Monitoring and evaluation will then examine achievements and progress against various standards, reference points, targets and indicators. These should be embedded into local, regional and national plans and strategies. These may include BAPs, regional spatial strategies, the new local development frameworks and community strategies.

It is important to recognize that providing, managing and maintaining an accessible network of urban open spaces is always going to be more about process than

product. The natural world is in a constant state of change – today's bare site is tomorrow's grassland and next week's woodland. Much conservation management is about arresting or reversing natural succession. The demographic profile of local communities changes, and with it their needs from, and demands upon, their local environment. For a couple of decades safe and stimulating spaces for children may be at a premium, after this places for more quiet recreation may be needed.

Whatmore *et al*. (2003) have studied the relationships between local people and the open spaces that are important to them. This has led them to propose the existence of 'vernacular ecologies', the importance of recognizing that urban greenspaces are literally 'living spaces', and the necessity for management processes to be driven by local people with expert assistance, not the other way round.

Buildings and enterprises come and go, creating both opportunities for, and threats to, open spaces, parks and wildlife sites. Too often one interest (usually economic development) has dominated the process of change.

A sustainable city landscape is not one set in aspic, unchanging, looking back to what has, or might have been. It is one which provides for today whilst looking forward to what will be needed. It should incorporate some constants (no one is going to move the River Thames or Hampstead Heath out of London), but needs also to be capable of adaptation. In the past, changes to open spaces have tended to be *ad hoc*, reactive and marginalized. By understanding how land-use relates to and affects people's lives and the quality of their environment we can incorporate changes in a planned and proactive way, and move open spaces into the mainstream of urban planning and design.

CITY METAPHOR

6

INTRODUCTION

A number of theoretical forms have been suggested for the sustainable city. All are based on the notion of reducing the need for movements by private motor car, and a reduction in the transportation of goods by road. From continental European sources the compact high-density city is advocated. At another extreme are proposals for low-density decentralized urban areas. A third school of thought suggests an urban form based on policies for 'decentralized concentration'. The fourth theoretical position develops the concept of the Sustainable City Region, extending the ideas of Howard and the Garden City Movement (Breheny and Rookwood, 1993; Elkin *et al*., 1991a; Howard, 1965; Owens, 1991). Authors advocating a darker green philosophy suggest that the city should be located within a largely self-sufficient region. There is also a difference amongst authors about the preferred type of detailed city structure for sustainable development. Such preferences include: linear forms, dispersed structures, centralized and polynucleated urban forms, or some variation of the grid. Despite the many theories and the strength of views held by some of the advocates, there is, at the moment, little hard evidence in terms of urban metabolic efficiency or even energy efficiency to support any of the structures unequivocally. It is not possible to state categorically that one particular theoretical urban structure is more sustainable than another. In view of the inconclusive evidence, this chapter will review the origins of the ideas for city form. In particular, it will discuss the nature of the three main metaphors which have been used as a basis for understanding and coming to terms with the city. The theme of the chapter is symbolism and the city: it will form the basis for the analysis of specific city forms in Chapter 7.

THE FIRST CITIES

City formation is an act of human will. However obscure the reason, however ineffective the means and however tawdry the result, city development or reformation is a conscious act. The act of city foundation

may be the decision of a great leader, the result of corporate action by a group or simply accretive development, the outcome of many individual spontaneous actions. Cities first emerged independently in six or seven places, and all after a preceding agricultural revolution. Toffler (1973) in *Future Shock* said that the changes in the society of today are so great that the only comparison in history is the period of change associated with the agricultural revolution which predates civilization. To support his argument Toffler quotes Marek, author of *Gods, Graves and Scholars*, as saying: 'We, in the twentieth century, are concluding an era of mankind five thousand years in length . . . we are not as Spengler supposed, in the situation at the beginning of the Christian West, but in that of the year 3000 BC. We open our eyes like prehistoric man, we see a world totally new.' Today, amidst great societal change, and with a command of a powerful technology, man is being forced to reassess the effect of unlimited development upon the environment. In the process of coming to terms with the limits of the environment the city is being reinvented in sustainable forms. The creation of the sustainable city is an act of will, the creation of a work of art, a determination to come to terms with the limitations imposed upon human settlement by the environment.

It may be possible to gain some insight into the problems of city design by examining the origin or birthplace of early cities. The birth of cities saw the simple and, to a large extent, egalitarian life of the village community replaced by a more complex social grouping. The new social grouping in the city exhibited: unequal ownership, a clearly distinguished power structure, war-like tendencies for defence and colonization, a monumental architecture, and a city structure which clearly expressed the highly stratified society. The city was also a vehicle for learning – it is associated with specialists not involved in farming, with the birth of science and writing. The city is associated with naturalistic forms of art and with craft and distant trade. Wherever this complex heterogeneous society developed spontaneously, it followed a path which started with a settled society producing a surplus of food. Amongst the Hausa people of Nigeria there are folk tales about the coalescing of small villages to form larger towns (Moughtin, 1985). A reasonable explanation of city formation is based on the hypothesis that stateless societies, which define their solidarity by co-residence on a clearly delimited tract of land, contain in their cultural systems the germs from which state organization can develop. Stateless societies of this type still exist in West Africa, though they have been absorbed into the large modern nation state. The important principles of political organization are co-residence on common territory and submission to the laws sanctioned by the spirit of the land. These ideas are close to the concept of sovereignty and a body of laws to which all comers are automatically subject. The first occupants of the defined territory have a closer and more intimate relationship with the land than late comers, which provides a potential differentiation between royal and non-royal lineages (Horton, 1971). The reasons for the initial growth of particular cities are lost in antiquity: a particularly effective shrine and its wise man may have attracted gifts or followers from far afield or a chief may have been able to unite disparate groups in a formal coalition for mutual safety or economic benefit.

Early cities functioned as warehouses for the food surplus, break points on trade routes, fortified centres for war or administrative centres for managing great public works such as irrigation schemes or the building of pyramids. Finally, early cities were religious centres of importance. The early city is both a great centre of activity and a place of oppression and aggression. Its form and layout was carefully planned to express the power structure in society and to create a theatrical backdrop for religious ceremony. The form of the early city is, therefore, designed to reinforce and enhance the sense of awe and dependence of those subject to the state: at one level it is a device to assist the process of psychological control and domination. The city was, at the same time, a seat of learning and a place for the meeting of minds. As such it was a physical expression of pride in man's achievements, a shelter from both foe and the elements: it also promised hope for the future.

There are common structural and physical features in the layout of cities in most of the great early civilizations of Egypt, Mesopotamia, India, China and Mezoamerica. These common features included the use of the grid, the straight axial street, an orientation of the settlement or its main building to the path of the sun and, with the exception of the inaccessible reaches of the Nile, encircling fortifications (Figures 6.1–6.7). Teotihuacan in Mexico, at its most powerful in about AD 450, covered eight square miles and had a population of 200 000. It was laid out on either side of a great ceremonial way running along the valley floor for three miles. The processional route terminated in the north at the Pyramid of the Moon. The Citadel and the Great Compound, the administrative centre and commercial heart of the city, were located at

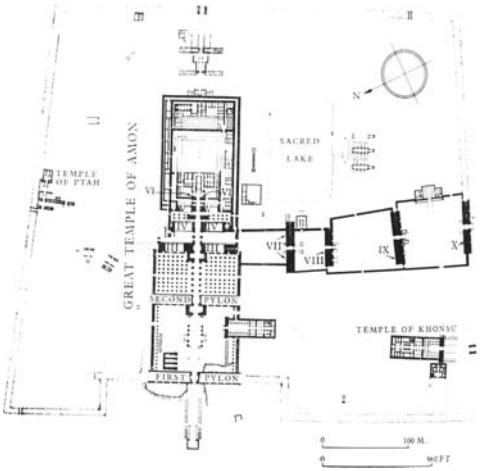


Figure 6.1 Plan of the Temple at Karnak in Egypt (Stevenson Smith, 1958)

the junction of the north–south processional route and the main east–west cross street. The houses of the nobility were on the main axial street together with the pyramid of the

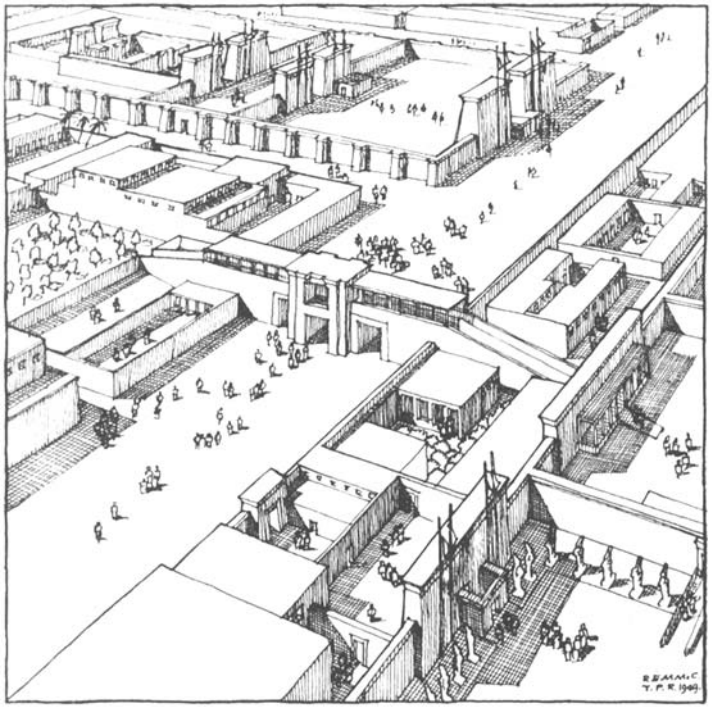
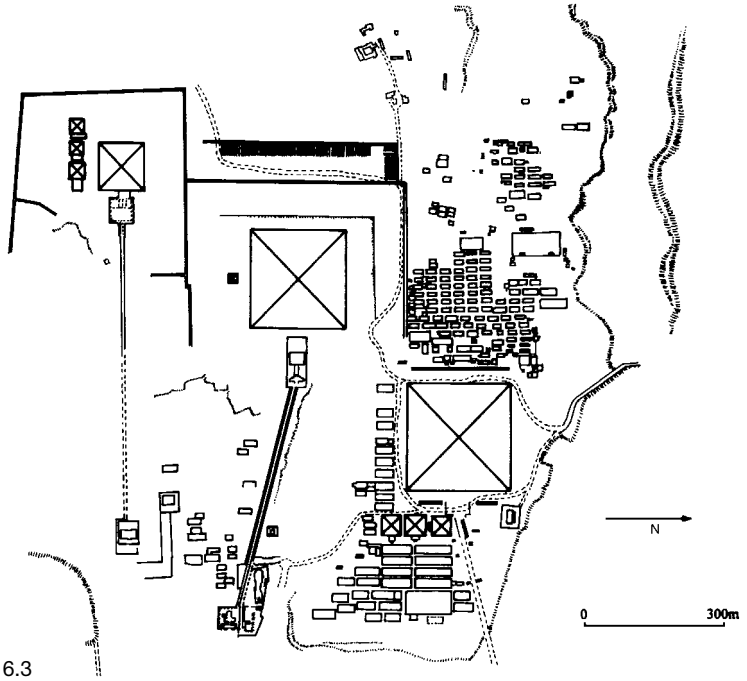


Figure 6.2 Central Area, Amarna in Egypt (18th Dynasty) (Fairman, 1949)



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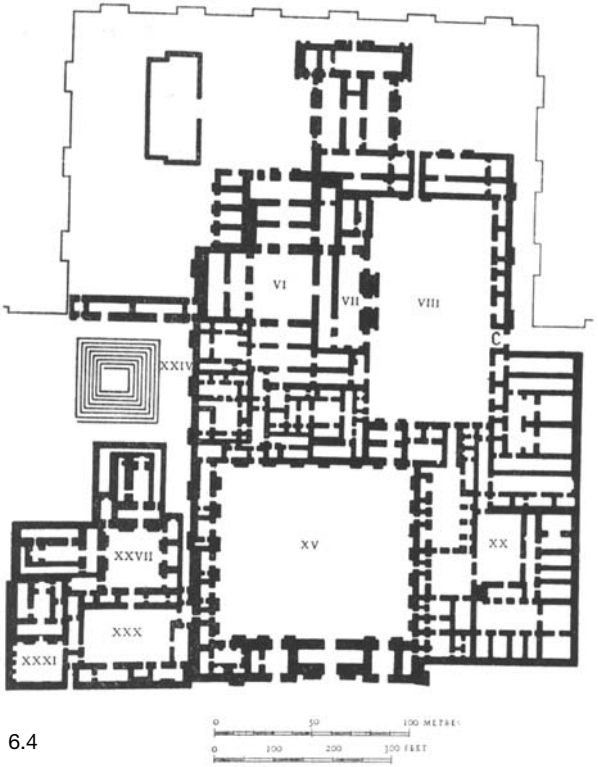

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Figure 6.3 City of the Dead, Gizeh, Egypt (Stevenson Smith, 1958)
Figure 6.4 Plan of Sargon's Palace, Khorsabad (Frankfort, 1954)

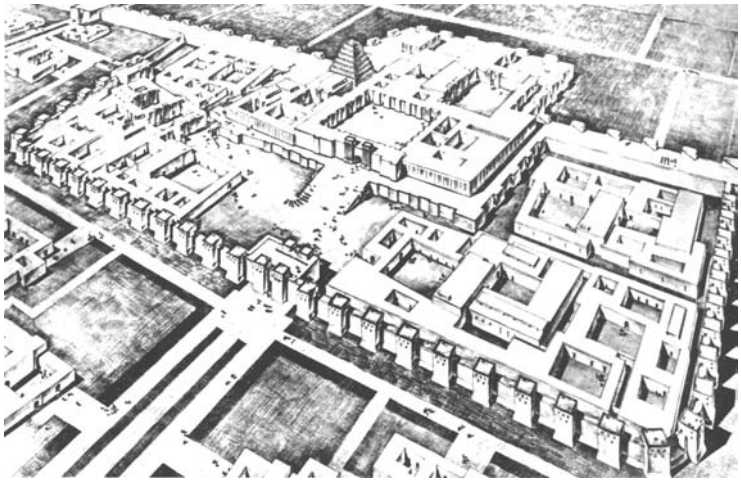

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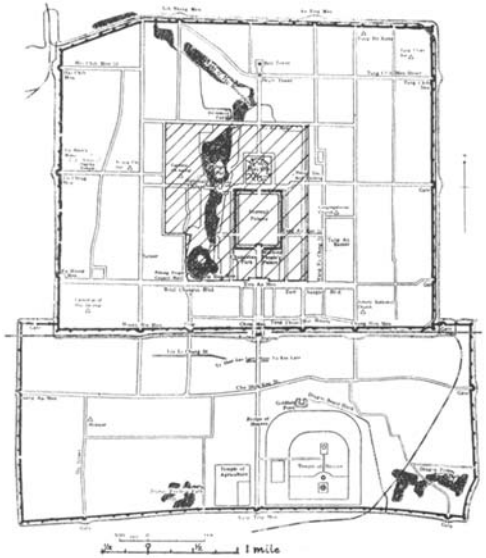
Figure 6.5 Reconstruction of the Citadel, Khorsabad (Frankfort, 1954)



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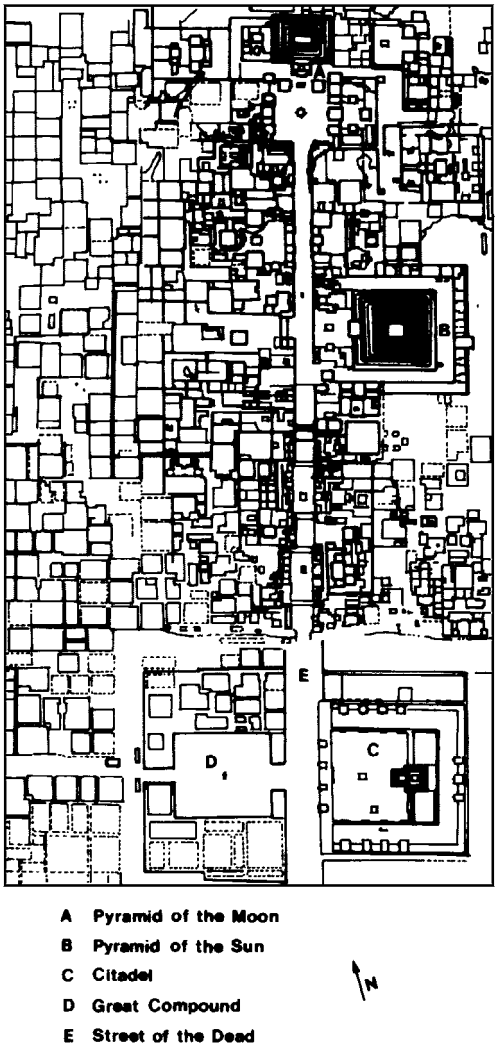

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Figure 6.6 The Chinese city (Boyd, 1962)

Figure 6.7 Plan of the Central Area of Teotihuacan. (From *Urbanization at Teotihuacan*, Mexico, University of Texas Press, © René Millon, 1973)

sun (Millon, 1973). The idealised city plan in Pharaonic Egypt is best illustrated by the cemetery at Gizeh where the tombs of the courtiers and high officials crowd close to the pyramid tombs of the Pharaohs. Being close to the Pharaoh in death was obviously as important as it was in life. The Egyptian city of the dead is laid out in a rectangular grid with the less influential members of society buried in graves on the outskirts of the cemetery (Fairman, 1949).

Orientation and relation to the environment was of paramount importance in the planning of the early city. The parts of the building were also organized to be in harmony with the forces of nature and the local environment. Chinese city planning emphasized the need to relate built form with the environment. The sensitive relationship of buildings and the landscape is epitomized by the Chinese city. In China, over many centuries, the ideal layout for the city was codified as sets of principles. In China, the ideal city should be square, regular and oriented correctly: a strong emphasis is on enclosure with gates and approaches to the enclosed areas related to the cardinal directions and to the meaning given to those directions. In addition, symmetrical compositions were used to maintain the balance between left and right (Wheatley, 1971). This complex relationship of physical city form and the environment has developed

into an intricate geomancy for environmental layout. This ancient geomancy, Feng Shui, is still in current use in Asia; prominent business people in Hong Kong take advice from the local expert in Chinese geomancy for the layout of home and workplace (Lip, 1989).

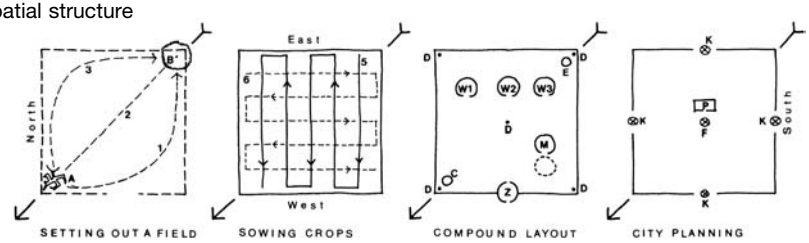
There are records in Niger as late as 1945 of settlements being laid out according to pre-Islamic cosmology of the Hausa people (Nicolas, 1966). In traditional non-Muslim Hausa society the layout of fields, houses, granaries and towns are regulated by an ancient cosmology which also regulates numerous facets of daily life. Each important activity is the occasion for a preliminary ritual, more or less exclusive to the particular activity undertaken. An activity may only be undertaken in a limited and defined space protected from the malevolent spirits which inhabit the world. This space, when defined correctly and orientated within a precise schema, becomes the domain of favourable forces.

In Hausa mythology the eastern and southern cardinal points are masculine, the western and northern ones are feminine. In ritual these cardinal points become personified. By nature, everything is situated facing east. A person is born into this world facing east, enters home facing east and makes sacrifices facing east. A person is surrounded by four beings or groups of beings: male to the front and right; female to the left and to the rear. A man's strong sides, to the front and right, are male and his weak sides to his left and rear are female. The four major spaces surrounding a person are divided into two sexual components. Certain couplings of the spaces are permitted and others forbidden. The relationship between the cardinal points is experienced as a matrimonial alliance: the line linking north-east and south-west is a line of sexual exclusion; the axis joining north with south and east with west is the coupling or copulating axes. Space in non-Muslim Hausa cosmology appears to be a field of convergent and divergent forces which maintain a delicate equilibrium. In setting out a field, a house, a market or a city, the Hausa, through geometrical ritual, try to maintain this delicate balance with the forces of the cosmos (Nicolas, 1966) (Figure 6.8).

Most Hausa fields are square or rectangular, the important axes being north–west/south–east. Crops are sown in a rectangular pattern. Where millet and sorghum are planted together in the same field, they are sown in rows at right-angles to each other. Millet, because of the phallic shape of the seed, is thought to be a masculine crop, and is sown in an east–west direction; sorghum, a feminine plant, is sewn in a north–south direction. After such a marriage the millet and sorghum become fertile.

The traditional Hausa compound in Niger – unlike its Muslim counterpart in Nigeria – is laid out with its sides facing the cardinal points. In order to establish a new dwelling the head of the household buries five pots containing charms, one each at the cardinal points and one at the centre of the site. The whole site is surrounded by a boundary wall. Each male adult member

Figure 6.8 Hausa spatial structure



of the family arranges his own hut in the compound, the entrance facing west so that entry to the hut is eastward. Houses of the spouses of each man are arranged in a line along a north–south axis: the first wife has the hut to the north, and the most junior wife the one to the south. This physical arrangement reflects the social hierarchy of the wives: the first wife is the mistress of the house and is called the 'woman of the north'.

In 1945, when the French moved the cities of Katsina and Gobir, the local inhabitants insisted that the layout of the new towns follow their own planning principles. In both new capitals, the main rites consisted in anchoring the new city into the supernatural structure by placing offerings at the centres of sacred energy in the five nerve-centres of the traditional plan. Charms and talismans were buried at the four doors sited at the cardinal points and at the centre of the main axes where the ruler's palace is located (Moughtin, 1985; Nicolas, 1966).

POWER AND CITY PLANNING

In this enlightened age we dismiss magical models of the universe together with the gods which sustain the universe. We still, however, accept the psychological efficacy of some of the forms which control behaviour. These ideas still permeate Western city building. China and India have left to posterity the most highly developed heritage of cosmic city models. Nearer home, however, in Africa, Egypt and Etruscan Rome, similar traditions have been followed. These ancient traditions in the symbolic expression of power have been absorbed into Western civilization. For example, the ideal city of the Renaissance was in part a symbol of the

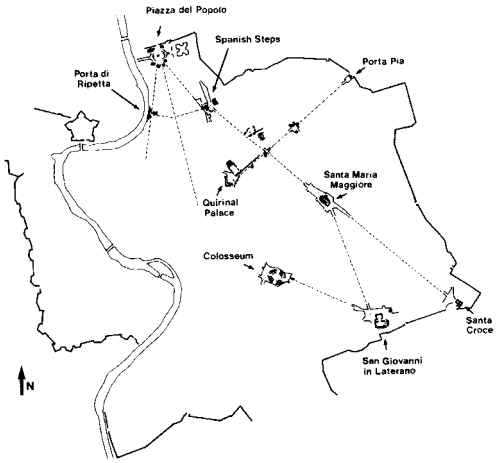
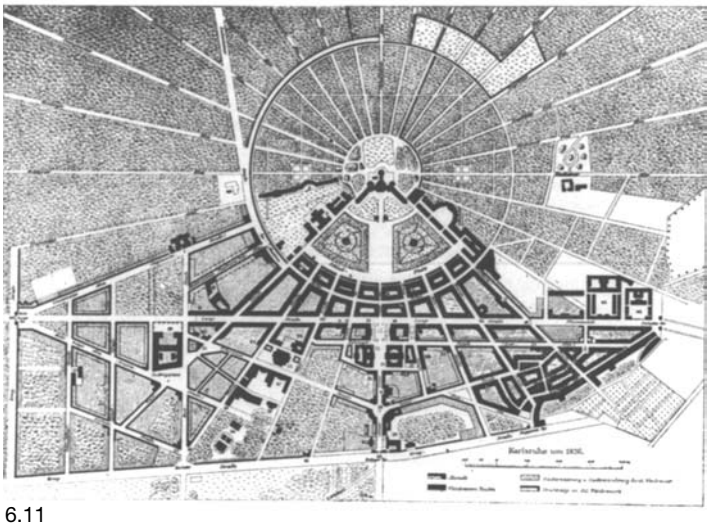


Figure 6.9 Rome and Sixtus V

mathematical order and unity of the universe. In contrast, Baroque city planning with its use of interconnected axes was used by Pope Sixtus V to stamp his and the Church's authority on Rome. As a device to symbolize power, the axial arrangement of streets became the model for other potentates and was used in Karlsruhe, Germany, by L'Enfant in Washington and by Hausmann in Paris (Figures 6.9–6.16).

Figure 6.10 Rome: termination of the vista at S. Maria Maggiore



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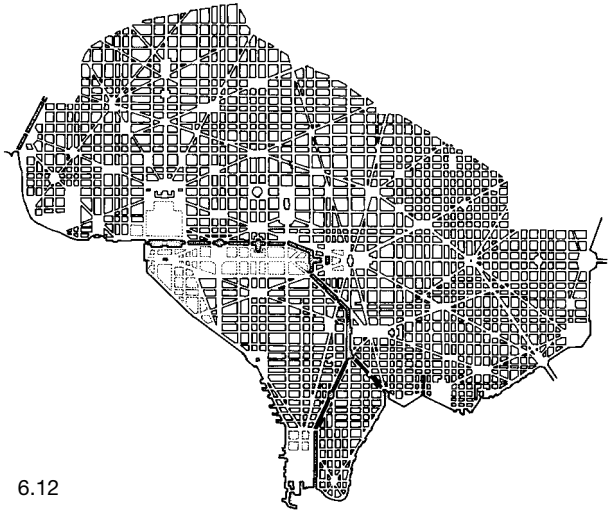

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Figure 6.11 Karlsruhe (Morris, 1972)
Figure 6.12 Plan of Washington DC (Lynch, 1981)
Figure 6.13 Washington. (a) The Capitol; (b) the Washington Monument
Figure 6.14 Paris: transformation by Hausmann

6.15a

6.15b

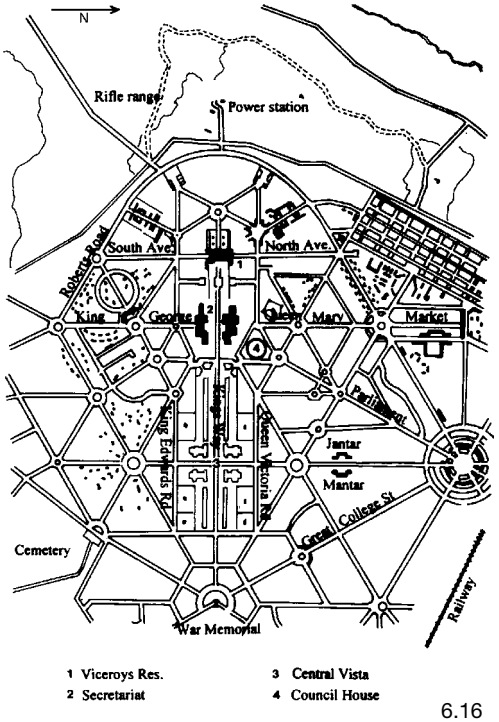

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Figure 6.15 Paris. (a) Avenue de L'Opera; (b) boulevard
Figure 6.16 Plan of New Delhi
Figure 6.17 Roscommon, Ireland: The courthouse with jail beyond

In Ireland, the authority of Britain was stamped upon town form. For example, in Roscommon the axis of the long main street terminates in the Court House and the towering shape beyond of the jail where the state's ultimate sanction, execution, took place. The stone-built jail, still in good condition, has had several lives, being converted first into a Lunatic Asylum, then Tourist Office and now the home of boutiques – an example of the conservation and reuse of a building with a grim past (Figures 6.17 and 6.18).

These forbidding instruments of civic power did not end with Hausmann in Paris, or even with Lutyens in New Delhi: they persist in the urban structuring of today. These ancient devices of control still maintain their psychological power. For

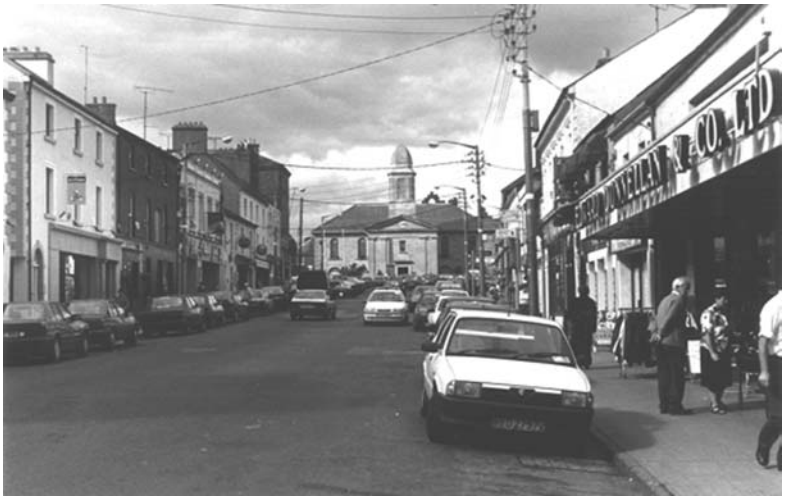

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Figure 6.18 Roscommon, Ireland: former jail

example, a boundary wall or privet hedge with garden gate still encircles the Englishman's semi-detached castle, forbidding entry to unwelcome guests. Less urbanely, the high-income residential complex in the United States of America is surrounded by a strong protective wall and entered through a guarded gateway. The parade route is still important for British pageantry: the Queen on state occasions takes possession of her capital city, processing from Buckingham Palace to Parliament or St. Paul's Cathedral. The annual parade in Moscow of the Red Army, together with its lethal firepower, is a blatant exercise in control. In Northern Ireland during the 'marching season' in July, the Orange Lodges with pipe band and fearful Lambeg drum reassert the Protestant right to city territory. Provocatively, the Orange march is always planned to invade or skirt sensitive Catholic areas: the route is festooned with arches and banners proclaiming the Protestant ascendancy (Figure 6.19). The landmark is a symbol of possession: the possession of the land.

Figure 6.19 Protestant March, Belfast

The landmark of the modern city is the tall building, which dominates its surroundings. Business corporations have been competing to build the tallest skyscraper, following the example set by the powerful Medieval families in cities like San Gimignano (Figures 6.20 and 6.21). The sheer size and scale of some recent urban developments dominate and are meant to dominate the city and its citizens (Figure 6.22). Bilateral symmetry and elevation are key formal cues which are still used to emphasize position and power. The high table at College is an example in the use of physical cues to reinforce status. Staff and honoured guests sit elevated above the rest of the College while the Dean, Director or Warden sits at the head of the table on the axis dominating the occasion.

The distribution of land uses, together with the condition and density of the buildings which give the land uses three-dimensional form, graphically illustrate the disparities in wealth and power of the groups occupying city space. Harvey (1973) documented this particular phenomenon, showing how spatial use in a city is organized to favour those with wealth, while the powerless members of society are located in the least

Figure 6.20 San Gimignano
Figure 6.21 New York: roofscape
Figure 6.22 Romania, Palace of the People. (Photograph by Neil Leach)

6.20a

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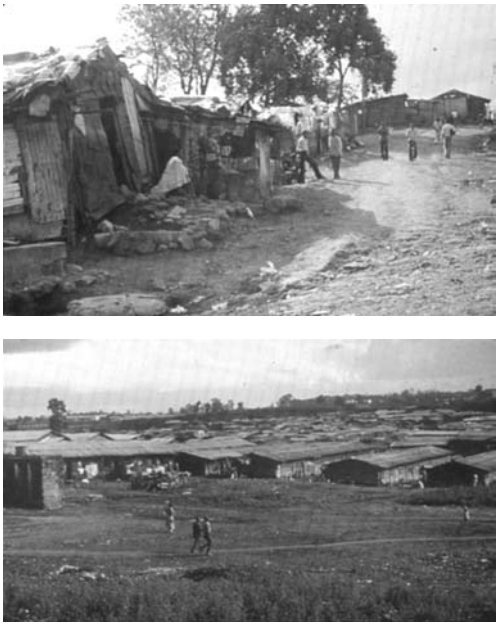

Figure 6.23 Slums in Nairobi

advantageous positions. In Third World cities this fact of urban life is visibly apparent. The poor occupy areas euphemistically called 'spontaneous development', slums of temporary, make-shift housing without services or sanitation. The poorest of the poor are often consigned to unstable land, that is, to areas liable to flash flooding and erosion (Figure 6.23).

A NEW SYMBOLISM FOR THE SUSTAINABLE CITY

How far should the sustainable city of the future jettison these anachronisms from the past? Or how far is it possible to do so? Sustainable development has for its philosophical and intellectual foundation three basic values: equity, citizen participation and good husbandry. The sustainable city is one that nurtures both man and the environment: its function as far as man is concerned is one of enabling. This process of enabling is predicated on the notion of democracy, some would suggest a highly participatory democracy. The city should give form to these basic values: a new symbolism is necessary to give expression to the new sustainable city structures. The sustainable city is not one that consigns the poor to cardboard box cultures, a homeless underclass occupying the space beneath the viaduct. The sustainable city does not emphasize private affluence and the policing technologies which maintain the relative peace in enclaves of privilege.

It would be unwise to reject all that originated with the birth of city life in ancient times. A fortunate result of many religious preoccupations, including Chinese geomancy, has often been a harmonious setting for urban development, a by-product of the great care taken with the siting of towns and buildings or the organization of landscapes. This heritage should not be lost in any restructuring of the principles of city planning and design. Many of the ideas originating from groups representing the richer hues of the green movement have overtones of, almost, a religious fervour. These more extreme green ideas extol the virtues of living within the laws of nature and attuned to the greater unity of the planet which is personified as an Earth Mother or all-encompassing being. Without going quite to these lengths it is clear that a respect for nature is something we can and must learn from the earlier periods of man's evolution. An important quality of the nurturing city would be the conservation and development of natural multi-functional landscapes within its boundaries, as outlined in Chapter 5.

Equally important would be the conservation of the building stock: the 'throwaway society' of Toffler has no place in the sustainable city. Conservation and a 'make-do-and-mend' process will inform urban development policies. The conservation movement, however, is more than simply being concerned with the conservation of energy: it represents a philosophy of life which relates people to their traditional roots, to those great urban traditions going back 5000 years.

The skyline of the fully developed sustainable city may be similar in form to the pre-twentieth century city, pierced only by the towers which remain as a memory of former state, municipal, commercial or religious power centres. Most new additions to the sustainable city will be limited in height to three or four storeys built in a regional architecture using regional materials and probably learning much from local traditions of building. The city spaces, its streets, squares and parks, will be pedestrian-centred and designed for a walking pace: transport, being predominantly public, will thread its way carefully through the pedestrian and cycle-dominated network of city pathways. This may sound utopian, and at one level it is, but this city form follows logically from the adoption of a philosophy which accepts sustainability as both necessary and desirable.

CITY METAPHORS

According to Lynch (1981) there are three main metaphors which attempt to explain city form. The magical metaphor for the earliest ceremonial centres of religious ritual attempted, as already discussed, to link the city to the cosmos and the environment. The other normative metaphors are the analogy of the machine and the analogy of the organism. The city, like the house, was seen by some modernist architects as 'a machine for living in'. In contrast, many planners following Geddes (1949) and Mumford (1938, 1946a, 1961) described the city as organic in an extension of ecological analysis. These main normative theories have generated a series of model city structures, concepts such as: the central city; the star-shaped city; the linear city; the grid-iron city; polynucleated cities; and the dispersed city. From these basic concepts of city form additional hybrid concepts have been developed such as the figure-of-eight structure used by Ling for Runcorn New Town (Figure 6.24).

The concept of the city as a machine is quite different from conceptualizing it as a microcosm of the universe, as a perfect unity modelled on the universe. The idea of the city as a machine is not purely a twentieth-century phenomenon – its roots lie much deeper. During the twentieth century, however, the idea was developed and

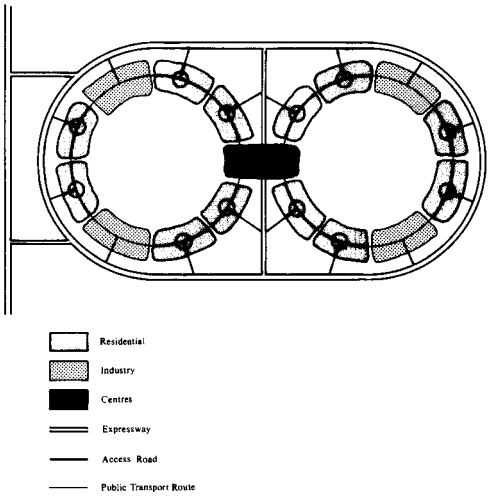

Figure 6.24 Runcorn, structure diagram

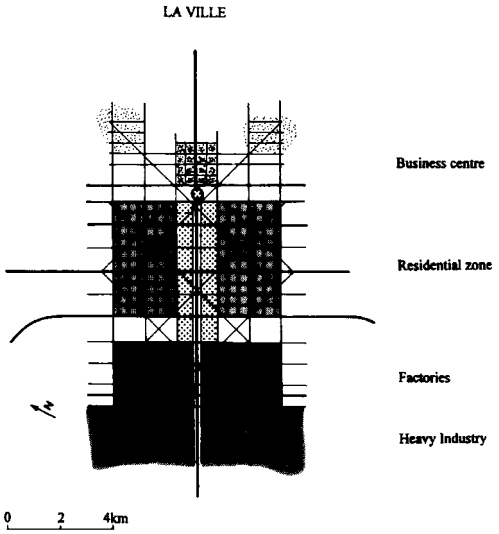

Figure 6.25 The radiant city (Le Corbusier, 1967). © FLC/ADAGP, Paris and DACS, London 1997

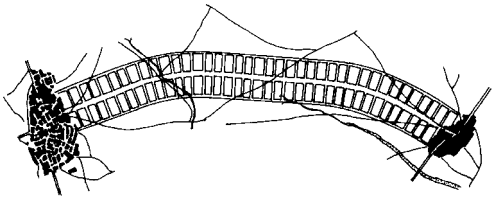

Figure 6.26 Linear city by Soria y Mata (Hugo-Brunt, 1972)

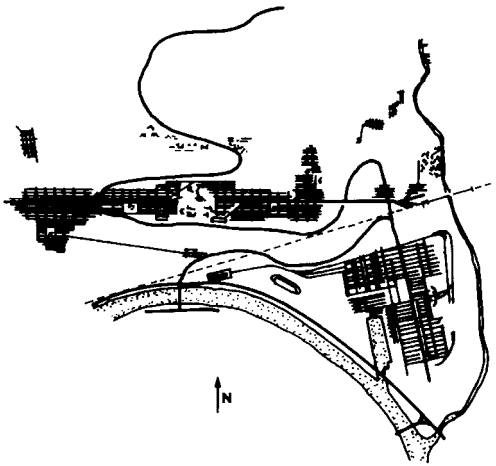

Figure 6.27 Cité Industrielle by Garnier (Wiebenson, undated)

elevated to a predominant position by movements such as Futurism and the writings of Le Corbusier (1946, 1947, 1967, 1971), particularly his project for the radiant city (Figure 6.25). Other landmarks in the development of this theme, the city as machine, are the linear suburbs for Madrid by Arturo Soria y Mata in 1894 and the Cité Industrielle by Tony Garnier (Figures 6.26 and 6.27). The linear suburbs of Soria y Mata ran between two major radials of the city and were intended to encircle the whole of Madrid. They were designed to provide cheap housing for the middle classes. The main feature of the proposal was a tree-lined boulevard along which ran a private streetcar. The streetcar connected the linear arrangement of house plots with transport routes to the city centre. Unlike the later suggestions of Garnier, the Madrid project was built and operated by the designer's family until the 1930s. Garnier's project for the Cité Industrielle was on a much greater scale. The city was to be served by a linear transport route with the land uses segregated and arranged in linear fashion along its length. Both linear urban projects, like the work of Le Corbusier, place great emphasis on the transport system. Le Corbusier's designs were primarily concerned with the glorification of the motorcar while Soria y Mata was developing ideas about mass transport.

The city, when thought of as a machine, is composed of small parts linked like the cogs in a wheel: all the parts have clear functions and separate motions. In its most expressive form it can have the clarity of a crystal or be a daring exhibition of rationality. In this form it is seen in the heroic or early modern work of Le Corbusier both in his architectural forms and monumental city planning projects (Figures 6.28 and 6.29). It

can also appear coldly functional with undertones of social dominance and state control. Miliutin develops the machine theme to an extreme in his ideas for Sotsgorod (Miliutin, 1973). He uses the analogy of the power station or the assembly line for the city. Miliutin also pays great attention to transportation and, like Garnier, separates the city into autonomous parts or separate land uses.

The city as machine is as old as civilization itself. The machine is not only the complex assembly line made famous by Chaplin in *Hard Times*, it also predates the nineteenth century and the industrial revolution. A machine can be as simple as a lever or a pulley or that great invention, the wheel. The concept of the city as machine can be found in the plans for the workers' villages in Pharaonic Egypt (Figure 6.30). The concept is based on the use of the regular grid plan which is used for ease of development. All the parts are repeated in a regular pattern. The Greeks when establishing a colony also used a standard pattern of development in long narrow blocks, per strigas (Figure 6.31). It is an easy and quick method of development. It has often been used throughout history for colonial foundations or the planning of a new city. Another important example is the Roman military camp. The cardo and decumanus, the main streets of the camp, cross at right-angles and connect the main gateways. The layout of the two main axes crossing at right-angles was used by the Romans over large landscapes as a method of land sub-division (Figures 6.32–6.34).

6.28

Figure 6.28 Building by Le Corbusier, Stuttgart
Figure 6.29 Drawing by Le Corbusier (Le Corbusier, 1967). © FLC/ADAGP, Paris and DACS, London 1997
Figure 6.30 Workers' village, Amarna, Egypt (Fairman, 1949)

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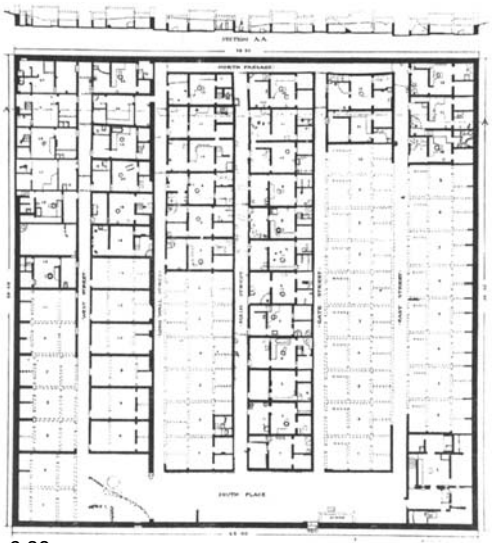

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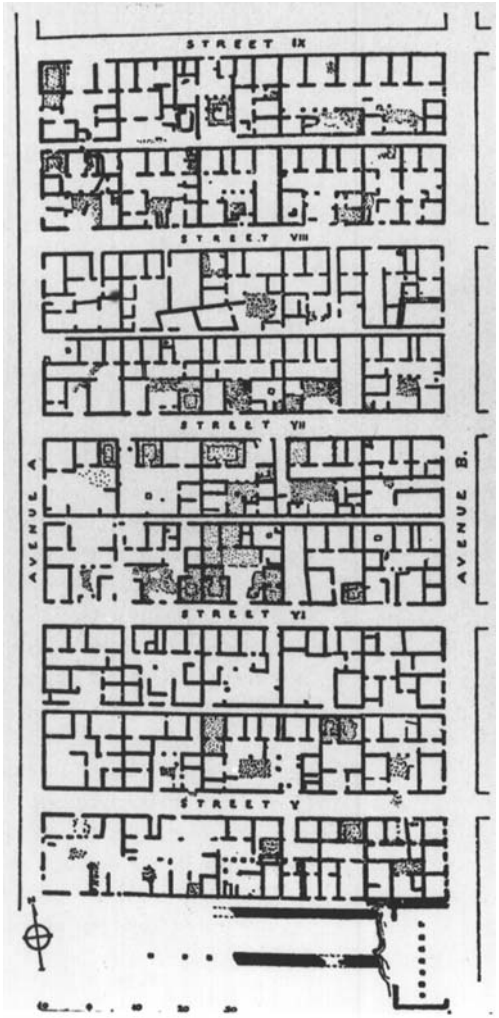

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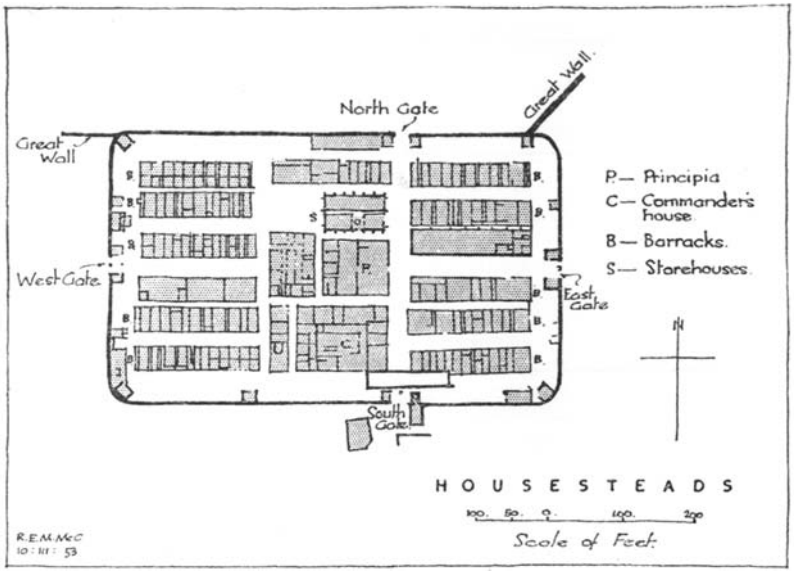

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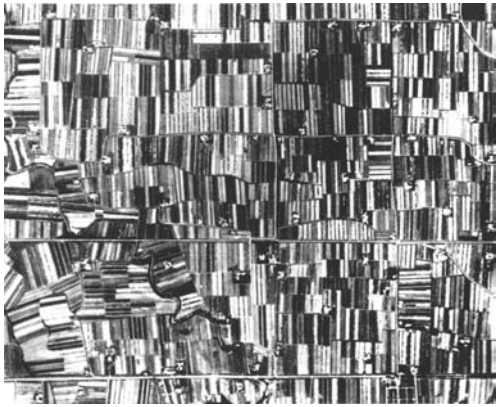
Figure 6.31 Housing Layout Olynthus (Lynch, 1981)
Figure 6.32 Plan of the Roman Fort at Housesteads
Figure 6.33 Lucca: the Roman gridiron can be seen in the present street layout



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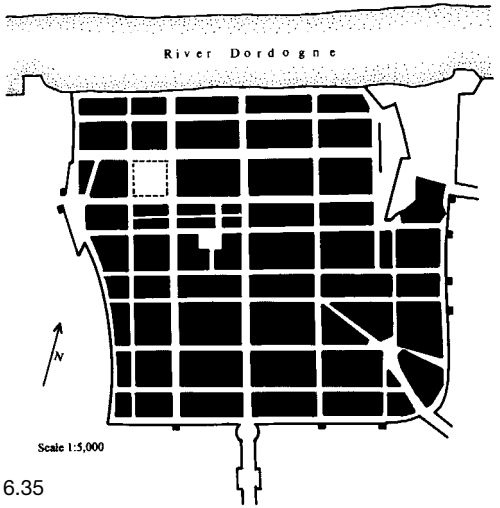

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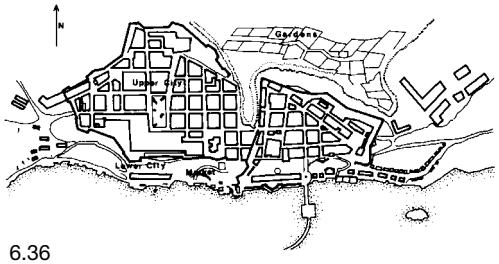
Figure 6.34 Roman field sub-division: Centuriation near Imolia
Figure 6.35 St Foy La Grande, Gironde (Beresford, 1967)
Figure 6.36 Salvadore, planned by Tome de Sousa in 1541
Figure 6.37 Derry/Londonderry, Northern Ireland

Similar forms of settlement also appear in Medieval Europe and in the later colonization of North and South America (Figures 6.35 and 6.36). The grid plan was also used in the plantation of Ulster. In Derry/Londonderry, the 'Diamond', a public square, is set at the crossing point of the two main routes which cross the town. In the conservation area within the walls of the old planned town, properties are being tastefully rehabilitated and given new uses to serve a tourist industry with great potential (Figures 6.37–6.39).

The machine aesthetic, if not explicitly stated by planners and city designers, still permeates much of the practice of city development. The philosophy of the machine aesthetic when applied to the city has many practical advantages. The city when viewed



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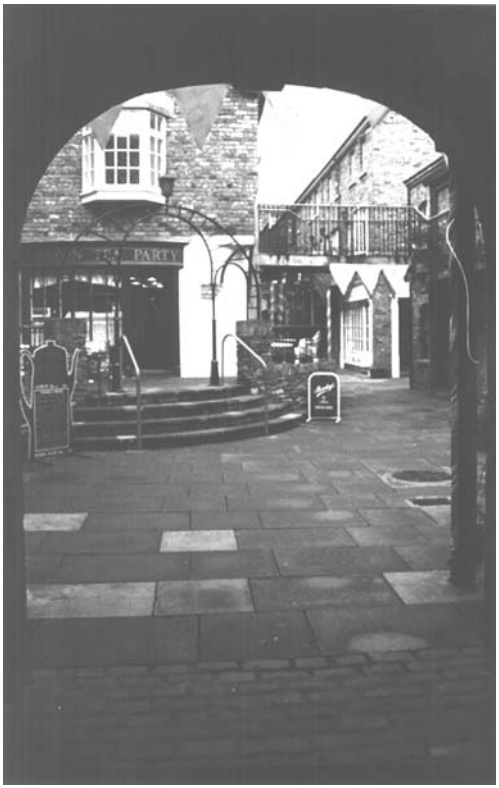

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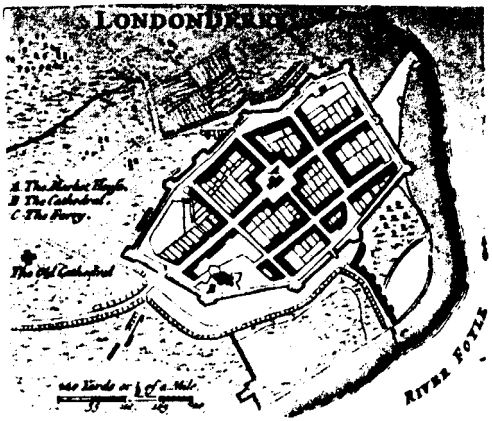
Figure 6.38 Derry/ Londonderry, Northern Ireland

as a machine can be analysed in terms of its parts and therefore it can be structurally improved in sections. The methods employed in the practice of city development include: the techniques of the traffic engineer; the estate management and land assembly skills of the surveyor; and the technical codes devised, initially for public health purposes, by the sanitary engineer. This model of the city, in practice, results in the mechanical application of building codes and regulations, the enforcement of land use zoning and other planning standards, the uncritical use of mathematical modelling for the solution of transport problems and the advocacy of standardized solutions to building structures. The reasons for city development under the influence of the machine aesthetic, on the surface, appear to be ethically sound. The goals of development would include good access, choice, economic and technical efficiency, quality of life including good health, but above all else the package would emphasize freedom. As motives baldly stated, none could be challenged. Many of the motives which underpin the present mechanistic vision of the city, however, will require to be interpreted and redefined for a world governed by the quite different ethical notions of sustainable development with its emphasis on inter- and intra-generational equity. For example, freedom of the

Figure 6.39 Derry/ Londonderry, The Diamond (plan from Camblin, 1951)



individual, while still important, will be qualified in the light of commitment to the community, to future generations and to the environment in general. Choice will have to be defined in terms of the limits imposed by the environment, while access will be determined not by the ability of an individual to pay but be more closely related to the needs of the community. The machine model of the city emphasizes the parts rather than the whole, the individual as opposed to the community; it emphasizes the components of urban form rather than the city as a whole. It is for this main reason that the machine is not an appropriate metaphor for the sustainable city. The metaphor for the sustainable city must be holistic; so too must be the methodology for problem identification and the design concepts used to solve the urban problems.

The third metaphor for the city is the analogy of an organism – the city being seen as organic and composed of cells. According to this metaphor the city can grow, decline, and die. This particular way of looking at the city is associated with developments in the biological sciences during the eighteenth and nineteenth centuries. At one level it can be seen as a reaction to the worst features of the industrial revolution and the rapid growth of cities. It is probably this view of the city which has infused the thinking in many planning schools. In contrast, the dominant theme of architectural education has been the machine aesthetic. This, of course, is a great oversimplification but it is true to say that members of the planning profession have been educated in the mould of Howard, Geddes, Mumford and Olmstead with Sitte, Unwin and Perry giving architectural form to those ideas. Architects to some extent have been more influenced by the writings of Le Corbusier, and many of the other great masters of the Heroic Age of Modernism have also been captivated by the romance of the machine and high-tech solutions to urban problems. Architects also write about organic order, the order of nature as it applies to urban or civic design. A cursory examination of Frank Lloyd Wright's work in the early part of this century sets a pattern for an organic architecture which appears wedded to the landscape (Lloyd Wright, 1957) (Figures 6.40 and 6.41). This particular strand of architectural theory was later taken up by Alexander in The Oregon Experiment (1979): '... natural or organic order emerges when there is a perfect balance between the individual parts of the environment and the needs of the whole'. This organic

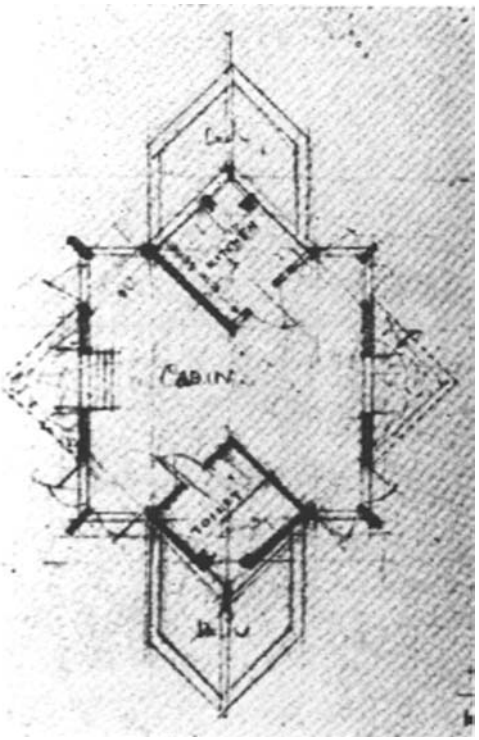


Figure 6.40 House by Frank Lloyd Wright, plan (Lloyd Wright, 1957). © ARS, NY and DACS, London 1997

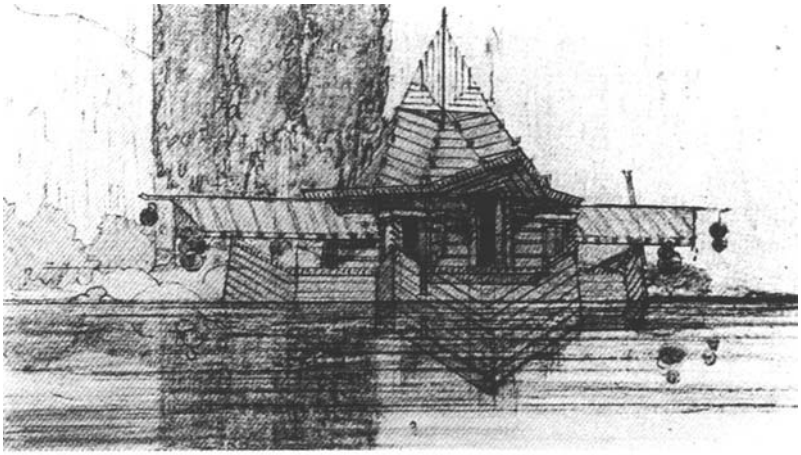


Figure 6.41 House by Frank Lloyd Wright, elevation. © ARS, NY and DACS, London 1997

metaphor for the city is probably the analogy most in tune with the ethos of sustainable development.

The organic model of society may, in part, have its origins in religious communities such as the Moravians in Britain and Ireland or the Shakers in America. The search for a visual identity for a green approach to urban design may learn from the experience of settlements which were: '... designed and planned but were constructed to respect rather than over-ride the environment ... life in the community was uncomplicated and centred on the church. It was recognized that the community had to be fed and money had to be earned, but if the environment was to supply a living for the believers, then the environment had to be respected. The Shakers believed that their settlements should reclaim poor land and improve it as part of their realization of the construction of heaven in earth' (Vale and Vale, 1991). Gracehill, Antrim, Northern Ireland, like other Moravian settlements, centres on the chapel, burial ground, school and village green. Around the green cluster the family homes arranged along neat streets organized in a grid pattern. The architecture of Gracehill follows closely the local vernacular style. The buildings are simple, single- and two-storey structures built from local materials. It is the idea of the community and the unified architecture giving form to that idea which is a powerful model for sustainable urban form (Figures 6.42–6.44).

Figure 6.42 Gracehill, Antrim, N. Ireland

The main principle of organic planning is the structuring of the city into communities each of which is a self-contained unit for many of the immediate necessities of life. Cooperation rather than competition is emphasized in the organic model for the city. Members of each community are interdependent within a unit of collaboration and mutual support. The healthy community is a mix of diverse individuals and groups tending towards some optimum or balance necessary for the smooth working of the community. Each member or group within the community has a particular role or function in society. In this idealized world of the organic city the community is organized in a hierarchy of units

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Figure 6.43 Gracehill, Antrim, N. Ireland
Figure 6.44 Gracehill, Antrim, N. Ireland

within which are sub-units which in turn are composed of smaller distinctive sub-sub-units.

The early new towns in Britain after the Second World War followed this organic settlement model with parts structured like living cells. New towns such as Harlow by Gibberd are structured on a strict hierarchical basis. The city comprises four main districts each with its own district centre. Districts are sub-divided into neighbourhoods, each with a neighbourhood centre. The neighbourhoods further divide into distinct housing areas which in turn sub-divide into housing clusters composed of the basic unit – the home of the nuclear family (Figures 6.45–6.47). McKei (1974) devised an interesting organic model for restructuring streets and neighbourhoods in inner city areas. McKei called his process Cellular Renewal, confirming a strong association with the organic model of city planning. His suggestion was to replace comprehensive redevelopment with a more sympathetic small-scale process of rehabilitation and regeneration. There was evidence at the time McKei was working to show that comprehensive redevelopment destroyed many vital communities in the process of renewing the physical infrastructure. Cellular Renewal depends on a survey of individual properties to determine the precise state of the physical structure and the nature of the social unit occupying that structure. Each unit or home was described as a cell. A soft cell, one ripe for immediate action, was one which was in poor condition and where the family was in great need of rehousing. A hard cell, one which could take low priority for redevelopment or rehabilitation, was seen as a property in reasonable condition and perhaps occupied by an elderly person who was unwilling to move. Such a property could be left until the occupant died or moved to sheltered accommodation. This organic concept of the neighbourhood proposed a slow renewal or rehabilitation of the properties in piecemeal fashion which did not disturb the community and which was in tune with the growth and decay of the families.

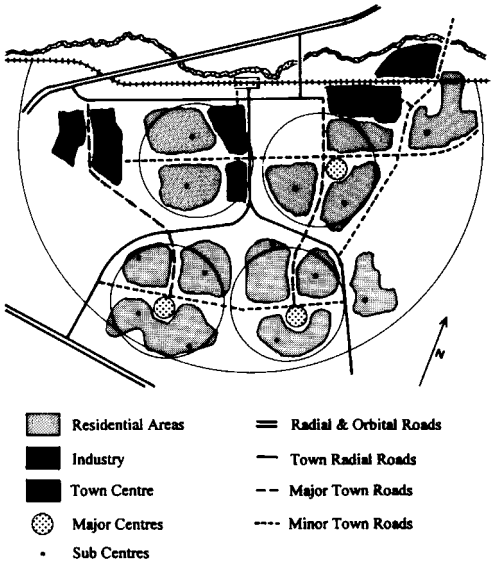


Figure 6.45 Harlow New Town, structure diagram (Gibberd, 1955)

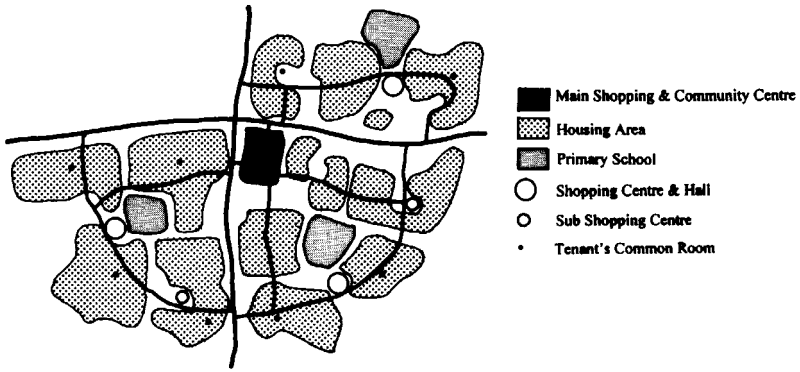


Figure 6.46 Harlow, neighbourhood structure (Gibberd, 1955)

Figure 6.47 Harlow, housing cluster

THE COMPACT CITY

The compact city as an ideal for sustainable urban form is the current orthodoxy both in this country and in the Republic of Ireland. The plan for Adamstown in the Republic of Ireland (see Figure 8.8) echoes the main features of the model outlined in the Report of the Urban Task Force, *Towards an Urban Renaissance* (Urban task Force, 1999) (Figure 6.48). These features include:

(1) High-density mixed use development with mixed tenure housing at fifty units per hectare.
(2) Development arranged around centres with most homes being within 10 to 15 minutes' walking distance from a centre.
(3) These semi-autonomous communities, self-supporting in daily needs, are connected to other centres and to the city centre by public transport routes.
(4) An important structuring element is a well-connected public realm of streets, squares, parks and other open spaces.

GAIA

Lovelock (1979), in his Gaia thesis, deepens our perceptions of the environment and man's place within it: he also broadens the possible scope and meaning of an organic model for human settlement. Gaia theory has, as its premise, the idea that the Earth is a superorganism which is actively self-regulating. Lovelock, however, rejects the notion that the Earth seen as a self-regulating organism is necessarily a teleological concept.

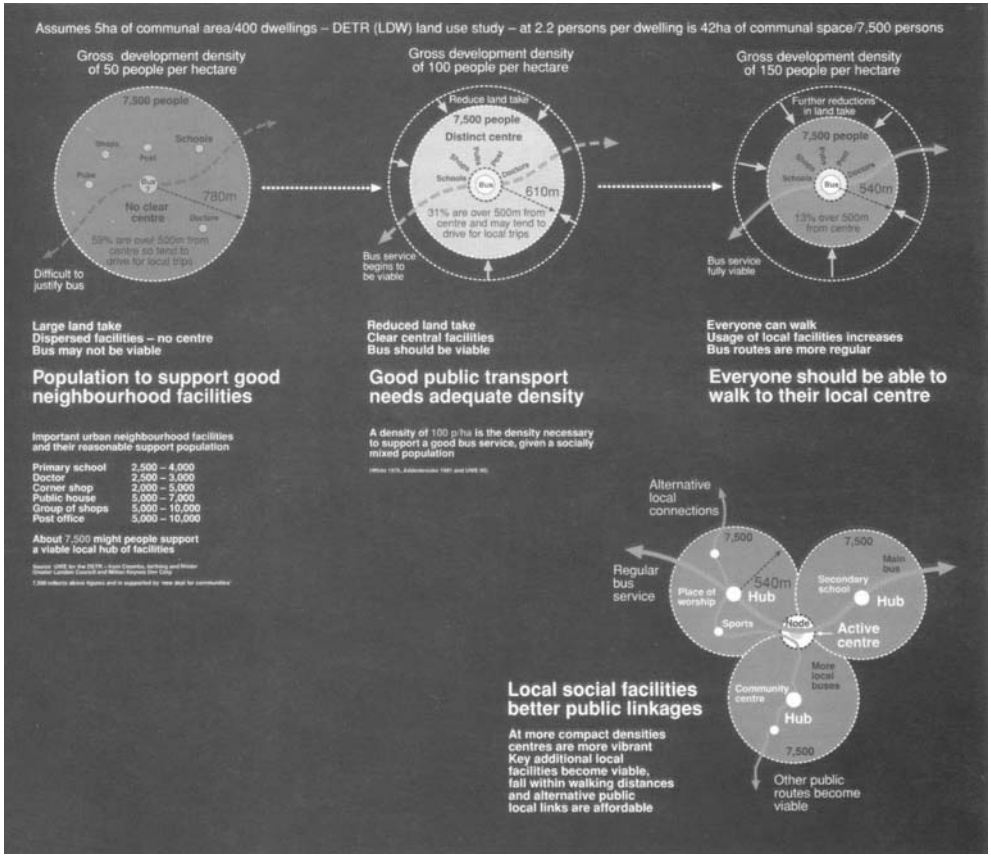


Figure 6.48 Land requirement. Communities of 7 500 and 22 500 people

He maintains that a self-regulating superorganism, such as his concept of Gaia, does not require a biota with both foresight and skills in planning.

Life on this planet is a paradoxical contradiction of the Second Law of Thermodynamics, which states that everything has been, is, and always will be, running down to equilibrium and death. It is rather like a wound clock spring, which slowly unwinds until the clock stops. Natural processes always move towards an increase of disorder measured by entropy, a quantity that inexorably increases. The normal expectancy for a planet like Earth is an inert, lifeless mass such as Venus or Mars. Lovelock illustrates the paradox of life on Earth in this way: 'Yet life is characterised by an omnipresence of improbability that would make winning the sweepstake every day for a year seem trivial by comparison. Even more remarkable this unstable, this apparently illegal, state of life has persisted on Earth for a sizeable fraction of the age of the Universe. In no way does life violate the second law, it has evolved with Earth as a tightly coupled system to favour survival.'

PERMACULTURE

Permaculture, a theory developed by Mollinson, like Gaia theory, has for its starting point life and the world of nature: also like Gaia theory it, too, is a useful tool for an examination of the design of sustainable organic urban forms. Permaculture, which is short for permanent agriculture, is '... the conscious design and maintenance of agriculturally productive ecosystems which have diversity, stability and resilience of natural ecosystems. It is the harmonious integration of landscape and people providing their food, energy, shelter, and other material and non material goods in a sustainable way'. For a case study in permaculture, see *Urban Design: Method and Techniques* (Moughtin *et al.*, 2003a, pages 111 to 114)

CONCLUSION

The Gaia thesis and Mollinson's permaculture emphasize both the complexity and delicacy of the ecosystems in which human beings live and breathe. In contrast to this holistic approach, the compact city attacks mainly one set of a whole host of interrelated problems associated with achieving a sustainable settlement pattern. Certainly the compact city and 'densification' of development can achieve reductions in the use of fossil fuels for transport and town heating, reductions too in the use of land and in the cost of urban infrastructure. But from an organic model of the city perhaps we should expect more than the compact city can deliver.

The organic city in general has an optimum size: the city is born and, like organisms, comes to maturity, then persists if healthy. In the past cities have died but, unlike organisms, have been resurrected on the same site. City health is maintained according to the organic model only as long as the balance of its components is maintained. Excess growth is managed by the propagation of new colonies, but only where new or underused land exists. The organic model for the city is most in tune with the concept of sustainable development when, in particular, it takes on the attributes of nature's ecosystem. Sustainable human settlement occurs where there is a state of ecological balance, however temporary, between human activities and the supporting environment. That is where there is diversity in the total components in the human–nature ecosystem that maintains the delicate balance between energy inputs and outputs and where recycling and the environment are able to absorb residual waste and pollution. According to this model of the city, decay is apparent in settlements when this delicate balance breaks down and excessive growth occurs or when self-healing ceases; the result can be likened to cancer, uncontrolled growth, or obesity.

In developing a normative theory for the sustainable city the metaphor of the city as an organism has a clear advantage over both the concept of the eternal city of the gods, the microcosm of the universe and also the idea of the clockwork city of honest industry. The main contribution of organic theory is its holistic view of the city as a part of nature. The organic city is not set in an idealized but remote cosmos, nor is it limited to the pursuit of the technological control of the environment. Sustainable development and organic city theory share the fundamental

goal of conceptualizing settlement as a whole: the elements or parts of the city are not strictly separate but supportive. The organic city has the delight, diversity and subtlety of the natural world: indeed it is part of nature.

In both sustainable city theory and organic theory, process and form are one. While the process of city structuring results in the form, the form is apparent from the beginning: the pattern, as Alexander *et al.* (1987) suggest, is in the seed, at the point of origin. The growth of any acorn results in an oak tree, and while each tree is composed of similar elements linked in specific ways, no two trees are identical. So too with the sustainable city, the pattern is established by the principles used for the design and linkage of the parts. The design of the parts and the nature of their linkages will form the content of later chapters. Certain forms, however, are associated with and act as symbols for the organic city, the most obvious being the green areas of open landscape within and around cities. Other forms associated with the organic city are buildings which appear to be grounded in the earth or to be a part of the environment through the use of traditional materials and local forms in harmony with the landscape. Other more romantic ideals associated with the organic model include the thatched cottage, the ivy clad wall, the herbaceous border, the orchard and the walled garden. The urban structure of the organic city is non-geometrical: roads follow a curving path while spaces in the city are picturesque and in the manner of Sitte's ideal. In terms of the overall structure, the pattern of the organic city has an edge or zone of transition between town and country, a 'fleshy' edge between strictly urban activities and those of the surrounding countryside with its environmental support services. Like all boundaries, however, the city edge is a product of the mind. It also has a centre and clearly recognised parts, districts or neighbourhoods. These symbols of the organic city appear to be useful concepts for the purpose of discussing the possible form of the sustainable city of the future. They may form the basis from which to develop a design tradition for the sustainable city.

The organic metaphor has certain limitations. The city is not a tree (Alexander, 1965). Cities do not grow, reproduce and heal themselves: the agent for their change is man. Describing a city in terms of its heart, lungs or arteries does not help in the analysis of the problems of city centre decline, pollution and gridlock on city streets. Such terms for the parts of a city based on human and animal anatomy, however, may have value in suggesting ideas for problem solutions through analogy (de Bono, 1977; Gordon, 1961). For analytical purposes the most fruitful metaphor from nature is the ecosystem – that is, a relatively stable arrangement of flora and fauna delicately balanced with other elements of the environment. The relationship or nature of the connection between the components of the ecosystem can be analysed and modelled. The effect, therefore, can be estimated of changes to any components in the system. McLaughlin (1969) and Chadwick (1966) and others forty years ago, were advocating this method for planning. Systemic thinking is probably the conceptual framework which is essential for the analysis of urban processes of great complexity. Tools such as GIS (Geographic Systems Analysis) are available to facilitate this complex analysis (for a case study, see Moughtin *et al.*, 2003a).

The premise for this book and the others in this series is that the form and

distribution of settlements is a physical manifestation of a particular culture. Culture, as used here, is a broad concept covering the way we conduct our lives: the mores and values that infuse the way we think; the social, economic, political and legal structures that govern the way we behave and connect with group members, strangers and the environment, together with the technology which facilitates our activities. Following on from this premise and definition, the process of city building is a people's use of an accumulated technological knowledge to control a particular environment for its social, economic, political, aesthetic and spiritual purposes. It is the method learned and used by people to solve the total programme of requirements for city building. In summary, the city is an element of people's spiritual and physical culture and, indeed, it can be one of the highest expressions of that culture. Culture, however, is never static; it is in a constant state of flux. The world is becoming smaller, and there is increasing contact between people. Cultures are therefore changing at an increasingly rapid rate. If our actions are, to some extent, culture-bound then the ways in which the organic model is interpreted, developed and translated into the sustainable city will vary from place to place, from time to time, and in different ways in the same place. The remaining chapters of this book will explore some possible interpretations of sustainable city form.

CITY FORM

7

INTRODUCTION

This chapter examines the relationship between urban form and sustainable development. In particular, it outlines a typology of city forms. The three main archetypal urban forms discussed are: the linear city; the city set out in the form of a grid; and the highly centralized or inward-looking city. The form of each archetypal plan may be modified by the prevailing metaphor: the city as a replica or model of the cosmos; the city as a machine; or finally the city as an organism. The grid layout, for example, has been used to express physically both the cosmic and the machine city metaphors (Lynch, 1981). More rarely, as in Gracehill, it has also been used to express the community needs of the settlement built according to the organic metaphor. The Chinese model city uses a grid to relate the city to a cosmic structure (Boyd, 1962; Wheatley, 1971). In Chinese culture the city is designed as a microcosm of the universe, but complete in itself. In contrast, the grid, when used to give form to the city as a machine, emphasizes the autonomous parts, each having a distinct function. Devices such as size, scale or the imposing axis are used to give emphasis to the dominance of the motor car or the world of business: they are never used in this context to mirror the universe. This difference can be illustrated graphically by the contrast between a Roman encampment or the project for a contemporary city by Le Corbusier with the Mandala, which sets out the Indian ideal pattern for city structure (Figure 7.1; see also Figures 6.25 and 6.32).

Ancient Indian city planning theory is based upon texts, Silpasastras, defining the methods of land sub-division which control the evil forces of chaos (Rowland, 1953; Dutt, 1925; Shukla, 1960). The Mandala, adopted to give form to the city, comprised a set of enclosing rings of development divided into squares, the most powerful point being the centre. Main movements, particularly processions through the enclosures, are clockwise following the apparent direction in which the sun moves in the northern hemisphere. Madurai (Figure 7.2), dating from the sixteenth and seventeenth centuries, follows the idealized pattern of the mandala. There are encircling streets, no radials as

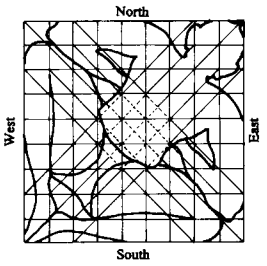


Figure 7.1 Indian Mandala

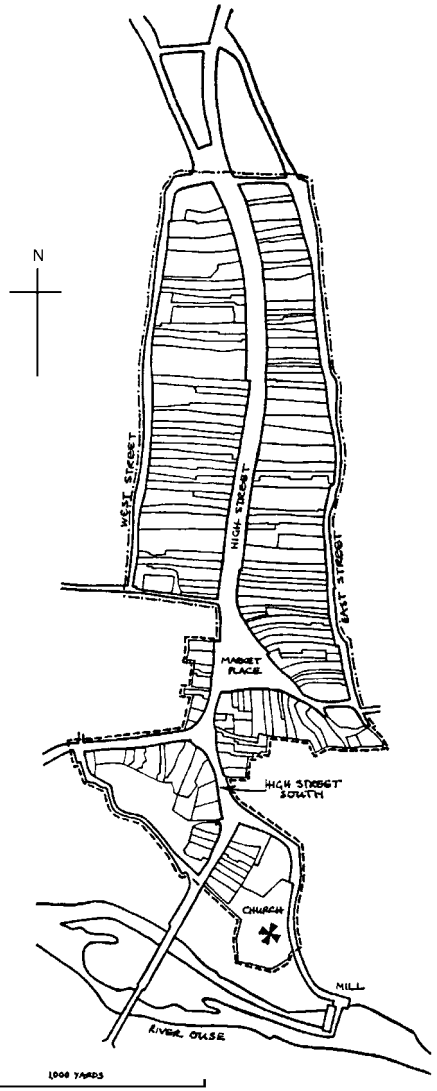
Figure 7.2 Madurai, India (Lynch, 1981)

such and the use of a deformed but clear grid, while the most holy buildings occupy a central position.

The three main archetypal city forms have been converted into an array of hybrid types of city structures to serve different ends. The particular form of a city may owe its shape to a number of factors such as imperatives of location, land values, or social structure. The choice of a structural concept for a new urban foundation may have been influenced by attitudes to: density; the form and distribution of central area functions; the predominant means of transport; the location of social infrastructure or places of work; and, more generally, ideas about ideal forms of lifestyle. Narrowing the range for use in sustainable development is a daunting task. Fortunately in Britain there were a number of new towns built after the Second World War in the last century, which offer a wide range of urban structures available for close study (Osborn and Whittick, 1977).

LINEAR URBAN FORMS

Linear urban forms can be found in many unplanned developments of the Middle Ages (Beresford, 1967) (Figure 7.3). However, they are more usually a product of the industrial revolution. They are most closely associated with the metaphor of the city as a machine. The main feature of the linear urban form is its ability to deal with the rapid and efficient mass movement of people and goods within and between cities. A further quality of the linear structure is its ability to deal, in theory, with infinite growth. Two early examples of linear urban forms are Ciudad Lineal by Soria y Mata for the suburbs of Madrid and Cité Industrielle by Tony Garnier (see Figures 6.26 and 6.27). The linear suburb for Madrid was discussed in Chapter 6, while the Cité Industrielle has also been mentioned before. However, other features of this project are worthy of discussion in the light of sustainable urban form. The most important locational factor for Garnier's ideal city was to be an energy source (Wiebenson, undated). Garnier's prescient choice of energy source, hydro-electric power, foreshadows much of today's preoccupation with renewable energy. The form and layout of housing in the Cité Industrielle was to be governed by orientation. The design aim of the building form was to achieve good ventilation and high levels of sunlight into all homes. Both of these qualities are important considerations



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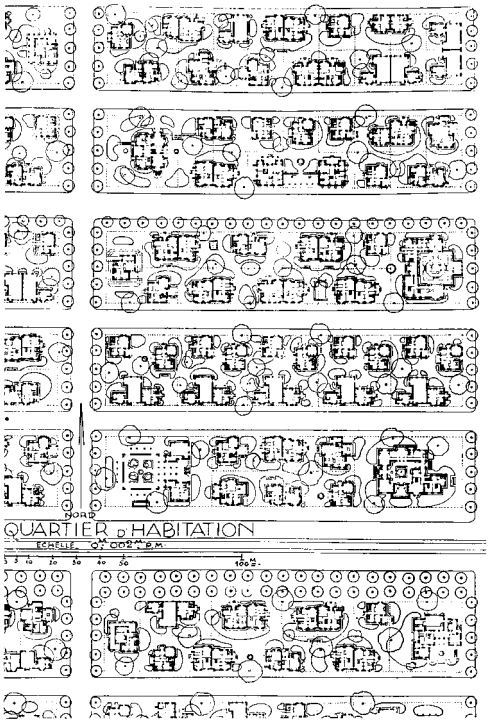

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Figure 7.3 Medieval linear settlement, Olney, Bucks (Beresford, 1967)
Figure 7.4 Cité Industrielle, residential quarter (Wiebenson, undated)
Figure 7.5 Cité Industrielle, housing (Wiebenson, undated)

for the design of sustainable housing where the aim is to maximize solar gain and reduce the need for mechanical ventilation (Figures 7.4 and 7.5). Garnier's ideas about land use zoning was also a precursor of one of the important but perhaps less sensitive innovations of modern city planning.

Other manifestations of the modern movements in architecture and planning were developing in Russia early in the twentieth century. Early in post-revolution Russia the discipline of architecture was examined to see if it could serve the needs of the proletariat rather than the expensive taste of the aristocracy or wealthy bourgeoisie. Two main groups with conflicting ideas emerged: they were, the 'urbanists' and 'de-urbanists'. The urbanists were advocating high-rise, high-density development: '... a network of enormous communal houses with integrated collective services' (Houghton-Evans, 1975). The de-urbanists, in contrast, suggested communities of houses dispersed throughout the countryside. The aim of the de-urbanist was to end the distinction between town and country: 'The agricultural areas must become centres not only for producing but also for processing raw materials. ... Rural housing ... is a prerequisite of production. ... The transfer of manufacturing industry to the sources of raw materials, the integration of industry and agriculture, is likewise a new condition of residential planning and population distribution. But the new planning raises the problem of cheap housing built of local materials.' The view of the de-urbanist is holistic, the city is seen in its total environment: 'We must stop designing piecemeal and start to plan whole complexes, to organise the distribution of production and the territorial distribution of industry and housing over entire economic regions of the Soviet Union' (Kopp, 1970). Many fine thoughts are contained in the manifesto of the de-urbanists; some no doubt are in tune with the ideas being put forward in the name of sustainability. The developments in what was the Soviet Union did not, however, live up to the high sounding ideals of the 'de-urbanists'. The agenda of the urbanist was politically more acceptable, with state control and planning resulting in a dehumanized urban development. The planned exploitation of the environment to sustain the process of urbanization has also led to environmental degradation on a grand scale: a degradation which equals anything the free market of the West has achieved.

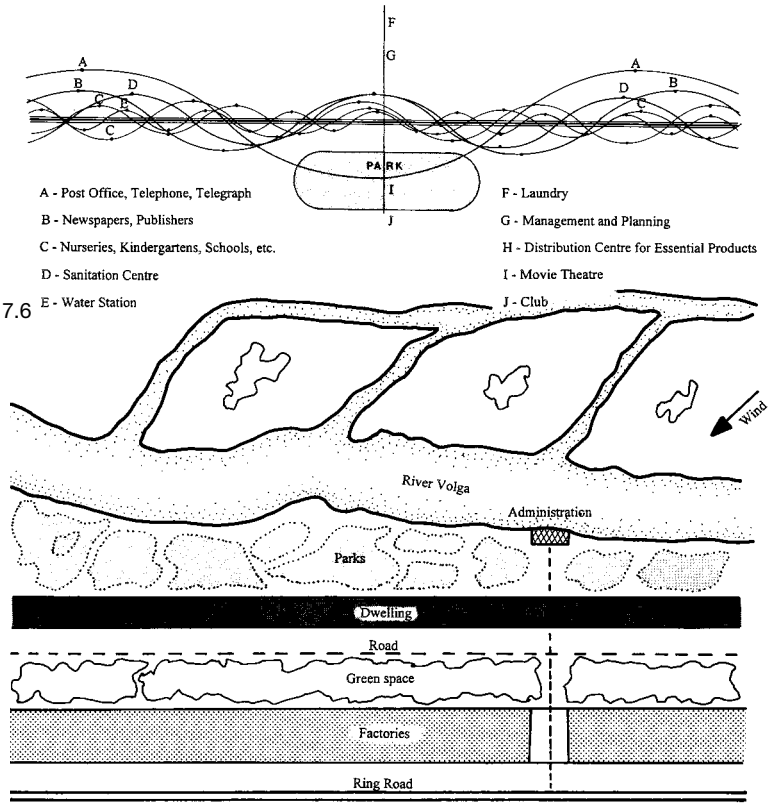
A significant contribution made by the de-urbanist was the development of the idea of the linear city. Miliutin, in his writings and in his inter-war plan for Stalingrad, used the linear concept as a flexible extensible form for the city and its region. According to de-urbanist theory, which Miliutin followed, populated areas were to be associated with a major road; dwellings were to be located in the countryside within easy reach of urban facilities dispersed in a ribbon about 300 metres wide and arranged on either side of the road. Each facility was planned to occur at different frequencies depending on the population required to support the service (Figures 7.6 and 7.7).

MARS PLAN FOR LONDON

The linear city concept has occupied the minds of many urbanists since Miliutin. The Modern Architectural Research Group, who became known as MARS, were interested in applying the ideas of CIAM (*Congrès Internationeaux d'Architecture Moderne*) to conditions in Britain. They produced a master plan for the rebuilding of London after the destruction caused by the Second World War. It became known as the MARS Plan for London. The MARS group saw London as a deteriorating factory which was technically inefficient. MARS proposed a more efficient structure based upon the

analysis of the problems of movement in a great but congested metropolis. They also saw the problem as including the provision of homes, work and the maximum possible number of amenities, including adequate open space for the population. The approach was one of problem-solving, that is, discerning the salient characteristics of the problem, London, then devising: '. . . a master plan, a grid on which the town can be developed' (Korn and Samuelly, 1942). The plan was not based on a 'grid' in the conventional sense in which the word will be used later in the chapter. The MARS Plan for London was based on a series of linear forms arranged around the transport network. Each structural unit, though in practice constrained by existing development, was nevertheless, as a theoretical form, capable of expansion (Figure 7.8).

The MARS concept for the transport grid is deceptively simple. The reality, however, based on the rational movements of people and goods, led to the development of complex systems of interchange between great transport highways. An aim of the plan was to increase the importance of public transport: 'With an excellently organized public transport system, the number of people going to and from town in private cars will be few, being confined to certain professions. Other private cars would serve mainly for pleasure' (Korn and Samuelly, 1942). The group were also advocating the design of highways for use only by public transport. These bus-only highways would be without interruption of crossings, and the service was to be strictly timed by schedule. Here in Britain in 1942 was the origin of the idea for an integrated public transport system of rail and bus. Furthermore, the urban form was designed to give equal importance to 'organized transport', or public vehicles, as was allocated to 'flexible transport', or the private car.



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Figures 7.6 and 7.7 The linear city of Miliutin (Kopp, 1970)

The MARS plan envisaged residential belts 1.5 miles wide by 8 miles long. The housing density was to be fifty-five persons per acre, which is similar to densities being discussed at the moment. 'Green wedges' extending from the periphery of London to the city centre were to provide sites for recreation, health and education. All inhabitants would be living within walking distance of both borough centre and landscaped areas. The MARS group

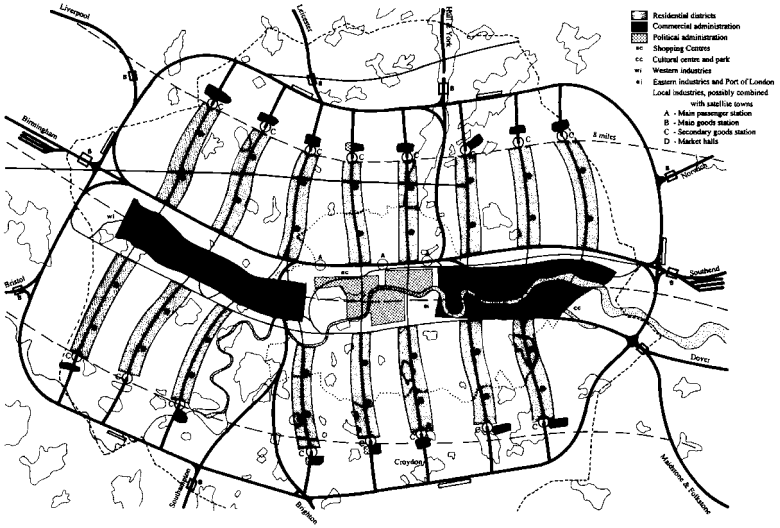


Figure 7.8 MARS plan
(Korn and Samuelly, 1942)

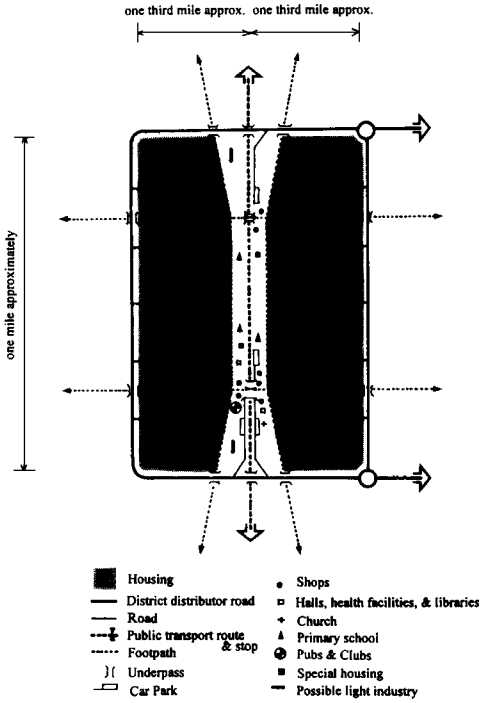


Figure 7.9 Redditch
(Houghton-Evans, 1975)

suggested the idea of landscape fingers connecting the countryside with the city centre, an idea which reappears in *Towards an Urban Renaissance* (The Urban Task Force, 1999). The MARS Plan for London is a fine theoretical exploration of urban form. In practice, however, it was the ideas of Howard as interpreted by Abercrombie which were finally accepted as the basis for planning London and its region in the post-war period (Abercrombie, 1945).

BRITISH NEW TOWNS IN THE TWENTIETH CENTURY

A number of the second generation of new towns built after the Second World War in the 1960s were clearly based upon the linear city concept. Notable amongst these linear new town plans are: Redditch; the linear city for Central Lancashire comprising Preston, Leyland and Chorley; Runcorn; and the first proposals for both Telford and the new city for North Bucks.

In his report on a regional study for Northamptonshire, Bedfordshire and Buckinghamshire, Hugh Wilson advocates a linear structure based upon a public transport spine linking all new development (Wilson *et al.*, 1965). Wilson also developed this idea for the new town of Redditch, for which he was commissioned in 1964. The basic structuring concept for Redditch is shown in Figure 7.9. The fundamental feature of the plan is a road for public transport, unimpeded by other vehicles. Community facilities were to be placed on this public transport spine at the bus stops which were to act as the foci of the districts. The districts were to be of mixed use and to contain residential, industrial, recreational

and other related land uses. All parts of the districts were planned to be within half a mile or 10 minutes' walking distance of the district centre and its bus stop. These proposals in 1964 seem as fresh today as the time they were written: such ideas now appear in many proposals for sustainable development.

A regional study for mid-Lancashire included a proposal for a linear city incorporating Preston, Leyland and Chorley (Matthew, 1967). The three existing settlements were to be connected by a triple strand of routes, the central one being a 'community route' for use by public transport only. Both outer routes were to be roads for the motor car. The city region was planned for a population of 500 000 housed in Radburn-style residential development on both sides of the public transport route (Figure 7.10).

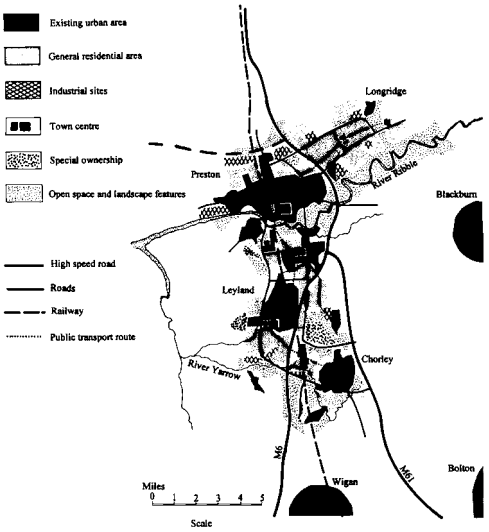


Figure 7.10 Central Lancashire (Matthew, 1967)

Arthur Ling, who had worked on the MARS plan for London, was the first planner since Soria y Mata to implement a plan specifically designed for public transport. Runcorn in Cheshire was the extension of an existing settlement with a population of 30 000. It already had an industrial base, and Ling planned to increase the population to 100 000, attracting additional employment outlets onto a strong local economic base. The population was arranged in a dispersed linear form: 'A linear arrangement of new residential communities, on either side of a spinal public transport route, has been evolved so that the majority of people will be within five minutes walking distance, or 500 yards, of a route which is especially reserved for buses' (Ling, 1967). It was not possible to use a pure linear form for the town because of the existing development. Ling's solution to the problem was both simple and elegant: he turned the linear structure in on itself to form a figure-of-eight with the town centre in a focal position (see Figure 6.24). The spine of the plan is the bus-only road which links all the neighbourhoods to each other and to the town centre. The expressways for private cars bound the urban area and have spur roads that enter each neighbourhood but do not traverse them to form direct connections. This is the only British new town which was designed primarily for public transport: 'In many post-war new towns and suburban extensions, the tendency has been to design the road layout for private vehicles and then route buses along the most appropriate roads. This has led in some instances to a minimum use of public transport which has made it uneconomical to provide socially convenient services. It is considered that contribution of public transport to a new town is of such importance that it is essential to plan for it as an integral part of the town structure and not to provide it as an afterthought' (Ling, 1967). How appropriate these words still sound today – a promising model for a sustainable city even though

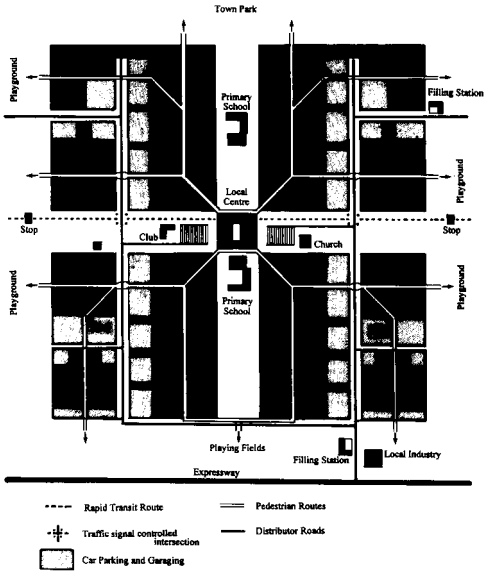


Figure 7.11 Runcorn a community (Ling, 1967)

some of the early housing left much to be desired and was demolished (Figures 7.11–7.14).

Two other linear town proposals in Britain during the 1960s, though never implemented, carried forward the development of this concept in interesting ways. The first proposal for Dawley (later to become Telford) arranged the town centre functions in linear fashion along a town walkway. The town walkway was joined to form a loop. At the centre of the loop was the central town park. Encircling the doughnut-shaped town was open countryside. Each residential area, a section or portion of the doughnut, was linked to the town walkway, central park and open countryside by pedestrian paths (Figure 7.15). Vehicular access is quite independent of the pedestrian routes and takes the form of a development of the Radburn system.

The first plan for Milton Keynes was also based on a linear concept for urban structure. The original proposal for Milton Keynes is far more interesting for those concerned with sustainable development than the 'drive-in-city' which was finally implemented. The County of Buckingham in 1959 was seeking ways of dealing with the considerable increase in population which was then forecast. The County proposed to house the extra population in a regional city of 250 000. The city plan at that time was to be based on a linear concept, the form being governed by public transport with development taking place at stopping places on that route. The public transport system suggested for the new city was to be a monorail. The community size was to be 5000 to 7000, and each such community was to be centred on a monorail station with a maximum walking distance of 7 minutes from the station to the housing. The overall density of the township was to be fifty persons to the acre. The housing was to comprise mainly patio houses of one or two storeys in height, but with higher blocks near to the station (Houghton-Evans, 1975).

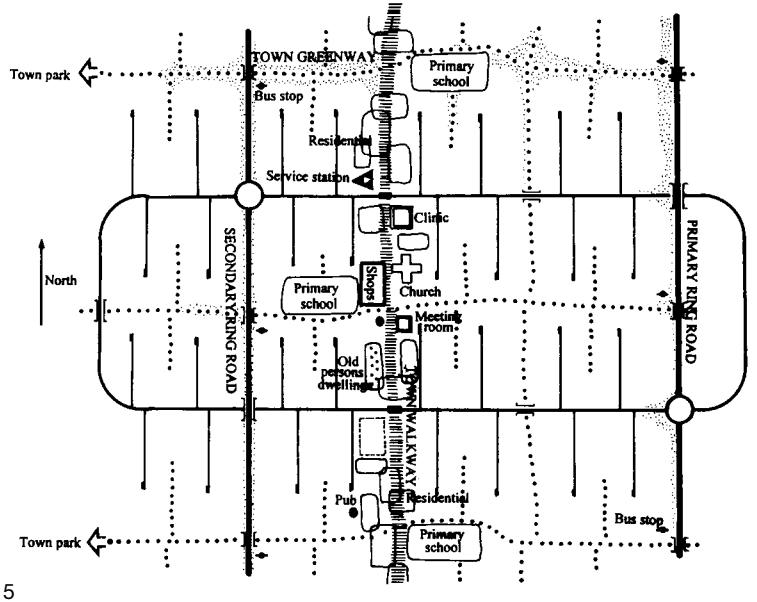
Figure 7.12 Runcorn, town centre

The first plan for Milton Keynes was to comprise four main circuits of linear groups of townships. The townships were to be connected by two interlinked circuits of public transport joining home, work and the central city. The central city was itself of linear form and capable in theory of expansion. The townships were also served by an independent road system giving Radburn-type access to the housing (Figure 7.16). The monorail system was found to cost more than the infrastructure required for 100 per cent car usage. With monorail, however: '... the cost per passenger mile would be much less than travel by car, and a modest rate charge would allow the system to be paid for, operated and replaced after 60 years for much less than the alternative high capacity road system which would be needed' (Houghton–Evans, 1975). Taking account of the true environmental costs would have, without doubt, tipped the advantages further in the direction of the monorail in any debate held now where sustainable development is an important consideration. It would too, have made a great structural foundation for any proposed extension to the city.

The concept of the linear city has been developed into an idea for an urban structure stretching *ad infinitum* along transport and infrastructure corridors which cross regional and national borders (March, 1975). Central place activities would be located along these corridors in a manner similar to the one suggested by Miliutin. Unlike the proposals of Miliutin and the Soviet de-urbanists, the March proposals make a clear distinction between town and country. In this particular theoretical proposition every part of the city would be close to the countryside but it

Figure 7.13 Runcorn, busway

Figure 7.14 Runcorn, early housing



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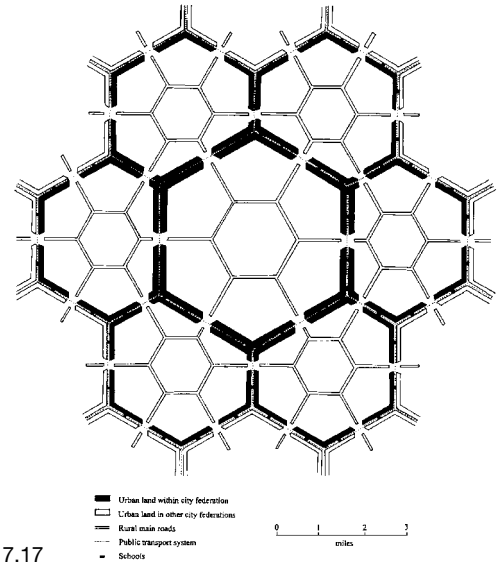

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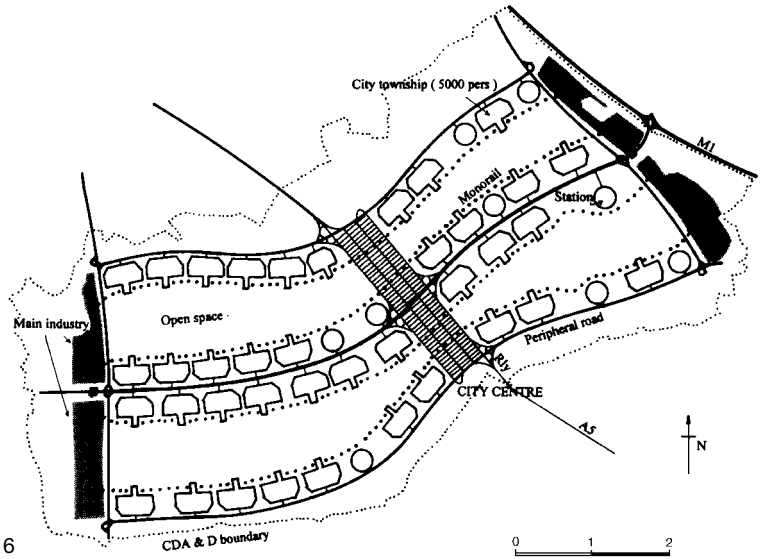

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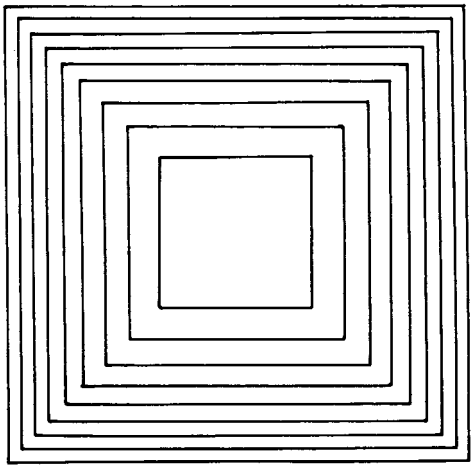

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Figure 7.15 Telford (Houghton-Evans, 1975)
Figure 7.16 Monorail city (Houghton-Evans, 1975)
Figure 7.17 Linear city (March, 1974)
Figure 7.18 Fresnel's square

would still be possible to drive through country areas without seeing a town (Figure 7.17).

The starting point for March (1974) was 'to think line not blob'. The theory relied for its intellectual rigour upon the geometry of Fresnel's square (Figure 7.18). Each

successive 'annular ring' of Fresnel's square diminishes in width from the middle but is exactly the same area as the central square, the 'blob'. If the rings are regarded as possible ways of arranging buildings or areas of urban development, then each poses different problems of internal arrangement, servicing, lighting, heating and the use of external space. The greatest difference is between the central space, a pavilion of development, and the outer space, a courtyard-type development (Figures 7.19 and 7.20). For example, imagine these two areas, the central square, the 'blob', and the area at the perimeter, the 'line', being developed with four-storey buildings. The outer 'line' of development would present fewer problems in terms of achieving reasonable levels of natural lighting and ventilation than the inner 'blob' of development. The pavilion-type development on the inner square would require light wells of some description: in short, it would require either buildings of greater height or an extension of the ground area to achieve the same building volume as the outermost line of development (Figures 7.21 and 7.22).

March (1974) points to the history of urban development to support his theory for the linear city. Development in the past has often been built along the route of a thoroughfare for reasons of economy (see Figure 7.3). March in his theory did not, however, take into account the equally natural development of central places along transport routes. Such central places act as magnets attracting development to specific locations in ways Christaller discovered in Germany (Christaller, 1933, 1966). This attraction of the central place distorts the pure form of linear development, creating real estate of high value. The result is the sort

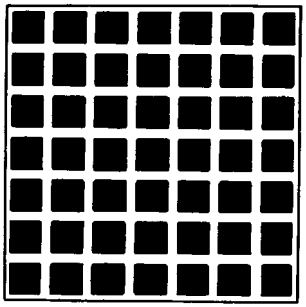


Figure 7.19 Pavilion development (March, 1974)

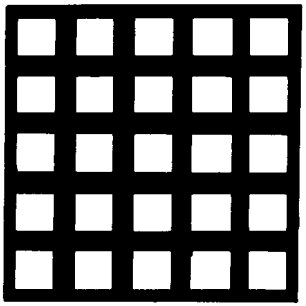


Figure 7.20 Courtyard development (March, 1974)

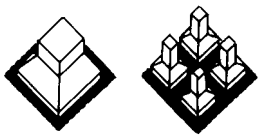
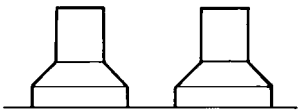


Figure 7.21 Pavilion development (March, 1974)



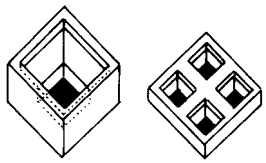
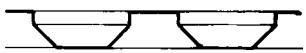
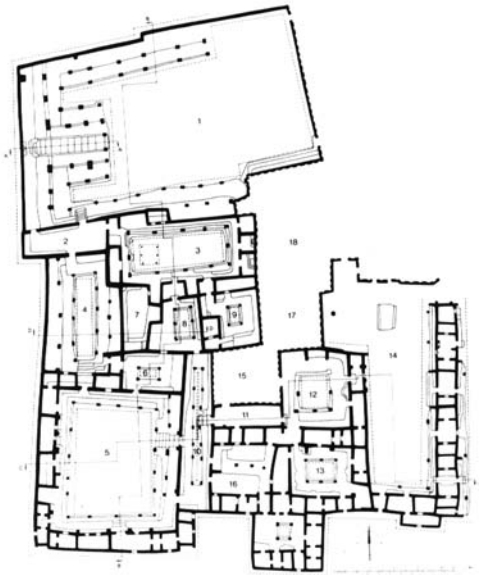


Figure 7.22 Courtyard development (March, 1974)



Yoruba
Afin Akure



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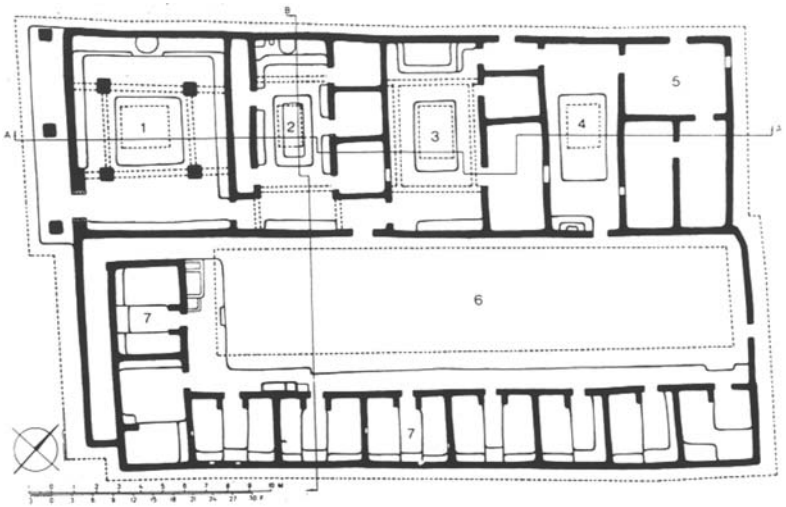


7.23b

of blob of development March advises his readers to dismiss from their minds.

The arrangement of accommodation along the perimeter of a single plot has a long and well-documented history. This form of plot development can be seen in, for example, the courtyard house of the classical world, and it is also a typical house form in some parts of Africa (Moughtin, 1985; Denyer, 1978) (Figure 7.23). This may prove to be a useful concept for the arrangement of accommodation on a well-defined site and an appropriate form for the street block (Martin, 1974). The magnification of the concept for use on a regional, national and supra-national scale is to remove all meaning from the original idea; a linear city stretching from Birmingham through London across the Channel to Europe and along the Rhine belongs to the world of fantasy, if not to 'the stuff of nightmare'. Such suggestions do little justice to an elegant concept devised by Soria y Mata for the suburbs of Madrid. A linear form of limited extent for public transport corridors may prove to have a great potential in achieving local sustainable development.

Figure 7.23 African courtyard house. (a) Yoruba (b) Igbo (Dmochowski in Moughtin, 1988)

Chief Uzana Edigi's house
Key
1 Ogbe
2 Ikun-na-Aruerna
3 Ikun-na-Nogiukpo
4 Ikun-na-Aruiye
5 Enogie
6 Harem courtyard
7 Women's apartment – Ogua – Oderie

THE GRID PLAN

The grid plan has been used in a number of ways to structure the city: it has also been used with all three normative city models. The grid, for example, was used at Teotihuacan in Mexico to give form to a city as a religious symbol (see Figure 6.7). It has also had wide use as a tool for land subdivision in colonial cities and new towns, where it was used to express the technical demands of a machine aesthetic. In contrast, Frank Lloyd Wright in his project for Broadacres proposed a grid of high-capacity roads extending over the regional landscape with each family occupying one acre of land on which to build an extensible do-it-yourself family home (Lloyd Wright, 1958). Lloyd Wright, in extolling the virtue of the nomad, the pioneer and wide open spaces, while denigrating the old form of the city and 'pig piling' in high-rise buildings, was expressing his ideals of 'back to nature' and the organic city (Figure 7.24). The grid-iron is a versatile method of city structuring which can be used to give form to quite different values.

The grid plan can take five main forms:

(1) The grid as a hierarchy of boxes, each nesting within one another.
(2) The grid as a strict orthogonal geometrical figure, often called a 'grid-iron plan', or checker-board pattern.
(3) The directional grid.
(4) The triangular grid.
(5) The grid as an informal lacework of paths.

When associated with cosmic symbolism, the grid is divided and sub-divided into boxes within boxes. The hierarchy of finer grids of nesting boxes found in South-east Asian cities express in physical terms an equally hierarchical system of religious and civil power, each level of authority having its own appropriate location, colour and building materials. The enclosures, gateways and symmetrical approaches to each box were imbued with a magical protection which was reinforced by the ceremonies used both to found the city and to sustain its socio-political structures. The geometry and geomancy, the foundation for the structure of the grid used in many ancient cities, has little relevance for the sustainable city of the twenty-first century, except as an artefact of great historical and archaeological value. The search for a symbol of sustainable city form lies in other directions.

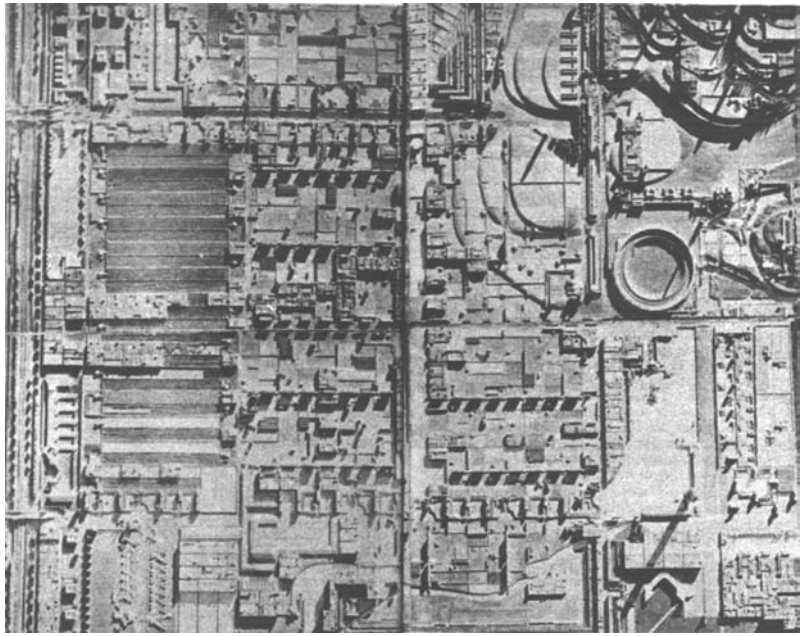


Figure 7.24 Broadacres (Lloyd Wright, 1958). © ARS, NY and DACS, London 1997

The grid becomes a 'grid-iron pattern' when it is composed of standard square insulae similar to the standard structure used by the Romans for colonial settlements. In theory, the grid-iron plan permits the

expansion of the settlement in all directions by the addition of further insulae at its perimeter. The use of the grid-iron plan has proved to be a useful tool for the efficient sub-division and sale of development land. During the initial stages of urban development, the insulae tend to be open with scattered properties. During later stages, the frontages of the insulae are completed. Later still, the back-yard spaces are infilled with buildings. Before development pressures result in an expansion at the edge of the settlement, the buildings in the old town are demolished: the central insulae are redeveloped, building heights throughout the older parts of town increasing. The traditional grid structure has proved, in the past, to be a most sustainable form surviving many centuries of development and redevelopment (see Figure 6.33). For those advocating compact settlements as being the ideal model for sustainable urban form, the gridiron plan offers scope for further experiment. In its traditional form, however, the orthogonal grid appears to have limits of scale and may be of most use for settlements or parts of settlements which can be traversed by foot, that is, about a half mile or 1 kilometre square, as in Gracehill, Northern Ireland (see Figures 6.42 to 6.44). Beyond this size, the grid-iron plan may become visually dull and lose clarity; as Lynch would say, the form has a weak image.

A variation of the grid-iron is the directional grid (see for example, Buchanan's plan for Southampton; Figure 7.34). The directional grid has some of the properties of linear structures: parallel roads in one direction are made more important, which implies axial growth in two directions in a similar fashion to the linear city. A further theoretical version of the grid is the triangular grid consisting of parallel road systems in three directions. The triangular grid adds flexibility of through movement. When combined with the orthogonal grid, as in L'Enfant's plan for Washington, it adds the possibility of easy diagonal movements (see Figure 6.12). The triangular grid and other non-rectangular lattice structures based on it, such as the hexagonal grid, produce awkward road junctions and difficult building plots. One of the few practical uses of this type of complex structure is the plan for New Delhi by Lutyens (Irving, 1981) (see Figure 6.16). Finally, there is the informal grid of streets, or lacework of paths, which Alexander described in 1975 (Figure 7.25). Alexander uses the term to identify a low-density settlement in which the traffic routes are widely spaced, and the insulae are occupied by large open spaces consisting of farmland, intensive market gardens, wooded areas and wild countryside. The frontage onto the main roads is a linear strip of housing and other

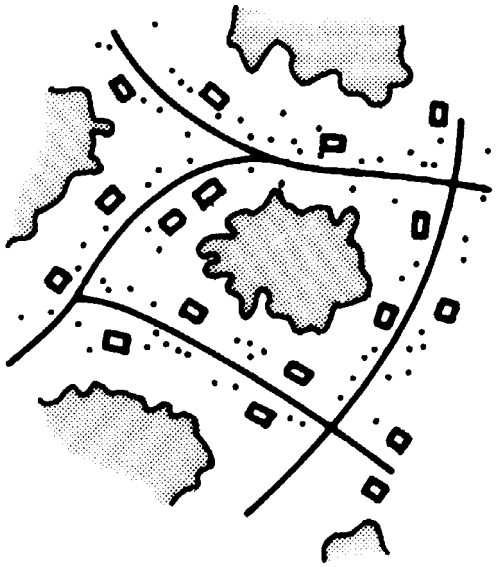


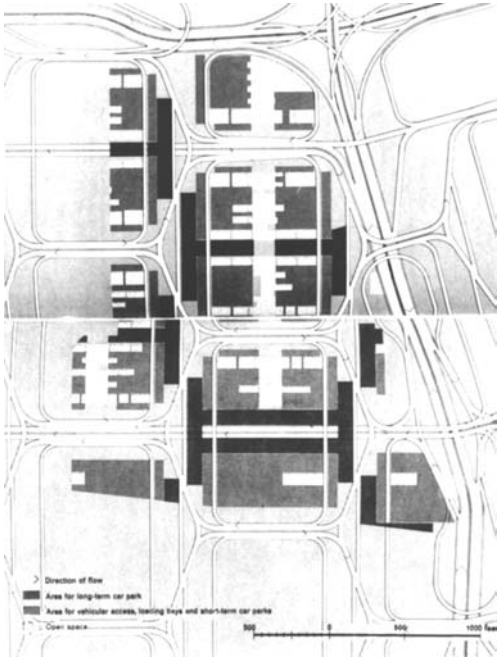
Figure 7.25 Lacework grid (Lynch, 1981)

urban uses. During the twentieth century – and particularly in its second half – the grid, when used for urban development, has not been the rigid grid-iron pattern but one of the more informal variations of the concept (see for example, the main road network of Milton Keynes; Figure 7.35).

During the 1960s a number of important studies were conducted for new towns which gave priority to planning for the free movement of the motor car. These studies came to the conclusion that some form of the grid best served the needs of the car. It is not the conclusion of these studies which is important for sustainable development, but the rational thought process which went into their construction. An exploration of sustainable urban forms should use these studies as models of a design process. They follow in single-minded pursuit of clearly defined objectives, which in the case of these studies is the overarching goal for the unrestricted movement of personalized transport. For a study of sustainable urban form the goal is to design structures predominantly for the use of public transport supported by walking and cycling, the private car taking low priority with the limited exception of its use by those with special needs. Despite many of the new town studies of the 1960s dismissing the utility of the neighbourhood, they all, without fail, replaced it with population groupings resident on a fixed piece of land. Often, the size of the grouping is based upon the amount of road traffic that the community would generate, and the best ways in which that traffic can be absorbed into the main road system. Sustainable development would start from a different premise in deciding a population size for a district or quarter. Community groupings in a sustainable settlement would be dependent more upon the level of population required to support public transport, political institutions and the catchment areas for schools and other social facilities.

Buchanan, in the early 1960s, used the orthogonal grid for his theoretical study of Marylebone in Central London (Buchanan, 1963). Buchanan was concerned to define the dimensions of his grid according to the traffic the superblock or insulae would generate. If the grid of bounding roads are too widely spaced, too much traffic is generated by the land uses within the block for the roads to carry and the internal roads within the insulae would have to be designed as high-capacity primary routes. If, on the other hand, the distance between the roads forming the main grid is too small, the number of junctions in the overall grid would be too close and too many to facilitate free-flowing traffic. Buchanan's calculations showed that a grid 4500 feet square permitted the highest car generation, 12 200 cars per hour. This is the limitation or ceiling for traffic movement in an orthogonal grid. This limitation in the road system is caused mainly by the number of junctions, which ultimately determines the capacity of the system (Figure 7.26). It was Buchanan's study which influenced the further development of the grid in the British new towns of the late 1960s and 1970s. The orthogonal grid is a form of road system which is particularly suited to the free flow of traffic over a large urban area: 'Since access to a high-speed road must be limited to a few junctions, a system intended to distribute traffic over a wide area may quite logically be arranged as a gridiron, and this in contrast to the linear form, has been exploited . . . by planners more concerned with achieving an even spread of traffic over a town than with concentrating public

Figure 7.26 Buchanan's grid for central London (Buchanan, 1963)
Figure 7.27 Washington New Town, half-mile square grid (Llewellyn-Davies, 1966)
Figure 7.28 Washington New Town, road hierarchy
Figure 7.29 Washington New Town, plan based on one mile square grid



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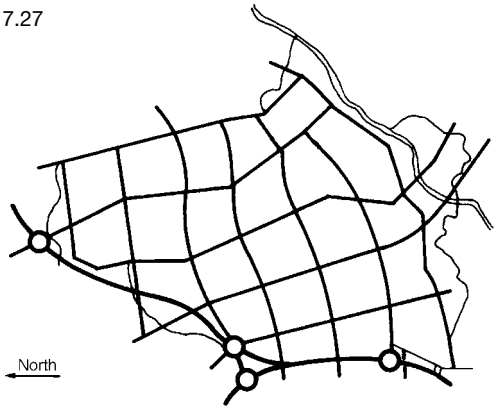

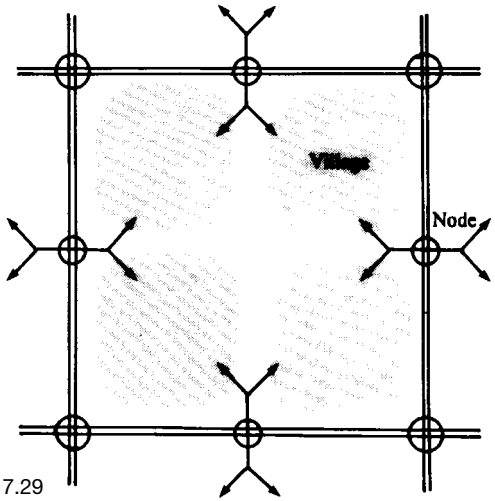

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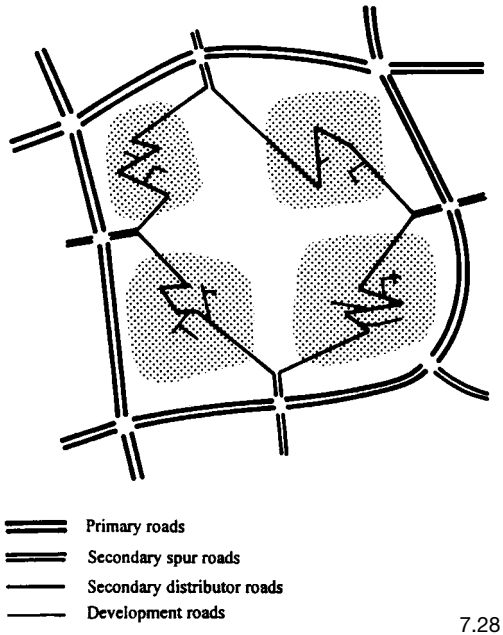


7.28

transport along a limited number of routes' (Houghton-Evans, 1975).

The study for Washington new town in County Durham was yet another investigation into the most appropriate urban form for the 1960s (Llewellyn-Davies, 1966). Like the Buchanan investigation, the planning of Washington placed great emphasis on freedom of movement for the motor car (Figures 7.27–7.30). The new towns of the 1960s were analysed as a functional part of a region: new towns in

Britain were no longer seen as having a high degree of self-containment. The logic of a regional or metropolitan context for a new town was the design of an urban form which facilitates movement on a regional scale. A regional network of high-capacity roads taking the form of a grid seemed to offer a solution for a dispersed pattern of daily movements. The appropriateness of the neighbourhood concept, which had been a guiding principle of the early post-war new town in Britain, was questioned. The new town was now conceived as a complex overlapping structure and was no longer seen as being composed of simple functional elements such as industrial zones, housing areas or town centre. Furthermore, the town was not envisaged as an object with an ultimate, finite or ideal size: a prime objective of the plans both for Washington and other new towns of the same vintage were to accommodate growth and change.

Despite its rejection of the neighbourhood concept, the plan for Washington proposed a settlement pattern based on villages of 4500 people – that is, a village population which supports a primary school. The village, as in Runcorn, was a neighbourhood in all but name. A village of 4500 requires an area of a half-mile square at normal densities for two-storey housing. The village, being easily traversed by the pedestrian, was an area of pedestrian priority with footpaths linking all parts of the village to the centre. Each village was bounded by a grid of primary roads which spread uniformly over the town. The local roads serving the villages joined the primary grid midway between the main junctions of the grid. The local roads themselves formed a secondary grid connecting the villages. The secondary grid is made unattractive as a short-cut or rat-run by linking the village centres to the primary grid diagonally and by taking a circuitous route.

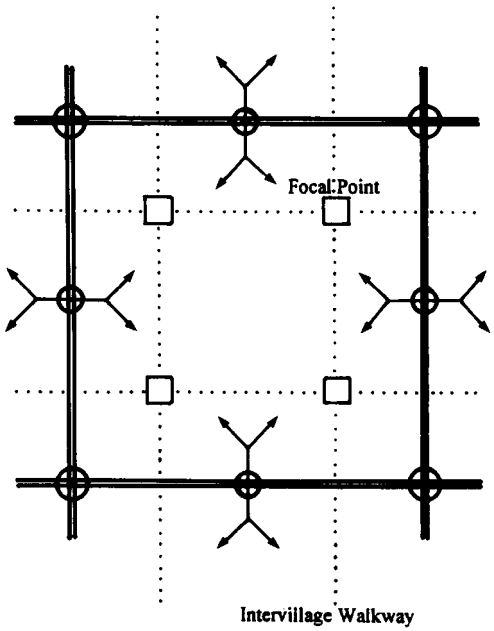


Figure 7.30 Washington New Town, pedestrian pathways connecting village centres

The proposals were subjected to further traffic analysis which showed that junctions at quarter-mile intervals severely disrupted traffic flow, and that where the grid joined regional roads some sections of the system were more heavily loaded than others, defeating the objective of evenly dispersed traffic throughout the network. On the basis of these findings the scheme was revised in favour of roads at 1-mile centres, similar to the grid resulting from Buchanan's findings. Within the square-mile grid there were four villages each of 4500 people, with a pedestrian system connecting all village centres to the town walkway (see Figure 7.28). While the scale of the main grid was determined primarily by the needs of the private car, the secondary routes passing through the village centres were for the bus.

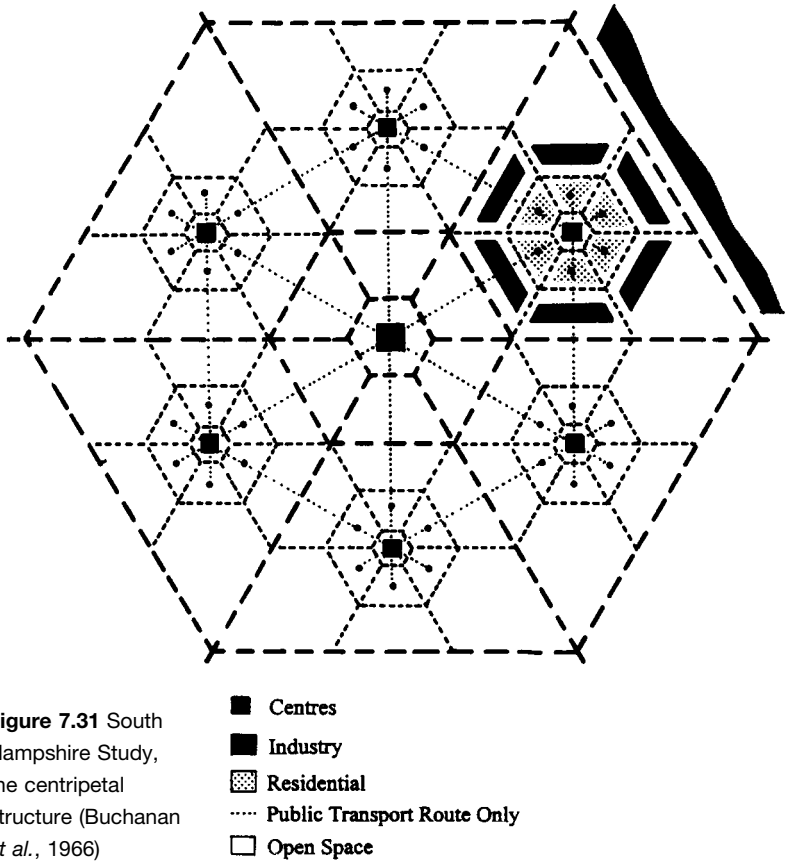


Figure 7.31 South Hampshire Study, the centripetal structure (Buchanan *et al.*, 1966)

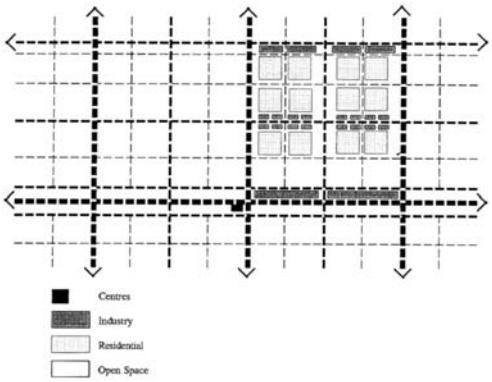


Figure 7.32 South Hampshire Study, a grid with different categories of route

Buchanan returned to the study of the grid when he was commissioned to carry out the South Hampshire Study (Buchanan *et al.*, 1966). His proposals were for the growth and redevelopment of an already intensively developed urban region stretching from Southampton to Portsmouth. Buchanan started his study with an analysis of urban form (Figures 7.31–7.33). This part of the study is a landmark in the method of rational analysis associated with 'modernist planning' of the 1960s. Buchanan contrasts three basic urban forms: the radial-concentric, the orthogonal grid, and the directional grid. He showed how each form could be adapted to serve both public and private transport needs at traffic levels thought inevitable at the time. Buchanan found that the radial-concentric form was less able to accommodate growth and change than either form of grid. He eventually argued for the directional grid which he believed combined the virtues of both the lattice and the line.

Buchanan demonstrated how the directional grid could be applied to South Hampshire (Figure 7.34). He was concerned to design a structure which was capable of responding to different rates of growth. The directional grid which resulted from the study was designed to accommodate increasing levels of both car ownership and personal mobility. The linear grid could be described as a hybrid urban structure combining the strict geometry of the orthogonal grid with the adaptability for growth, a property associated with the linear plan: 'The structure is not fixed or static in size. This was a basic factor in our whole approach to the study of the growth of urban structure, that it should be a structure capable of growth in the future and should never be seen as a complete unit.... It does not result in a fixed static plan of

development, but suggests a framework on, and within which, changing trends and strategies of growth towards different goals are possible' (Buchanan *et al.*, 1966).

The 1960s was a time when urban growth seemed natural and without end. It was not until the oil crisis of the 1970s that the strictures of the Club of Rome and the Environmental movement began to be heard. In contrast to the 1960s, unlimited growth now seems less inevitable, some would say less desirable. More emphasis is given to the process of consolidation, conservation and the regeneration of existing centres. Many of the concerns which occupied the minds of planners like Buchanan in the twentieth century seem now to be quite inappropriate, and almost a lesson in what not to do.

Earlier in the chapter the first proposal for Milton Keynes was discussed. When the proposal for a new city in North Buckinghamshire was confirmed by the government in 1967, Llewellyn-Davies and Partners – the planners of Washington – were appointed as consultants to prepare the plan (Llewellyn-Davies, 1970). It is regrettable, in hindsight, that the County Council's architects were not permitted to proceed with their ideas for the Monorail City. Many innovative and green planning ideas were lost for thirty years because of that decision. The monorail system would have provided the opportunity of creating, along its route, a series of ring mains, which is an economical way of distributing essential city services. There was also an idea for placing a power station at the centre of the city, circulating both power and district heating using the ring mains. Indeed, there was a proposal for heat and power to be supplied from the same plant which would also burn the city waste to recover the heat energy from it. Ideas like these, only now being resurrected, were current in the 1960s.

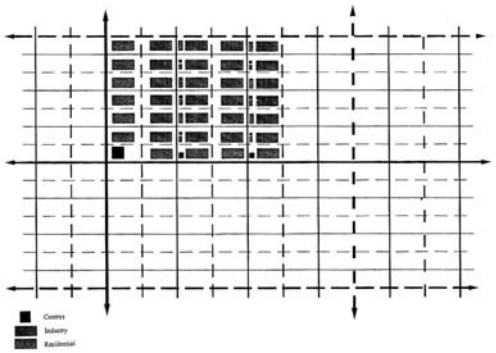


Figure 7.33 South Hampshire Study, the directional grid

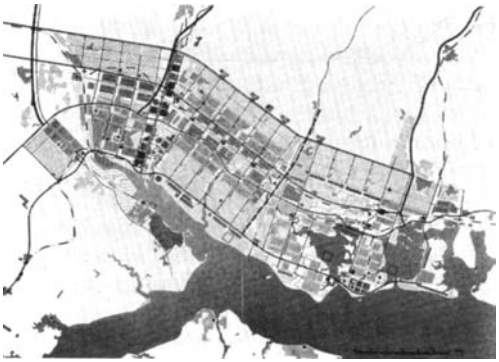


Figure 7.34 South Hampshire Study (Buchanan *et al.*, 1966)

The final plan for Milton Keynes consists of: 'A grid of primary roads of approximately one-kilometre squares. Within these squares are residential areas, called environmental areas, of about 250 to 300 acres (100 to 120 ha) each for about 5000 people. Estate roads branch from the grid to serve the residential areas, while a system of pedestrian routes traverse the whole city crossing the primary roads roughly in the middle of the sides of the squares and at the corners by over or underpasses. At the former points are the 'activity centres' with major bus stops, and a concentration of residential facilities like shops, first schools, pubs, places of worship and other

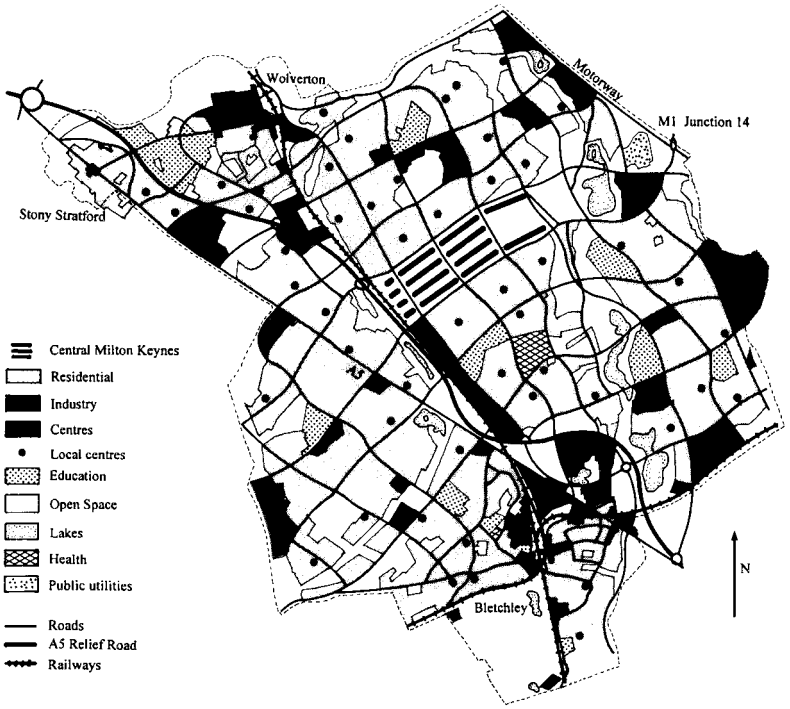


Figure 7.35 Milton Keynes (Llewellyn-Davies, 1971)

requirements. There will be about 60 of these centres with different groupings at each . . . the residential areas are not planned as inward looking neighbourhoods, as in the first generation of new towns, but rather as outward looking to a transport route that links rapidly with other parts of the city. Following the principle of giving the maximum possible freedom of choice to future residents, the plan aims to give scope for the free use of the car unrestrained by congestion while at the same time providing a high quality public transport system from the beginning, not only for those who need it but also for those who might choose to use it instead of private transport' (Osborn and Whittick, 1977).

Figure 7.35 shows the structure of the city which resulted from the extensive investigation of urban form carried out by the consultants with the assistance of an array of academic helpers. Essentially, the planners were attempting to fulfil a set of high-minded goals (Llewellyn-Davies *et al.*, 1970):

(1) Opportunity and freedom of choice.
(2) Easy movement and access, and good communications.
(3) Balance and variety.
(4) An attractive city.
(5) Public awareness and participation.
(6) Efficient and imaginative use of resources.

In hindsight, it is easy to be critical of a particular approach to the planning of any city, including Milton Keynes. Nevertheless, it is useful to examine the plan in relation to the current debate about sustainable development to see if the Milton Keynes experiment has anything to offer planners of today, particularly as there are proposals to extend the city. The consultants concluded that: '. . . only those plans offering potential for low concentration of work places and low residential densities were likely to meet the goals' (Houghton-Evans, 1975). Such a conclusion limits the effectiveness of public transport and places an undue emphasis on mobility based on private transport. It also increases the use of land and urban infrastructure costs. Both of these effects result from the choice of urban form, and run counter to the principles of sustainable development. The plan for Milton Keynes was criticized at the time by the National Farmers' Union and the National Union of

Agricultural Workers. They claimed that the site was one of the most important grain-growing areas in the country, and with improved drainage they thought it could be an area of exceptionally high production. From the viewpoint of sustainable development, the loss of an important environmental service such as food production was an unfortunate outcome of a plan based on wasteful densities.

The North Bucks Association was formed by the residents to oppose the proposal for the new city. The Association represented the parish councils in the area. Amongst its objections was the need for a national physical planning policy for Britain before a decision should be taken to increase the population of Buckinghamshire. The association argued that it was necessary to secure a more evenly balanced distribution of population throughout the country: it was advocating development proposals which would relocate or retain population in less densely populated areas where space, water supply and sewage disposal presented less serious problems. Such a policy, it was argued, would relieve the pressures in the south of the country in places like Buckinghamshire (Osborn and Whittick, 1977). These points are equally valid today for those advocating sustainable development. The dismissal of these arguments prepared by a resident's group throws into question the vigour with which Objective 5 of the consultants' brief, 'participation', was being pursued. Participation, of course, is a key concept in the process of sustainable development. It seems that, on balance, the first proposal for Milton Keynes by the County Council's architects was more imaginative in the way it proposed to use resources and more innovative and 'green' in terms of urban structure than the plan that was eventually developed.

Public transport is seen by many as the key to developing sustainable cities. It seems, therefore, that the grid plan, in the way it was developed in the 1960s as a means of accommodating the motor car, is inappropriate for fulfilling the goals of sustainable development. There is a fundamental relationship between urban form and the transportation system which services the city. Buchanan, Ling, Llewellyn-Davies and the many others working on urban planning in Britain in the latter half of the last century, were fully aware of the close connection between transport and city form: an analysis of this relationship is given great prominence in, for example, the reports on new towns (some of which have been discussed earlier in this chapter). The divergent views held on public as opposed to private transport to a large extent account for the difference in urban structure between Milton Keynes and Runcorn. The planning for sustainable development requires the application of a new paradigm for urban transport and consequently a new urban form. There are four main planning principles for sustainable urban transport. The first principle is that urban structure should reduce the need to travel. The second principle is that urban form should promote and encourage walking and cycling. The third principle is that urban form should be designed to give priority to public as opposed to private transport. The fourth principle seeks to develop an urban structure which encourages the movement of more goods by rail and water and discourages movement of goods by road.

Applying planning principles of a sustainable transport system would result in a form of grid which would be very different

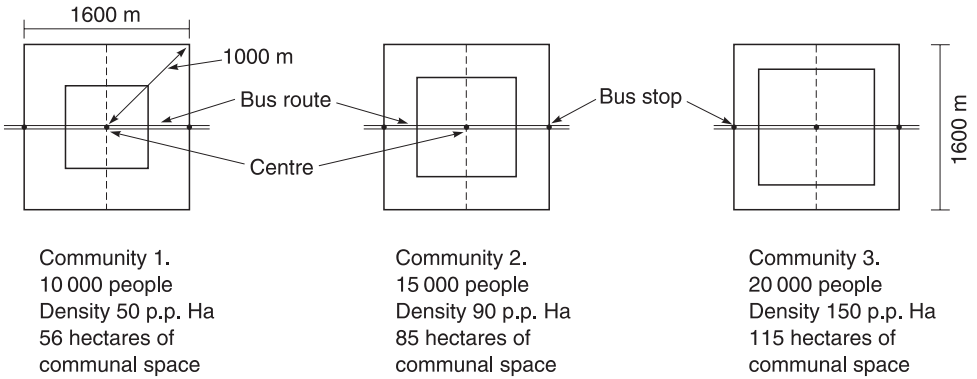


Figure 7.36 Small Local Community at different gross densities

2500 to 4000 Primary School

2500 to 3000 Doctor

2000 to 5000 Corner Shop

5000 to 7000 Public House

5000 to 10000 Group of Shops

5000 to 10000 Post Office

Figure 7.37 Community size which supports neighbourhood facilities

from the linear grid developed for the South Hampshire Study or the kilometre square of Milton Keynes. The grid designed to meet the requirements of sustainable development would not result in a protected environmental area surrounded by major roads carrying fast-moving traffic. The sustainable grid would have at its centre, the community facilities and activities which sustain the daily needs of the community. The spatial limits of the local community would be determined by a reasonable walking distance of about 800 to 1000 metres from the centre to the boundary of the community. A grid 1600 metres square (as shown in Figure 7.36) would accommodate a community of 10 000 at a gross density of 50 persons per hectare: this is allowing about 56 hectares of land for community purposes. At about 90 persons per hectare the same piece of land would accommodate a community of 15 000, allowing about 85 hectares of land for community purposes, while at the much higher density of 150 persons per hectare it would support 20 000 people with 115 hectares of community land. Figure 7.37 shows the population size necessary to support various neighbourhood facilities.

The most appropriate form of grid for a small sustainable settlement would more closely resemble a Plantation town such as Derry (Londonderry) (see Figures 6.37 to 6.39) or that of Gracehill, rather than the plan for Milton Keynes. The colonial Roman town such as Lucca is also a model for a small sustainable town: the town's main streets cross at right-angles where a centre is formed (see Figure 4.33). The two main streets are part of public transport routes connecting with other communities in the region. It is possible for the four quadrants of the settlement to be further sub-divided by an orthogonal grid. The scale and dimensions of the grid, however, would not be determined by the needs of the motor car, but rather by the land sub-division requirements for housing, which is the predominant land use in the settlement. All roads in the settlement would be multi-functional, carrying public transport

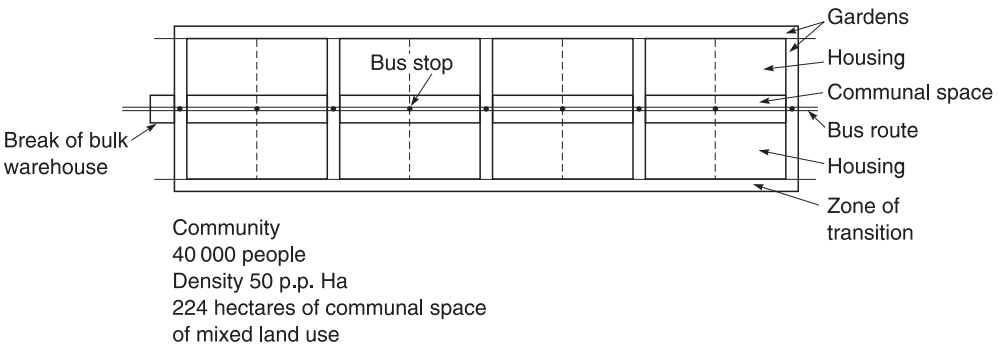


Figure 7.38 Directional grid: Small city extension

vehicles, private cars, bicycles and pedestrians, all moving at a maximum speed of 15 miles per hour – a speed which incidentally is faster than most traffic moves through cities at the moment. At the periphery of the settlement would be located the open space for recreation use and land for intensive market gardening. By arranging a number of communities in linear series (as shown in Figure 7.38), a directional grid would be formed, which would strengthen the central public service route along which community facilities would be located. At the town portal would be sited a break of bulk warehouse for goods destined for the town, delivery goods within the town being by small delivery vehicles.

It may be possible to design a grid form of land sub-division which would satisfy the functional requirements of sustainable development. The resulting settlement or extension to a settlement may incorporate some of the features outlined in previous paragraphs. It is not, however, altogether clear if such a settlement form would express in clear and unambiguous terms the values which would characterize a community practising the culture of sustainable development. The grid plan, unless retaining some of the informal qualities associated with the loose low density lattice advocated by Alexander, appears too mechanistic and antithetical to the organic, natural or ecological ethos with which the philosophy of sustainable development is imbued.

THE CENTRALIZED CITY

The third main archetypal urban form is the centralized or inward-looking city. The medieval city of the Islamic world, such as those still to be found in Northern Nigeria, is the centralized city in its most extreme and introverted form. This form of Islamic city is contained within a wall controlled by gateways (Figure 7.39). The neighbourhoods

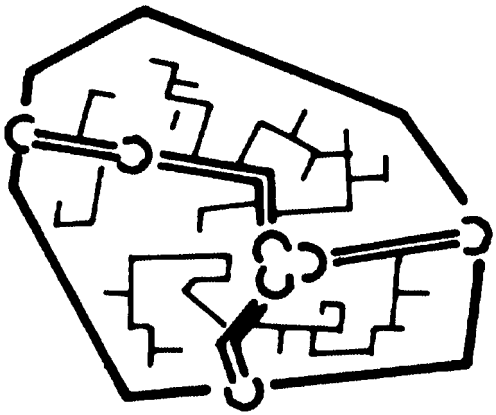


Figure 7.39 Islamic city (Lynch, 1981)

Figure 7.40 Ghadaia, Algeria

within the city are also closed and intensely private. Residential clusters occupied by families with close blood ties are approached along narrow culs-de-sac. Before entering the private world of the extended family, strangers negotiate tight dogleg passageways beneath accommodation bridging the street to form a gateway to the residential quarter (Figure 7.40). The house itself may contain locks or barriers between semi-public space and semi-private space before the intensely private and secluded area of the marital family home is reached (Figure 7.41). Except for space around the Friday Mosque, the Palace and the Market, open space within the traditional Islamic city is confined to small streets bordered by shops and commercial premises. These busy bustling streets contrast sharply with the quiet seclusion of the residential courtyards. Each ward of the traditional Islamic city is occupied by a distinct group practising the same trade such as weaving, pottery or building. At the heart of the ward is a local mosque and the ward chief's home. Within the ward, people of different incomes live as close neighbours, though the city is often segregated into wards for different ethnic groups (Moughtin, 1985).

The medieval European city, while not exhibiting the same preoccupation with privacy, had many features in common with its medieval Islamic counterpart: it, too, was surrounded by a wall controlled by massive gateways (Platt, 1976) (Figures 7.42 and 7.43). The gateways were closed at night for the economic control and protection of the city market; for most of the time this was a more important function for the gateway than defence against the marauding foe. The medieval city with its central market and clearly defined boundary appears to have its public space carved from the solid block of building forming the settlement. The streets and squares are three-dimensional spaces linked in the informal manner much admired by Camillo Sitte (1901). The picturesque structure of the city lends itself to Cullen's townscape analysis, with its emphasis on serial vision as the means of capturing, in

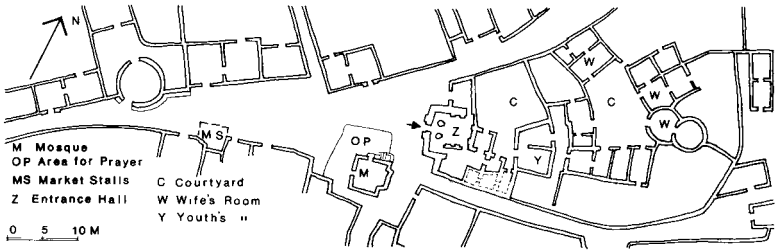


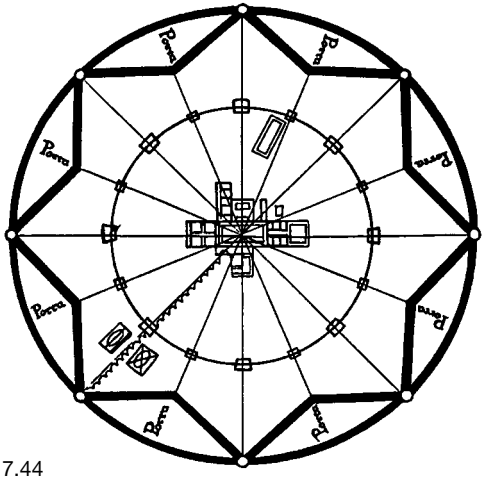
Figure 7.41 House of the Chief Builder in Zaria, Nigeria

sketches, the organic or natural feeling and appearance of the spatial composition (Cullen, 1961). The city appears to be the product of nature, growing in accretive fashion apparently without the artifice of man. This fine city form may be the inspiration of those 'green planners' who advocate a compact city of dense three- and four-storey developments limited in extent.

The concept of the centralized city has probably had the most influence on the development, in Europe, of ideas about ideal city form. In Renaissance Italy, Sforzinda, a model town by Filarete, is a centralized city: the plan of the city is an eight-point star made of two intersecting quadrangles set within a circle (Figure 7.44). Palmanova, planned possibly by Vicenzo Scamozzi, a sixteenth-century Italian theorist, was built in 1593 to defend the frontiers of Venetian territory (Figure 7.45). It too followed Renaissance radial symmetry, being influenced strongly by the writings of Vitruvius and his follower Alberti: it played

Figure 7.42 Rothenburg

Figure 7.43 Rothenburg



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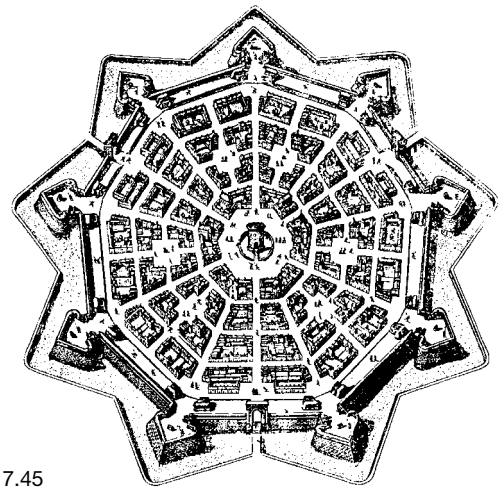

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Figure 7.44 Sforzinda
Figure 7.45 Palmanova

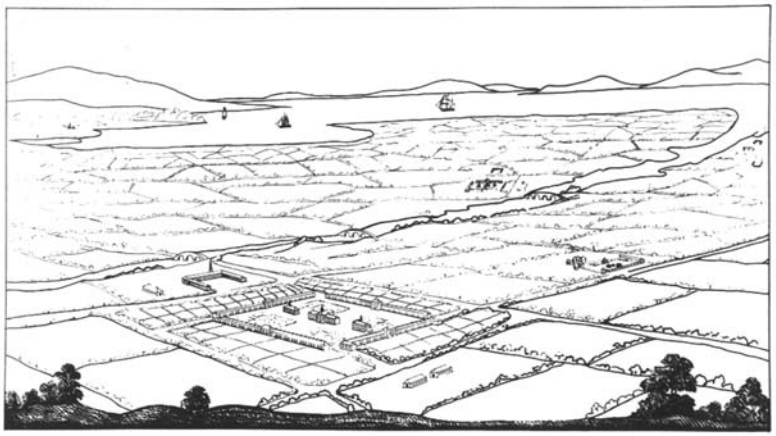

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Figure 7.46 Owen's village of cooperation (Houghton-Evans, 1975)

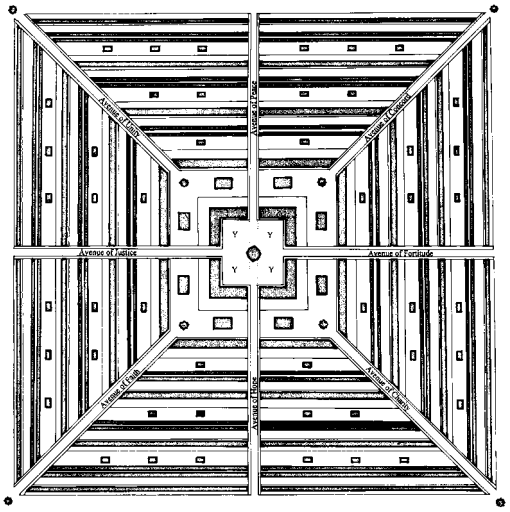

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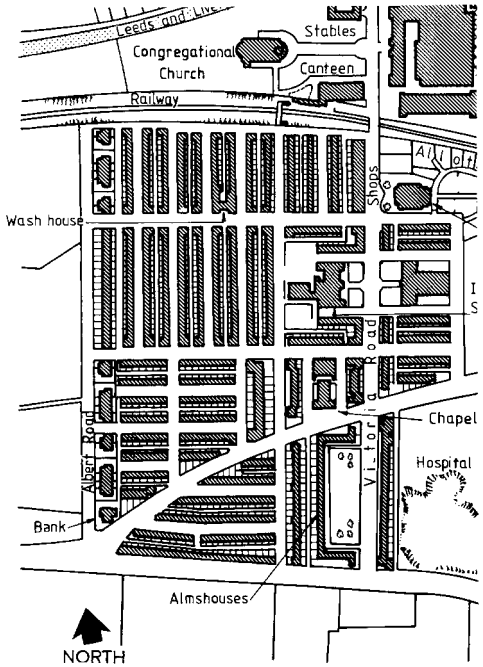
Figure 7.47 Victoria

an influential role in the general quest for the perfect form (Rosenau, 1974). In Britain, the work of Owen, though employing a rectangular plan for his villages such as New Lanark, envisaged the development of centralized and enclosed settlements: these villages of industrial cooperation, though discrete in themselves, were planned as a regional planning solution to the social and economic problems of the early nineteenth century (Figure 7.46). Victoria, the model town of James Silk Buckingham, which appeared in his book, *National Evils and Practical Remedies*, was also a centralized concept. The town comprised squares of terraced houses and gardens alternating with squares of other land uses, taking a form similar to the nesting boxes of South-east Asian cities. The best houses were to be near the centre, while at the boundary of the town it was planned to locate a covered arcade for workshops. Outside the town were to be located the large factories, abattoirs, cattle market, public cemetery and hospital. Also outside the town were to be large sites reserved for suburban villas (Figure 7.47).

Titus Salt put into effect many of the theoretical ideas of earlier reformers such as Buckingham and Owen. He built a small town, Saltaire, four miles from Bradford in Yorkshire, for 5000 people to house the workforce for his mill (Figure 7.48). The building of Saltaire has been discussed in detail elsewhere in this series on urban design (Moughtin, 2003). For the purpose of this book on sustainable development, however, a number of ideas are important. Saltaire was planned as a centralized, self-contained town: it was located on the banks of the River Aire, the Leeds–Liverpool canal and on the main railway line connecting Scotland to the Midlands. At the time, these were the important means of mass transport for goods and/or people. The town itself was built at quite high densities, having 37 houses to the acre (80 approximately to the hectare). It occupied an area about 1 kilometre square, so that all parts of the town were reached easily on foot. The town is built in the form of a grid plan with one main street on which were located the community facilities, the church, school, shops, municipal hall and factory. In addition, and although



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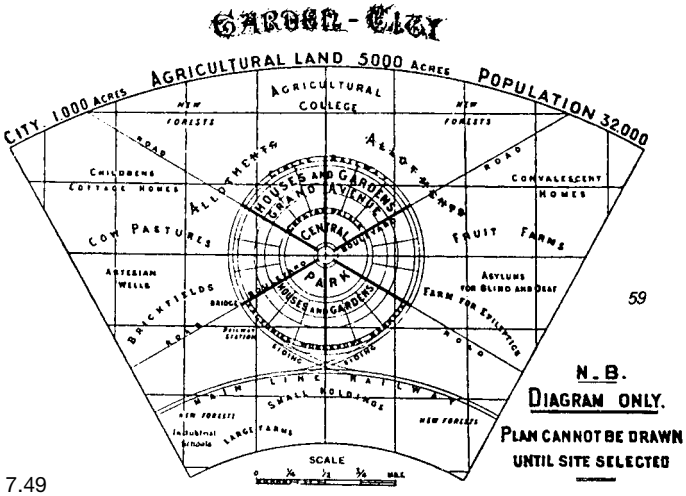

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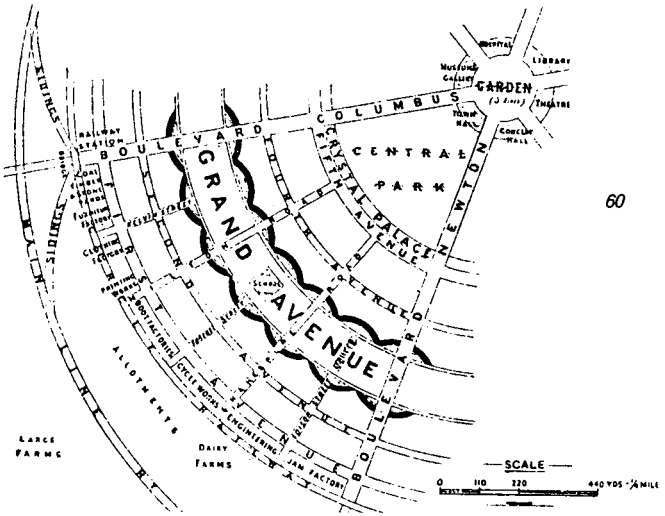
Figure 7.48 Saltaire
Figure 7.49 Garden City (Howard, 1965)
Figure 7.50 Garden City (Howard, 1965)

surrounded at the time by countryside, the town had its own public garden and allotments. Saltaire, despite being built in the form of a rigid grid, falls neatly into the category of the highly centralized inward-looking urban structure: it also exhibits many features expected from a sustainable settlement.

Howard's 'Garden City' is very much in the mould of the centralized city. At the core of this ideal city are the public buildings set in a central park (Figures 7.49 to 7.51). Encircling this park is the 'Crystal Palace', a glazed shopping arcade. Then follow residential rings, the fifth such ring being for higher socio-economic groups and comprising: '... very excellently built houses,



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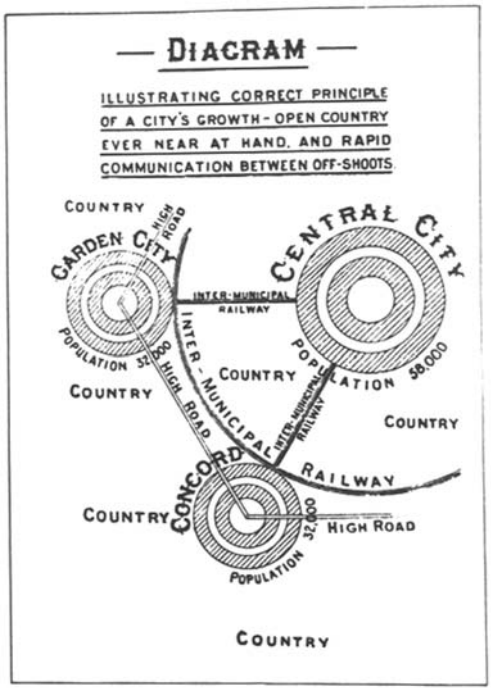


Figure 7.51 Garden City (Howard, 1965)

each standing in its own ample grounds'. Third Avenue, called Grand Avenue, interrupts the rings of housing: it is a linear park which completely encircles the town and contains the schools. Between First Avenue, which is the outermost ring of housing, and the circular railway are the town factories. The town sits in a large tract of agricultural land owned by the municipality, being kept free of urban development by the self-interest of the city population.

Garden Cities of Tomorrow, first published in 1898 by Howard, contains a wealth of ideas for urban development, many of which have been incorporated in new town developments in Britain and elsewhere in the world (Howard, 1965). Some of these ideas of Howard may prove useful to those seeking structures for sustainable urban form. For example, the notion that the town should be maintained at a size which facilitates pedestrian movements is central to the aim of reducing the use of non-renewable energy. Howard was quite clear that his blueprint for the garden city was a set of diagrams and not a town plan; nevertheless, in those diagrams he showed the distance between the railway station and the town centre to be about 1 kilometre or a 10-minute walk, the time taken to cross from one side of the town to the other being about a 20- to 30-minute walk. Furthermore, connections between towns for both people and goods are by rail, the rapid transport of his day. Both of these qualities of Howard's urban structure are fundamental requirements of sustainable development.

Howard's blueprint for the 'Garden City' reduces the need for movement in a number of ways. Schools are located at the nucleus of residential wards. Each ward was large enough to be a complete segment of the town, that is, containing a cross-section of its population. In embryo, this is the idea of the self-contained neighbourhood or quarter, self-sufficient in daily needs. In size the segment is based upon the convenient walking distance from home to school of about 500 metres. While it is possible to dispute the length of a 'convenient walking distance', nevertheless the general principle should be paramount for any form of civilized planning, but most especially for sustainable development where the aim is to reduce to a minimum the need for movement. In addition, Howard's proposals reduce the need for the movement of agricultural produce. The city, being surrounded by agricultural land, is capable of sustaining many of the needs of the town in terms of food supply and in turn

absorbing some of the waste products of the town.

Howard, following on from Owen, planned to site workplaces on the outskirts of the settlement. Instead of the town being considered a single productive unit such as Owen's or Salt's mill town, the 'Garden City' was designed as an industrial town with many firms grouped in an industrial zone. This concept permeated planning practice in many countries during the twentieth century. In some cases this practice of zoning has been used with disastrous results. Large industrial and commercial zones in cities have died by night, while desolate single-use housing areas of social deprivation have blighted whole sections of the city. The problems associated with rigid zoning have led to suggestions for a return to a mix of land uses in towns. It is argued that a policy of mixed land use, if implemented, would lead to an urban structure in which the need for many to travel from home to work, for example, would be reduced. There may be much to commend this relaxed attitude to zoning, but large-scale industrial or productive units depending on bulk deliveries may still require locations with close proximity to intercity or regional transport networks, be they road, rail or waterway.

The core of Howard's financial proposals was the acquisition of land, on behalf of the municipality, at agricultural prices. The ownership of the land was to be vested in the municipality and 'betterment' in the value of the land caused by the development of urban infrastructure was to accrue to the community. The local community would therefore, have control of land in the green belt and could determine the nature and extent of urban growth. Using the increased value of the land the financial scheme was designed to meet interest charges on the original debt and to clear that debt in thirty years. The financial plans included the idea of a combination of municipal and private finance. Public buildings, roads and infrastructure were to be financed by the municipality, all other development being undertaken by private enterprise.

A key to sustainable development is the ownership and therefore control of land for the benefit of the community and its long-term survival. The eighteenth-century land owners in London, using leasehold control, developed some fine residential property. In Bath, the Woods, father and son, through their clever control and manipulation of the development process, have left to the nation one of the great works of civic design. Howard extended this system of land banking to develop a whole town. In this case, however, the process was to be used not for the benefit of a single landowner or developer but for the benefit of the whole municipal community. In the USA during the 1960s similar experiments of town building were carried out by private enterprise. Companies, in great secret, tried to amass land for town development at deflated prices. Where insufficient land for the full development was not acquired in the initial stages of the project, as in Reston, USA, the benefits from the original investment in infrastructure accrue to neighbouring landowners through unearned betterment in the value of their land (Figures 7.52 and 7.53).

In the second half of the twentieth century, attempts in Britain were made – without great success – to nationalize land or control betterment. It may, however, be time once again to consider some form of public ownership and control of land to sustain the present and future needs of local

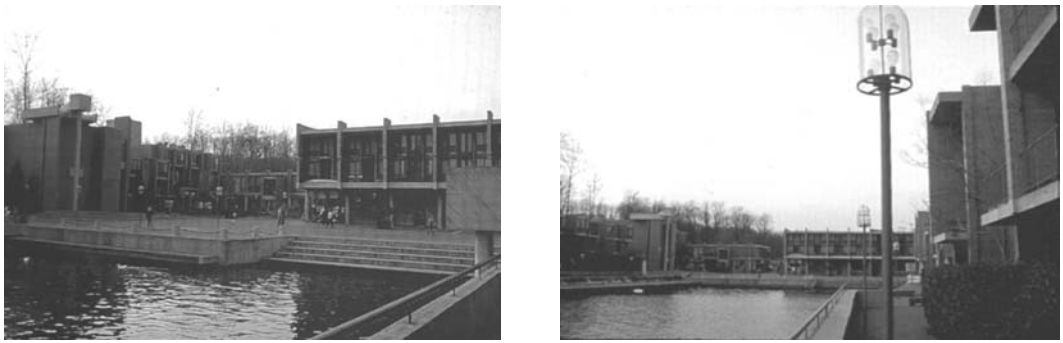
Figure 7.52 Reston, USA

communities. If so, then a system based on the local control of land in the Howard tradition may prove more successful than the rigid nationalization of land itself or even of a national system for taxing betterment values.

Many of Howard's ideas were put into practice at Letchworth and Welwyn. Later, those ideas were to influence the planning of the first group of new towns built in Britain after the Second World War. Basically Howard's concept for the garden city was a means of controlling the growth of cities through the building of a series of new towns physically separated from each other and from the parent city. The garden cities were to be self-contained for many needs. Nevertheless, Howard considered the urban areas so formed to be integrated socially and economically: the towns while physically separate were to be connected by an efficient transport network. Despite the social and economic integration the garden cities were physically separate, centralized and inward looking in their urban structure.

In 1945, the Reith Committee was appointed to: '... consider the general questions of the establishment, development, organization and administration that will arise in the promotion of New Towns in furtherance of a policy of planned decentralization from congested areas; and in accordance therewith to suggest guiding principles on which such Towns should be established and developed as self-contained and balanced communities for work and living'. Purchase of the land for the New Towns was to be by public authorities. The population of each town was initially to be 30 000 to 50 000, closely approximating Howard's own suggestions. Each Town was to be surrounded by a green

Figure 7.53 Reston, USA



belt which was to be used for agriculture and smallholdings for the production of food for the local market. The brief developed for the New Towns was comprehensive and detailed. It included recommendations for a balance of income groups in the town, a mixture of those groups in each neighbourhood and a broad base of industries.

Cumbernauld, Scotland, was one of the later of these British new towns which, by its form, most closely expresses the concept of the centralized urban structure (Wilson, 1958). The planners of Cumbernauld were concerned to correct the deficiencies, as they saw it, of the neighbourhood concept. The planned neighbourhood was thought to encourage people to look inward on their local area rather than visualizing the town as a whole. The neighbourhood also, so the argument ran, attempted to regulate social life into a fixed pattern of local communities. A compact town clustered round a single centre was proposed as the solution to these problems associated with neighbourhood planning (Figures 7.54–7.56). The town of Cumbernauld was conceived as a hilltop settlement standing in the landscape with the clear profile of Italian cities like Montepulciano or San Gimignano. For such a hilltop town both the grid-iron and linear forms of road pattern were considered to be inappropriate. A radial pattern was therefore proposed which had two ring roads, an inner one around the centre and an outer loop that gave access to the Radburn-style housing areas.

An unusual feature of Cumbernauld is the elongated multilevel centre which sits along the ridge of the hilltop and around which the rest of the town sits uncomfortably. Pedestrians and vehicular traffic are arranged on different levels. The town centre is windswept, without the architectural character or sunny climate of those wonderful Italian hilltop towns on which Cumbernauld was modelled. The centre is

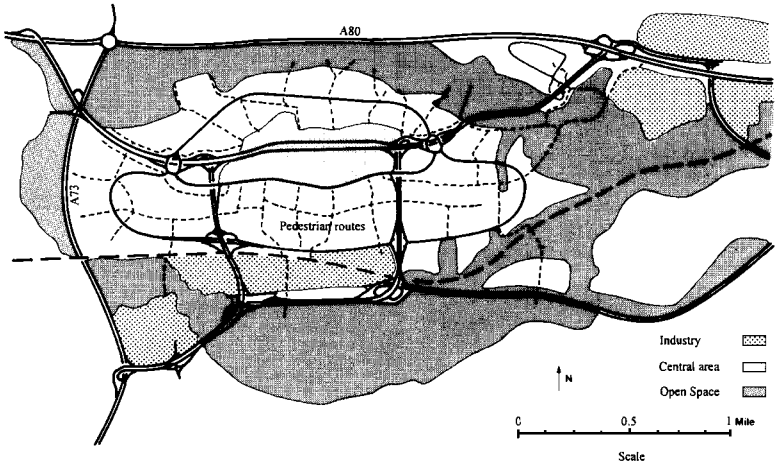
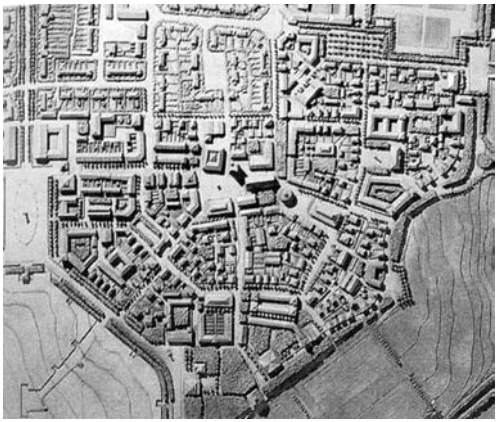


Figure 7.54 Cumbernauld (Houghton-Evans, 1975)

Figure 7.55 Cumbernauld, town centre

Figure 7.56 Cumbernauld, town centre



7.57a

7.57b

7.57c

Figure 7.57 (a) Poundbury Dorchester, Dorset (Architectural Design, 1993) (b) and (c) Poundbury, Dorchester, Dorset. Typical street scenes

three-quarters of a mile from all housing areas and within easy walking distance from them. Hilltop Cumbernauld, with its tight centralized plan form, has some features one would expect to find in a sustainable settlement. The centralized urban form appears to be a most useful model for new sustainable town developments of limited extent. The size of the development from centre to periphery should be about half a mile to 1000 metres. In a town of this size it is a 10-minute walk from the periphery to the centre. An appropriate form, however, for sustainable development is one that expresses the organic metaphor, applying the principles of visual composition found in many of the delightful European medieval towns – a quality not in great evidence in Cumbernauld. Leon Krier interpreted these ideas of organic layout and has used them as a basis for his master plan for Poundbury, Dorchester in Dorset. Demitri Porphyrios and Associates have also followed similar principles in deriving their master plan for Cavo Salomonti in Crete (Figures 7.57 and 7.58). The plan for Cavo Salomonti: '... draws on the experience of traditional towns which enhance rather than spoil the landscape.... The traditional urban fabric ... allows for buildings of two and three storeys with small gardens and courts that are closed off from the adjoining streets by two metre walls. The basic elements of the design have been the urban block, the street, the square and the public buildings' (*Architectural Design*, 1993).

A more complicated centralized city is the star shape (Figure 7.59). Blumenfeld, in his paper 'Theory of City Form: Past and Present', has a thorough description of this model of city form (Blumenfeld, 1949). The star shape has been the basis for a number of

Figure 7.58 Cavo Salomonti, Crete (Architectural Design, 1993)

city plans, sometimes very successful, as in Copenhagen, the classic realization of this idea (Figure 7.60). According to the advocates of this theoretical approach to urban planning, the star is the best form for any city of moderate to large size. The star city has a single dominant centre which should be high density and comprise a mix of land uses. From this centre a number of major transport routes radiate. Along these main radial routes would run the mass transit systems and the major highways. At intervals along the transport corridors would be located sub-centres, around which would cluster other intensive foci of activities, and to which residential quarters would gravitate. Green wedges originating in the open countryside penetrate the urban areas between the transport corridors.

There are concentric traffic routes at intervals along the diameter of the star. These concentric rings link the fingers or radials. The main sub-centres are located where the radials and concentric rings intersect. Along the length of the concentric rings, development is not permitted to interrupt the green wedge. This last requirement may be a weakness of the star theory, for it is at these points that a strong market pressure on the land develops. Unless the planning control mechanism is particularly effective, the pressure on the frontage of the ring routes results in infill of the areas between the radials close to the centre of the star. The further the concentric rings are from the centre of the star, the more important they become in connecting the distant radials. As the system expands, the outer reaches of the star – in a free land market – revert

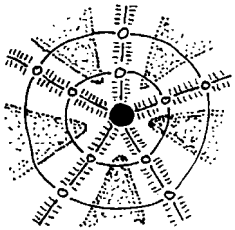


Figure 7.59 Star-shaped city (Blumenfield, 1949)

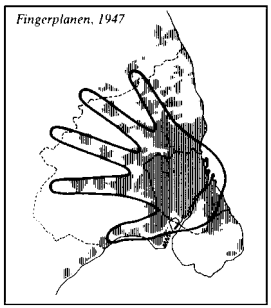


Figure 7.60 Copenhagen, The Finger Plan (Svensson, 1981)

to an open network of roads (Lynch, 1981). The designation of some of the concentric rings as a rapid public transit link following the ideas of Soria y Mata converts the star into a form which may be useful in attempting to solve, in a more sustainable way, the movement of people in existing large urban areas.

LANDSCAPE: THE DOMINANT STRUCTURING ELEMENT

A further model for urban structuring which is difficult to classify is based on the notion that landscape should be the chief consideration. It can be argued that, at one level, consideration of landscape form should influence all development. The location of Cumbernauld, for example, is determined to some extent by the topography, the town structure being used to strengthen and reinforce the form of the ridge on which the town centre sits. The star pattern for city development places as much importance on the landscape as it does on transportation; the green wedges which alternate with the corridors or fingers of development have equal priority in forming the shape of the city. This argument, however, misses the point that landscaping can be used as the factor which unifies the whole urban form: it then becomes the dominant element in the urban composition. The role of landscape as the unifying element in the siting of building groups has been discussed elsewhere (Moughtin, 2003). This notion can be developed further so that landscape is elevated to the position of the predominant factor in the generation of urban form.

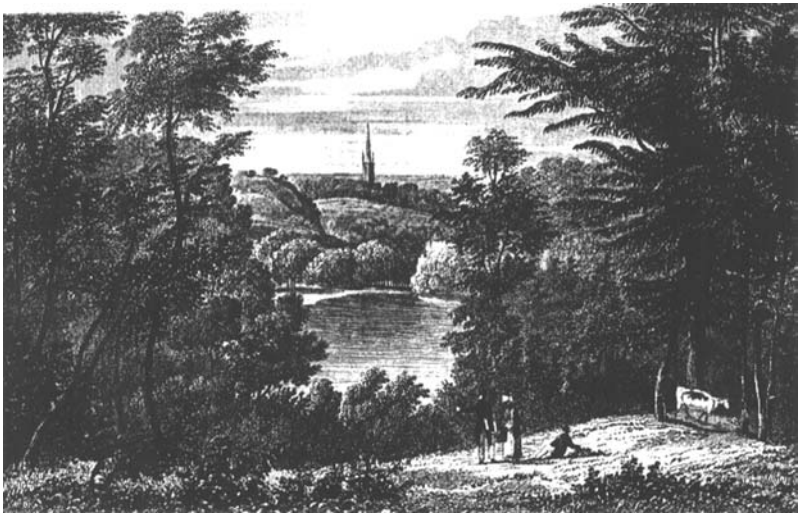


Figure 7.61 Landscape by Capability Brown (Stroud, 1950)

Respect for the landscape is deep-rooted in the British psyche. Amongst this country's greatest achievements are the landscape gardens of the eighteenth century, the high point of this achievement being the work of Capability Brown (Stroud, 1950) (Figure 7.61). The development of Howard's garden city ideas at Letchworth and Welwyn introduced the idea of landscaping as a feature unifying large areas of a town. In other countries, the landscaping of suburbia has proved highly successful. This is particularly true of the USA, where the freshness and boldness of suburbs such as Olmstead's Riverside near Chicago and Roland Park, Baltimore set new standards for landscaped residential areas. It was, however, Unwin with his pamphlet 'Nothing to be Gained by Overcrowding' who first analysed the effects of housing density and related it to development costs (Unwin, 1967). It was this analysis which was the intellectual rationale for the garden suburb: 'Unwin . . . showed that by cutting down on the number of needless streets and devoting the areas so dedicated to internal gardens, he could provide almost the same number of houses, each with more usable garden land,

and with more gracious surroundings, at the same price' (Mumford, 1961). Unwin and Parker, with their designs for Hampstead Garden Suburb (Unwin, 1909), set the pattern for most public housing in Britain until the Second World War; it was this pattern which was probably the ideal for most suburban dwellers throughout the last century. It is probably true to say that most housing development in British cities owes more to Unwin and Parker than to Le Corbusier and the pioneers of modern design. The 'leafy suburb' with its avenues of detached and semi-detached homes set in their own private gardens, is still the type of environment to which most families in Britain aspire. Most of the existing suburbs that surround our cities will still form the bulk of urban Britain when environmental constraints begin to take effect on urban lifestyles. It is therefore the existing suburb in Britain that has to be made more sustainable and where most design skills should be concentrated.

Harlow, designed by Frederick Gibberd, is the British new town which resembles most closely an urban structure where landscape is the dominant factor in determining its form. The plan for Harlow was published in 1947, and construction began in 1949. The master plan was designed originally for 60 000 people, but this was later increased, first to 80 000 and then to 90 000. The town was planned to be self-contained and balanced (Gibberd, 1955). Its primary purpose was to take overspill population from north-east London. Harlow is located 30 miles from London, just south of the River Stort and west of the old village of Harlow. It is in a rural landscape and occupies over 6000 acres. The urban form of the settlement follows a strictly hierarchical structure; for example, shopping is arranged in a series starting from the lowest level of shopping, the corner shop, extending through the intermediate levels of shopping, the neighbourhood and the district shopping centres, to the highest level in the hierarchy, town centre shopping. Roads and housing follow similar hierarchical structures.

The dominance of landscape as a form determinant is best appreciated from Gibberd's own words: 'The main railway and river run in a valley along the north boundary, beyond which are the Hertfordshire hills. There is another valley running east–west across the site, and this flows out on the west side to link up with the main valley on the north.... The plan form has been evolved from the existing landscape pattern, and from the desire to obtain sharp contrast between urban and natural areas. ...The housing groups are on the high ground, clear of the main traffic connections, with natural features, such as woods and valleys, forming barriers between them.... The valleys and hills on the north of the river are left in their natural state, and a park is projected from them into the heart of the town. The agricultural land on the east of the town, and that on the west, are both projected into the area to bring rural life into immediate contact with the urban one. The two wedges are linked up by the central valley which is left in its natural state. Links to the countryside, on both north and south, are formed by green wedges designed to embrace natural features, such as valleys, woods and brooks' (Gibberd, 1955). It is clear from Gibberd's description of Harlow that his major preoccupation was to design a development in harmony with the existing landscape structure (Figures 7.62–7.64). The city centre may not be the most exciting place in the world, but the landscape scheme is expansive.

Figure 7.62 Harlow

Figures 7.63 Harlow

Figures 7.64 Harlow

Implementing policies for sustainable development does not simply mean the sensitive location of urban development in relation to landscape features such as hills, valleys, streams and woodland. Of equal importance is respect for the ecological function of the landscape. Even a cursory reading of material by landscape architects such as Colvin (1948) shows that an understanding and an appreciation of ecology is central to the discipline of landscape architecture. Apart from the advocacy of an organic approach to design by some professionals in the field of city planning and urban design the main actors dealing with urban development have often been reticent in adopting ecology as a fundamental concern for development strategies, stressing the ornamental function of landscape.

There is, however, a growing concern with biodiversity, the conservation of natural landscapes and development of local indigenous plant regimes (see Chapter 5). For example, Leicester – the first Environment City in Britain – adopted an innovative approach to landscape planning for the city. Leicester was one of the first district councils to adopt a city-wide ecology strategy based on a detailed habitat survey. The Leicester Ecology Strategy aims to develop a network of greenways and natural habitats. The strategy considers the full range of open space in the city including: formal open space; private gardens; agricultural land; land left to nature such as woodlands and wetlands; the natural network of canals, rivers, hedgerows, ditches, road verges and railway lines; and finally the land outside the city. The size and continuity of habitats are important factors in maintaining the ecological value of a city's landscape provisions. Establishing a green network is therefore important to secure biodiversity and a sustainable local ecology. According to the ecological strategy devised by Leicester: 'Protecting areas of highest ecological value should be seen as the minimum requirement for conserving nature

in Leicester. Whilst other open land may presently be of lesser ecological value, it does nevertheless provide habitats for wild plants and animals and contributes to the quality of the City environment. It is the aim of the Ecology Strategy to encourage a greater abundance and diversity of wildlife and provide more opportunities to enjoy and benefit from natural landscapes. This will involve the protection of a network of open spaces and linear habitats. In order to achieve the aims of the Ecology Strategy the Council has devised a set of policy statements. For example, 'The City Council will define, and take appropriate steps to protect, a ''green network'' of wedges and other vegetated areas and features, so as to conserve an integrated system of wildlife habitats and will resist development on these sites' (Leicester City Council, 1989). This is a pattern being followed by other British and European cities and such landscape strategies could form a basic element in the structure of the sustainable city of the twenty-first century. Norway's environmental cities have a similar attitude to city landscape as Leicester in their approach to sustainable development, an account of which can be found in *Urban Design: Method and Techniques* (Moughtin *et al*., 2003a, pages 130 to 139).

CONCLUSION

This chapter has explored the three main archetypal urban forms. Each main form – the linear city, the grid-iron plan, and the highly centralized or inward-looking city – may have a role to play in achieving sustainable development. Very much will depend on the circumstances in which each form is used. A public transport strategy and an ecological strategy are probably the two most important factors in determining urban form. Broadly speaking, there are two main approaches to sustainable urban development: both have much in common and a high degree of overlap. The first places great emphasis upon planning for a public transport system and derives from the 'new urbanist movement'. The second, the eco-city movement, places greater weight upon the support services of the environment. Mumford and McHarg were writing about the ecological relationship of man and environment, respectively, in the 1930s and 1960s, but it is probably *Ecotopia, A Novel about Ecology, people and Politics*, first published in 1978, which is the Utopian foundation for this movement (Callenbach, 1978). Paradoxically, both of these approaches to the planning of sustainable human settlements have their origins in the USA, the country that some would describe as the engine of global pollution and unsustainable growth. It was Roelofs (1996), again from the USA who put flesh on the bones of Callenbach's Green City.

In Britain, The Urban Task Force under the Chairmanship of Lord Rogers of Riverside gave clarity of form to the idea of the compact city planned around a public transport system. *Towards an Urban Renaissance* summarizes very clearly and elegantly this way of thinking about sustainable urban design (Urban Task Force, 1999). According to the Urban Task Force, the sustainable city – or more correctly, a city that approximates to a sustainable form – is a compact and flexible structure in which the parts are connected to each other and to the whole, with a clearly articulated public space. The public realm connects the different quarters to each other across the city, while also linking individual homes to

workplaces, schools, social institutions and places of recreation. Figure 1.1 shows, in diagrammatic form, a possible structure for such a compact city, and Figure 1.2 illustrates the linkages for the structure. The Urban Task Force describes the compact city in this way: 'Urban areas are organised in concentric bands of density, with higher densities around public transport nodes, (rail, bus and underground stations) and lower densities in less connected areas. The effect of this compact layout is to establish a clear urban boundary, contain urban sprawl and reduce car use' (Urban Task Force, 1999).

In the Report of the Urban Task Force (1999) it is suggested that sustainable urban forms, which support a viable public transport system, may require higher densities than the twenty to thirty dwellings per hectare now widely used in suburban developments in this country: developments where densities are in the region of between 70 and 100 dwellings per hectare, it is argued, use significantly less land and consequently reduce the distances between home and local centre with its transport hub. For example, a neighbourhood of about 7500 people could be housed at densities of about 70 dwellings per hectare on a plot of land where the furthest distance from the centre is just over 500 metres – a reasonable walking distance for a mother and infant. The population would support a viable core of activities at its centre (Figure 1.2). Grouping such neighbourhoods, as shown also in Figure 1.2, would support a larger and more vibrant range of social facilities and warrant a more extensive bus service.

The other main strand of thought that informs the debate about sustainable development gives primacy to the natural environment. Work in Australia on *Permaculture* by Mollinson (1996), Birkland (2002) on *Design for Sustainability*, and Brunkhorst (2000) on *Bioregional Planning*, is beginning to give form and rigour to these ideas. The bio-city is deeply embedded within regional ecosystems that nurture human settlement and with which human beings have a symbiotic relationship. The regional landscape in the bio-city has primacy, for it is the natural environment which sustains human settlement. The bio-city – like the compact city – would be served mainly by public transport, but densities would be lower. The lower densities would mean that gardens and allotments penetrate to the centre of the city where every wall and roof, in addition to much of the ground plane, would be a garden and a potential source of food. Vibrant neighbourhood centres and a viable public transport service is possible at lower densities than suggested by those advocating the compact city, if slightly longer walking distances to the centre become acceptable. Neighbourhood populations that are able to support central services can be achieved by applying densities more in tune with British cultural preferences if walking distances are increased from 500 metres to between 800 and 1000 metres (see Figures 7.36–7.38). Environmentally friendly mobility aids, such as the electric buggy for the aged and infirm are now common, and even the design of a form of electric pram is not beyond the 'wit of man' (Figure 7.65). It is true that the lower densities would increase the amount of land used for urban development, but lower densities are better able to provide each home with a garden, the possibility of a home grown food supply, and the space to deal with organic waste (see Figure 6.49).

The star-shaped plan – a derivative of the centralized and linear plan forms – may have

advantages for the bio-city of moderate size. In this urban form, fingers of development radiate from a dominant centre along public transport corridors. Alternating with these corridors of development would be wedges of open landscape linking the centre with the open countryside. The British planning obsession with a neat hard edge between town and country may have to be reviewed. The junction between village and countryside is the fleshy edge that Alexander writes about: the backs of village properties slowly merge into the countryside with a useful zone of outhouses, sheds, crumbling walls, fences, mounds of old tyres, vegetable plots, nettles and orchards. Within the village itself is the neat green, the duck pond and war memorial: this is the public face of the village, the equivalent of the parlour in the home where visitors are received. This realistic view of a messy edge between town and country may be more appropriate to the bio-city and sustainable development than the manicured green belt which protects property values and the views of the fortunate few who are located at the edge of town.

Most of the urban architecture that exists in the cities of today will be here for at least a further sixty years. Many parts of the cities will probably last for much longer, particularly if emphasis is placed on conservation, as sustainable development theory would suggest. Clearly, it appears that a priority for the immediate future is making existing cities more sustainable – that is, discovering ways in which the great suburban belts of development which encircle Western cities can be made less energy-intensive in terms of mobility, while maintaining a good quality of life for those living there. This aspect of city design will form the theme for the last chapter in this book. It will explore some ideas for making existing cities more sustainable. The next two chapters will examine two other aspects of urban form, the design of the district or neighbourhood and the street block. Both subjects are necessary for an understanding of the scope of sustainable urban design and for determining an immediate practical response to the problems of our – at present – unsustainable cities.

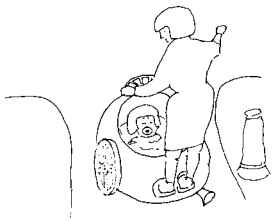


Figure 7.65 The 'motorised perambulator'

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THE CITY QUARTER

8

INTRODUCTION

Fundamental to sustainable development is active public participation in decisions which affect the environment. Popular involvement in the planning and management of the environment is most effective at the local level of the quarter, district or neighbourhood. It is at this scale of planning where the local resident has most knowledge and expertise (Moughtin, 2003). The resident of the neighbourhood has first-hand experience of problems faced by the family, friends and neighbours. There is, therefore, a need to support, develop and institutionalize this local participation by creating formal political structures which empower the citizen. The development of local political structures having the power to influence decisions which affect the local environment is the route to fulfilling the ideals of sustainability. This chapter seeks to explore the forms that the city quarter may take to fulfil this political role in the sustainable city.

It has been suggested that the city quarter is the main component of urban design (Gosling and Maitland, 1984). It has also been argued that clearly defined city quarters about 1.5 kilometres (1 mile) across will be a major preoccupation of urban designers in the coming decades (Moughtin, 2003). The scale of development in the twentieth century, but particularly after the Second World War, increased significantly both in the public and private sectors. It is now possible to consider the city quarter as a single design problem undertaken by one developer or group of collaborating developers working with a single design team. Urban Development Corporations involved with inner city regeneration are involved with major components of the city such as the Isle of Dogs in London or the once-great docks of Liverpool. While there seems broad agreement that the quarter is a legitimate subject for study by the urban designer, there is some doubt about its size and nature. This chapter will therefore, explore the historical origins of the quarter, some reasons given for structuring the city in quarters, the various definitions of the quarter, particularly in terms of its size and its structure, and finally the chapter will end with examples of city quarters

developed or planned mainly in the last century and an analysis of the qualities required of a quarter in a sustainable city.

THE QUARTER IN HISTORY

The Roman city was divided into four quarters by its two main streets, the cardo and decumanus, which crossed at right-angles. Evidence of this quartering of the city is to be seen in many cities of Roman foundation, such as Lucca, which are still important urban centres today (see Figure 6.33). Alberti refers to many ancient authorities, including Plutarch and Solon, to whom he attributes the notion of dividing the city into areas for different groups. For example, according to Alberti: 'Curtius writes that Babylon was divided into a number of separate quarters . . .' and 'Romulus separated knights and patricians from plebeians; and Numa divided the plebeians according to their respective employments' (Alberti, republished 1955, Book 4, Ch 5 and Book 4, Ch 1). Alberti also quotes Plato as proposing the division of the city into 12 parts: '. . . allotting to each its particular temples and chapels' (Alberti, republished 1955, Book 7, Ch 1).

The classical tradition which divides the city into quarters was probably based upon the observation of the natural or unplanned cities of the Ancient World. Cities which appear to develop without the conscious intervention of man are organized into clearly defined neighbourhoods or quarters. The traditional cities of the Hausa people of Nigeria, for example, are still organized in wards (Moughtin, 1985). Each ward is associated with one of the great medieval gateways and is occupied by a group which practises a common trade. Other wards outside the walls of the old cities of the Hausa are occupied by other ethnic or tribal groups. Closer to home, cities in Britain still have a jewellery quarter or lace market. In Nottingham, like other British cities, there are areas which are named, have clear boundaries and to which people belong. In Nottingham, The Lacemarket, Lenton, Basford, Forest Fields, the Park and others are quarters or neighbourhoods to which people relate either as residents or outsiders. Even to the outsider, these areas are major structuring elements by which the city is understood. Such patterns of quarters, districts or neighbourhoods are common to most if not all cities and are the basis of perceptive structuring which renders the city intelligible to its citizens (Lynch, 1960).

The city in the pre-motor car age developed naturally in the form of a cluster of quarters. The quarter as a major structuring element of the city is not so characteristic of the modern motorized city: 'The motor car, indeed, not only promotes the dissolution of the city: it virtually demands it. It demands space, and its use is facilitated by dispersal. A city designed for its uninhibited use would be spacious indeed' (Houghton-Evans, 1975). The city encircled by suburbia is now the common urban form of the developed world. Furthermore, there is widening physical separation of socio-economic groups in the modern city, a process which tends to accelerate with increasing affluence. This separation of different interest groups, though present in the pre-industrial city, was never as endemic as it would now appear to be in the present-day city. When socio-economic pressures stimulate, as they are now doing, this dispersed pattern of development, there is: '. . . the tendency

to seek simplified design structures, which is often abetted by development convenience' (Gosling and Maitland, 1984). The result of these tendencies is a coarse-grained city where: '... extensive areas of one thing are separated from extensive areas of another thing' (Lynch, 1981). The motives, however, which produce a coarse-grained city with extensive areas of single land uses, unsafe centres that die at night – such as Skelmersdale new town centre in Lancashire – and large socially homogeneous housing estates, are powerful. These powerful motives include the preference for living near similar people with similar interests, and the grouping of commercial activities which maximize the locational advantages of a dispersed network of roads. Constraints imposed on the poor by their unequal access to the housing market exacerbate the situation. The forces which are inhibiting the structuring of cities to form fine-grained quarters are real and powerful. Since this is certainly the case, why should the city designer be seeking an alternative city of the future built on an outdated idea from the distant past? More importantly, even if an alternative to the present situation is desirable, is such an alternative future for the city anything other than a utopian dream?

The movement towards sustainable development, environmental protection and the reduction of pollution engenders a new perspective for the city planning professions. The reorientation of planning and design priorities will inevitably lead to a reshaping of the city which, of necessity, will be dependent upon energy-efficient means of transport. While the car-orientated city demands space and the use of personalized vehicles is facilitated by dispersal, the efficiency of public transport supported by walking and cycling is promoted by concentration: 'Just as we have seen that the automobile and the bus pull the town in contrary directions so do they require totally different primary networks' (Houghton-Evans, 1975). The bus – in the same way as any other form of public transport – requires for its efficient and economic running a city where a large pool of prospective passengers live within easy walking distance of the routes: the car is more effective in a city which is dispersed with a widely spaced network of major roads. The sustainable city will give priority to the mixed street rather than the motorway and travelling through a centre rather than bypassing it. The thought process for the design of the sustainable city is the antithesis of that for the now defunct procedures used to facilitate the car. The new design paradigm requires a return to first principles and an examination of features of the traditional city which may, in an adapted form, be useful for greening the city. The quarter is one such component of the traditional city which deserves closer study.

THE QUARTER: DEFINITION AND SIZE

The quarter, district and neighbourhood are terms with different meanings for different authors. In some cases the terms have been used interchangeably. Jacobs classifies neighbourhoods into three broad types: 'Looking at city neighbourhoods as organs of self-government, I can see evidence that only three kinds of neighbourhoods are useful: (1) the city as a whole; (2) Street Neighbourhoods; and (3) districts of large, sub-city size, composed of one hundred

thousand people and more in the case of the largest cities' (Jacobs, 1965). Furthermore, Jacobs identifies the causes of the failure of neighbourhood planning as ultimately failures of localized self-government. Lynch also recognizes the importance of a political function for the neighbourhood or district: his size for the political unit is considerably smaller than the hundred thousand suggested by Jacobs: 'It is in governmental units of 20 000 to 40 000 people that ordinary citizens can be active in politics if they wish, feel connected to an identifiable political community, and sense some control over public affairs . . . ' (Lynch, 1981). In Chapter 4 it was suggested that the local government of the regions should be strengthened, but it is also necessary to strengthen small self-governing towns and districts within the urban region, so dissolving the scale of the big city into a finer political grain, and giving legitimacy to active public participation, in decisions about environmental quality.

The arguments about the size of the district, quarter, and neighbourhood like those about the region are inconclusive. We have seen, in Chapter 4, that Plato suggested a figure of 5040 householders or citizens as the population necessary for political decision-making (Plato, republished 1975). Aristotle was more circumspect. He was concerned that a political unit should be big enough for its citizens to be able to live a full life, but not so big that citizens lose personal touch with each other. For Aristotle, face-to-face contact was important so that questions of justice could be decided with the full knowledge of those involved, and so that offices could be distributed according to merit (Aristotle, republished 1981). The models for both Plato and Aristotle were Athens with 40 000 citizens, and the other Greek cities having 10 000 citizens or less. If figures of this magnitude are thought desirable for the lowest level of government and also for the size of the quarter or district, then the physical dimensions of the districts at Harlow designed by Gibberd, give an approximation of this component of the sustainable city of the future. The districts in Harlow comprise four neighbourhoods of between 4000 and 7000 people, so that the districts were approximately 18 000 to 22 000 people. There is probably no ideal size for the quarter or district, particularly in existing cities. It is important that the district or coalitions of districts can act as a check to the power of the city. The other chief function is the development of city structures which enable citizens to participate fully in both the administration of some city services and in decisions about the future of the city. As Alberti quite rightly stressed: '. . . the city itself ought to be laid out differently for a tyrant, from what they are for those who enjoy and protect government as if it were a magistery voluntarily put into their hands' (Alberti, republished 1955). If Alberti's statement is accepted, then it follows that the city structure for a more participatory democracy will probably be different from one structured for representative democracy which stresses centralized power in the state and in the city.

COMMUNITY

One of the formative ideas of the first new towns in Britain during the 1940s and early 1950s was the neighbourhood concept. Overlaying this concept was the notion of forming a 'community'. The cooperative

spirit which was prevalent after the end of the Second World War led to a belief that this community spirit could infuse the new planning system with life. The neighbourhoods in the, then, new towns and the local authority housing estates in the suburbs were to be modelled on the old inner city working-class communities of cooperation. Middle-class families, doctors, dentists and teachers, were to live as neighbours with the families of the labourer, mechanic and factory worker and to provide the community leadership. As Gosling points out, one group of planners was concerned that: 'The apparent impossibility of making any technical decision about the city without thereby implying a corresponding social structure has persuaded many designers of the primacy of the social programme. Urban design is seen essentially as the attempt to find the appropriate form to sustain this programme or perhaps more actively, to reinforce or even induce it' (Gosling and Maitland, 1984). To some extent the view of planning as social engineering prevailed, or was thought to prevail, into the 1950s. There was, however, another and more mainstream view of the neighbourhood which was held by planners. This idea of the neighbourhood is much more practical and is concerned primarily with the physical distribution of social facilities in relation to population thresholds: 'The neighbourhood is essentially a spontaneous grouping, and it cannot be created by the planner. All he can do is to make provision for the necessary physical needs, by designing an area which gives the inhabitants the sense of living in one place distinct from all other places, and in which social equipment, like schools and playing fields, are conveniently placed' (Gibberd, 1955). Gibberd in this passage stresses the spontaneous nature of community formation and suggests that the physical structure merely permits its development. It is not the pub, the corner shop or the chapel which created the British working-class community, but the strong family ties and the interdependence of the group in the face of financial crisis constantly present with the poor. It has long been recognized that 'community' is not necessarily a product of place. The 'community of interest' may draw members from the city, region or it may have a network of international contacts. The individual may, indeed, belong to several communities, including a local residents' group, a University fraternity and membership of an international professional association (Webber, 1964).

THE QUARTER AND PERCEPTION

The legible city – that is, the city easily visualized in the 'mind's eye' – has, according to Lynch, a clearly defined, easily recognized and distinctive perceptual structure. Lynch suggested that five components – the path, the node, the edge, the landmark and the district – were the key to urban legibility (Lynch, 1960). To some extent the perception and understanding of the urban environment is personal, but groups within a culture share sets of images. It is this shared image which is the concern of urban design. A clearly structured city in terms of Lynch's five components, it is argued, will strengthen the common features of the city image shared by its citizens. Such a city will possess the quality which Lynch described as 'imageability' or the ability to stimulate a strong visual image in the eye and mind of the viewer (Lynch, 1960).

Norberg-Schulz has views on city structure which are similar to those of Lynch: 'Places, paths and domains are the basic schemata of orientation, that is, the constituent elements of existential space. . . . Paths divide man's environment into areas which are more or less well known. We will call such qualitatively defined areas as domains'. Norberg-Schulz is not as clear in his distinction between place and domain as Lynch is between node and district: 'But the distinction place and domain is useful, as our environmental image obviously comprises areas to which we do not belong and which do not function as goals. The domain can therefore be defined as a relatively unstructured 'ground' on which places and paths appear as more pronounced figures' (Norberg-Schulz, 1971). It appears that for Norberg-Schulz, the place is somewhat smaller than the domain and possibly more like Lynch's node: 'Nodes are points, the strategic spots in a city into which an observer can enter, and which are the intensive foci to and from which he is travelling' (Lynch, 1960). It is Lynch's description of the district, however, which is most useful for this discussion of the quarter: 'Districts are the medium-to-large sections of the city, conceived of as having two-dimensional extent, which the observer mentally enters "inside of", and which are recognizable as having some common identifying character' (Lynch, 1960). It is this definition of the district by Lynch which will be used here as the description of the city quarter: while there is no standard size for a quarter, it is larger than the neighbourhood, and has a population of about 20 000 to 100 000.

THE QUARTER AND ITS FORM

Modern theories about the form of the quarter, district or neighbourhood can be traced to Howard and his architects Raymond Unwin and Barry Parker in this country, and to Henry Wright, Clarence Stein and Clarence Perry in the USA. Howard sited schools at the nucleus of wards. The wards were to be complete segments of the town. Here in this suggestion for structuring the city into segments is, in embryo, the idea of the city quarter which later developed into the neighbourhood concept (Howard, 1965). Residential communities in the USA such as Roland Green in Baltimore, though attractively landscaped, nevertheless comprised magnificent detached villas facing onto roads carrying through traffic. By the early 1920s in the USA traffic was already posing problems. A town planning movement developed in the USA, and which was influenced by the Garden City movement in Britain, was attempting to come to terms with the motor car. Stein and Wright were elaborating the ideas of Unwin and Parker for the 'superblock' and applying them to American conditions. The buildings in the superblock were not arranged along through-traffic routes. The homes were located around a central landscaped park, the whole superblock being planned as a large single unit, as in Chatham village, Pittsburgh (Figure 8.1). The superblock was surrounded by roads carrying through traffic, while the homes were accessed by culs-de-sac (Figure 8.2). The design concept was demonstrated on a large scale in Radburn, New Jersey. The idea was to create a series of superblocks, each around a green but with the greens

connected by pedestrian pathways. This pedestrian system of paths led to schools, shopping centres and other community facilities (Figure 8.3). At no point did the car interfere with or endanger the pedestrian. An essential feature of the Radburn principle was the organization of the town into clearly defined neighbourhoods. This idea was fully explained by Clarence Perry, the theoretician of the North American offshoot of the Garden City movement, in his book *The Neighbourhood Unit* (Perry, 1929).

The Abercrombie Plan for London embraced the idea of the neighbourhood which had been fully developed by Perry (Abercrombie, 1945). It was upon this idea of the neighbourhood that a new concept of urban form was elaborated. The city was conceived as a multiplicity of basic cells or modules, each independently viable for some services and connected to the whole urban area by an efficient transport system. The city can grow by the addition of cells or modules, each one being to some degree

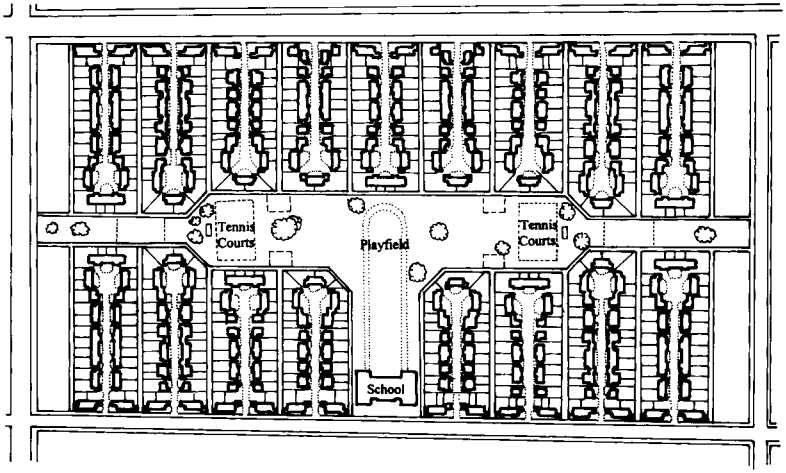
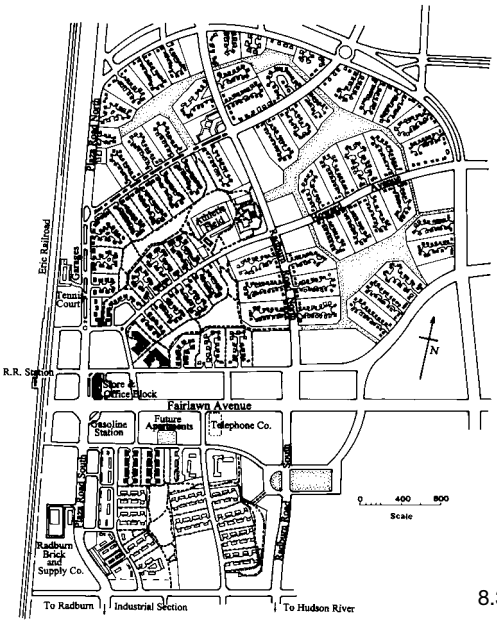


Figure 8.1 The Superblock

8.2



8.3

Figure 8.2 Greenbelt, Maryland (Lynch, 1981)
Figure 8.3 Radburn (Houghton–Evans, 1975)

self-sufficient and having its own integrity. A number of architects were also making a similar point:

> In all great epochs of history the existence of standards – that is the conscious adoption of type forms – has been the criterion of a polite and well-ordered society; for it is a commonplace that repetition of the same things for the same purposes exercises a settling and civilising influence on men's minds. . . . The uniformity of the cells whose multiplication by street forms and still larger units of the city therefore calls for formal expression. (Gropius, 1935)

In *Homes for the People*, there is a summary of the principles of neighbourhood planning as they were envisaged for London and the early British new towns:

> A neighbourhood is formed naturally from the daily occupations of people, the distance it is convenient for a housewife to walk to do her daily shopping and, particularly, the distance it is convenient for a child to walk to school. He should not have a long walk and he should not have to cross a main traffic road. The planning of a neighbourhood unit starts from that. In the proposals of the County of London Plan the Neighbourhood unit is the area that can be served by one elementary school and it works out at from 6000 to 10 000 inhabitants. Grouped centrally near the school are the local shopping centre and such community buildings as a clinic, or a communal restaurant. There is no through traffic in the neighbourhood unit: it skirts it, along one of the main roads. (Boyd *et al*., 1945)

Harlow, designed by Gibberd, is one of the early new towns in Britain which employed the neighbourhood as a structuring concept for urban form. Gibberd, in a number of places, outlines his prescription for a well-designed neighbourhood. The following quotations outline some of his views on this topic:

> The first aesthetic problem in the design of the neighbourhood is how to give the area its own physical identity, how, in fact, to make it a place with its own character, distinct from that of other places . . . The size of any particular neighbourhood is limited by the need to have all the social services . . . within easy walking distance of any home... The population generally taken by English planners is from five to twelve thousand people, because between those numbers it is possible to provide the majority of communal facilities which help to bring people together and engender a community spirit. (Gibberd, 1955)

The important design requirements of the neighbourhood, as proposed in the early British new towns are: a physical extent determined by a 10- to 15-minute walking distance from the furthest home to the school at the centre; a population which supports a junior school and a number of community facilities including a local shopping centre; a clearly defined boundary employing landscape to reinforce that boundary where possible; an architectural treatment which distinguishes it from other adjacent neighbourhoods; a definite centre; and the elimination of through traffic by arranging the major roads at the periphery of the neighbourhood.

THE NEIGHBOURHOOD AND ITS CRITICS

A high point of British new town planning in the twentieth century was the report on the

plan for Hook (Bennett *et al*., 1961). The study for a further new town for London, which was never implemented, returned to first principles in an attempt to discover the critical parameters in the design of an urban centre for 100 000 people. The concept of the neighbourhood was not supported by the study group and was not used to structure the new town. The neighbourhood was faulted for a number of reasons: it was thought to be over-simplified, not representing the richness of the real world of social interactions; it was also thought to lead to a dispersed urban form which did not lend itself to effective public transport. The last two criticisms relate more to the way in which the neighbourhood concept had been implemented, with large swathes of landscape between them, than to the concept itself. As for the first criticism, the neighbourhood was not conceived as a device to replace the natural process involved in the development of communities, but as a method for structuring the physical form of cities.

The plan for Hook, while aiming at urbanity, also aimed to accommodate the motor car. Further aims included maintaining a contrast between town and country and the promotion of a balanced community. The plan allowed for one car per household plus visitors' cars at the rate of a half-car per household. The accommodation of the motor car was to be achieved in such a way that the pedestrian took precedence. The town form evolved for Hook, in itself is of great interest to the student of planning and urban design, but it is the calculation of the spatial needs of the town which is an important consideration for those interested in sustainable development (Figures 8.4–8.6). The total area of the town was calculated in two main parts. The non-residential use was considered to be a fixed amount which for 100 000 people was calculated as 2600 acres. The residential area ranged from 3600 acres at a density of 100 persons per acre to 5100 acres at 40 persons per acre. Figure 8.5 shows how a decision about residential

Figure 8.4 Hook (Bennett *et al.*, 1961)

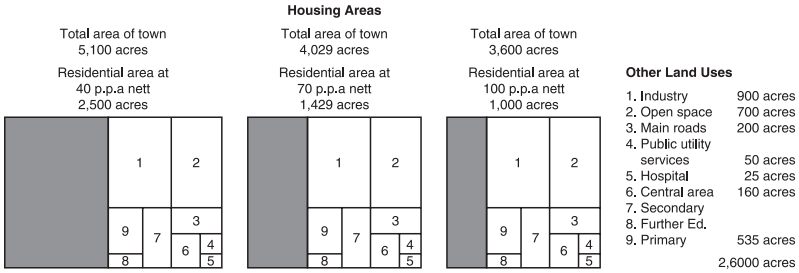


Figure 8.5 Hook (Bennett *et al.*, 1961)

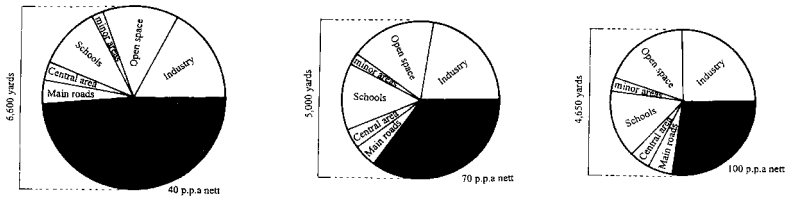


Figure 8.6 Hook (Bennett *et al.*, 1961)

density can influence the area of the town development and distances travelled on foot in the settlement. It also influences traffic within the town – the higher the density, the more effective the public transport system. The authors of the Hook report therefore, argued for the highest possible density compatible with the house and private garden, which they noted was the type of home most British people wanted.

Figure 8.6 is a diagram which was added, almost as an afterthought. It showed the various land takes as pie charts. This demonstrates that the same considerations of density, when applied to a circular form, do not affect the distances travelled from the perimeter in quite such a dramatic way as it does in an elongated rectangle. For the extremes of density used in the calculations of the 'land take', the radius of the circle increased from about 2 kilometres to 3 kilometres.

The criticisms of the neighbourhood have been directed mainly at the concept when it has been overlaid, mistakenly, with meanings of community. The neighbourhood concept when used as a physical structuring device is a most useful tool for relating population and facilities. Further confusion arises when the neighbourhood concept is used for structuring space at quite different scales. The term neighbourhood can be used to describe: a few streets with a population of about 500 to 600 inhabitants; the catchment area of a primary school having a population of 4000 to 5000; or the district or quarter with a political function and a population of 20 000 to 100 000. Alexander, for example, advocates the desirability of small neighbourhoods. According to Alexander, people need to belong to an identifiable spatial unit which should be no more than 300 metres across, with about 400 to 500 inhabitants: 'Available evidence suggests, first, that the neighbourhoods which people identify with have extremely small populations; second, that they are small in area; and third, that a major road through a neighbourhood destroys it'. In coming to a decision about the correct population for the neighbourhood, Alexander took as his standard the size of group which can coordinate itself to reach decisions about its community self-interest and the ability to bring pressure to bear on city authorities: 'Anthropological evidence suggests that a human group cannot coordinate itself to reach such decisions if its population is above 1500, and many people set the figure as low as 500' (Alexander *et al*., 1977).

The neighbourhood as used in the context of twentieth-century new town planning in Britain has already been discussed: its population is somewhere between 4000 and 10 000. These figures are based on the population which can be served by a primary school located within easy walking distance of every home. The school forms the nucleus of a centre for the neighbourhood: 'Grouped centrally near are the local shopping centre and such community buildings as a clinic . . . ' (Boyd *et al*., 1945). It is for this spatial unit – and not Alexander's smaller unit – that the term neighbourhood will be reserved in this text. As Gibberd and others have declared, it is important for the neighbourhood to have its own architectural character and to be a discrete visual unit. Boundaries between neighbourhoods reinforce the integrity of the neighbourhood. In Harlow and other British new towns of that time, landscape was the feature which established the boundary between neighbourhoods. While this is an effective visual method of

separating neighbourhoods, it does tend to increase the distances between the different activities in the urban area, and also weakens connections between adjacent neighbourhoods. In existing towns and cities, large areas of open space between neighbourhoods is most unusual. Other edges for neighbourhoods include: main traffic routes; canals and other waterways; or an abrupt change in architectural style. It is unusual to find an edge between neighbourhoods as 'hard' as the 'Peace Line' running between the Shankill and the Falls in Belfast Figure 8.7), or the wall of separation between the Jewish and Palestinian settlements in Israel. Alexander, while supporting the notion of the need for an edge to define spatial units, believes that such features should be 'fleshy' rather than 'hard': 'There is the need for a certain ambiguity at the edge and provision for connection' (Alexander *et al.*, 1977). The spatial unit of this dimension, that is, a neighbourhood covering an area about 1 mile or 2 kilometres in diameter and served by public transport, would seem appropriate for the sustainable city of the future.

The third spatial unit for which the term neighbourhood has sometimes been used is the large district of a city, which will be referred to in this book from now as the quarter: it is a unit of between 20 000 and 100 000 people. This, according to Lynch and Jacobs, should be the main governmental unit within and below the level of the city council (Jacobs, 1965; Lynch, 1981). Most writers since Jacobs would probably agree with her comments upon the vitality of cities and their quarters: 'This ubiquitous principle is the need of cities for a most intricate and close-grained diversity of uses that give each other constant mutual support, both economically and socially' (Jacobs, 1965). Gosling, for example, quoting Jacobs, proposes four conditions for a successful district: '... the need for mixed primary uses ... the need for small blocks ... the need for aged buildings ... and the need for concentration' (Gosling and Maitland, 1984). Leon Krier

Figure 8.7 Peace Line, Belfast. (Photographs by Pat Braniff)

makes a similar point, stressing the need to transform: '... housing zones (dormitory cities) into complex parts of the city, into cities within the city, into quarters which integrate all the functions of urban life' (Krier, 1978). An account of the development of a small traditional Portuguese town, Tavira, is given in the companion volume to this book, *Urban Design: Street and Square:* that account stresses the importance of the quarter as a town structuring element.

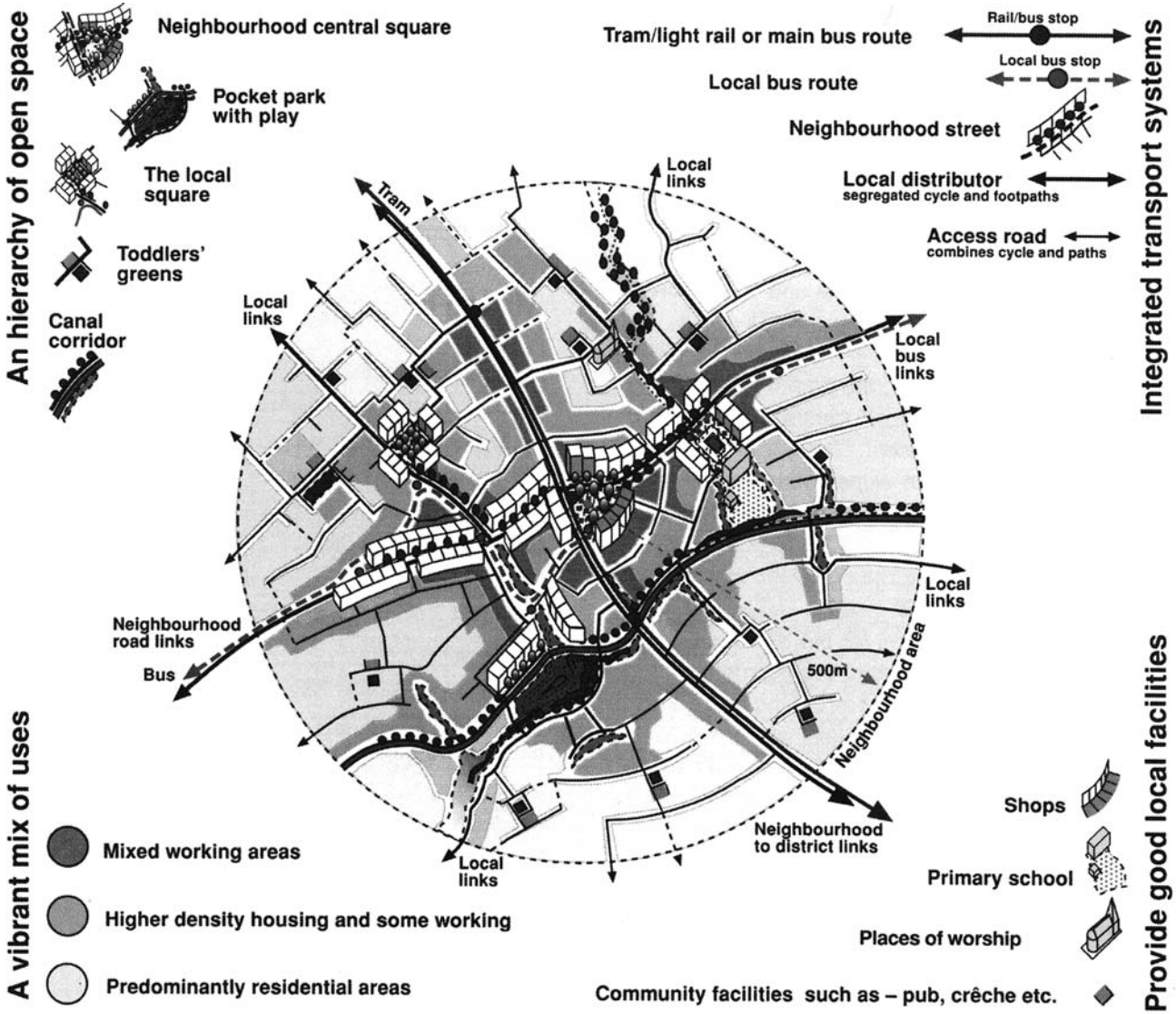
SUSTAINABLE QUARTERS

From the argument developed so far, it would seem that there are two possible structures for city sub-division into sustainable quarters. The first is a city quarter of 20 000 to 100 000 people with a major centre and sub-centres, around which are organized neighbourhoods of 5000 to 10 000 people. The second arrangement is a quarter of about 20 000 people with one centre but sub-divided into small neighbourhoods of 500 people. These model structures may be applicable for the planning of a new town or a large suburban extension to an existing city; however, such developments may not be the norm in the future. For the foreseeable future Western cities will remain much as they are today. The changes will be marginal: over the next few decades most city people in the West will live in a suburbia already built and inhabited. All cities have parts which are referred to as districts, enclaves, sectors, quarters or precincts. They are sometimes discrete areas having dominant or all-pervasive characteristics. Not all cities, however, can be neatly sectioned in this way: 'The most prominent enclave may dissipate visually at its periphery. Most urban enclaves lack outstandingly prominent characteristics. Further, complexity in an urban enclave should not be mistaken for confusion. Urban complexity – the intense intermixture of complementary activities – is one of the major reasons for cities and the spice of urban life' (Spreiregen, 1965). Cities are complex social, economic and visual structures; nevertheless, the users of cities simplify the physical structure so that they are able to comprehend its form and therefore react to it. It is the designer's task to assist in the creation of cities and parts of cities with a strong clear image. A strong image in part is due to a clearly defined outline or edge to component parts (Lynch, 1960).

Towards an Urban Renaissance – the report of The Urban Task Force (1999) – builds upon the experience of new town planning in Britain during the twentieth century and applies this knowledge and thought process in the service of sustainable development. Figure 8.8 shows a possible form for such a neighbourhood, a component for the compact city in the Irish context. It is a self-contained community, at least for local services. It is served by public transport, has a mix of land uses, together with a mix of housing types and tenures. Densities in the compact city are higher than those of a traditional British dormitory suburb and vary throughout the neighbourhood, having the highest densities near the centre but decreasing towards the periphery (Figure 8.9). The furthest distance from a centre would be about a 600- to 800-metre walk. The neighbourhood is structured around a linked pedestrian public domain comprising streets, squares and green areas: this linkage of open space would extend to

other neighbourhoods, the city centre and out to the open countryside.

The compact city with its component parts, in its own terms, is a coherent answer to the environmental problems associated with the over-use of fossil fuels for mobility in the city. It would, if implemented, result in a much improved environment, a reasonable step towards an urban renaissance: this is a civilized reaction to the environmental



(Andrew Wright Associates)

Figure 8.8 Concept-sustainable, high-density, mixed-use district

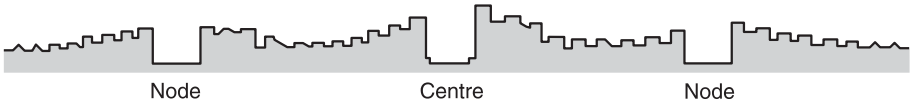


Figure 8.9 Compact city: Distribution of densities

Densities rise around local nodes and around centre

degradation, now patently obvious, but it is very much the result of a twentieth-century perspective – the culmination of a thought process that began with Howard and developed during the planning of the new towns in the last half of the twentieth century. This thought process has been overlaid with the notion of 'urbanity' – an idea associated with the wonderful compact medieval European cities such as Sienna. The British interpretation of the notion of urbanity is a compromise between the Cerda grid of Barcelona and the leafy suburb of the semi detached home, a compromise that may not be too unacceptable to voters in 'Middle England'.

How far does the British version of the compact city meet the needs of sustainability? There is no simple quantifiable answer to this question. It depends upon the shade of green philosophy that underpins the answer and the degree of pessimism with which the future is viewed. For environmental optimists, the establishment figures, sporting a philosophy of the paler shade of green, the answer would probably be 'Yes', and this is certainly as far as the political climate in Britain would support. For those who believe that we are underestimating the environmental problems ahead and for the 'hair- shirted environmentalist', the answer is a resounding – No!

Is there a valid position to be taken between the established view and those who, with much justification, proclaim '... that we, in the rich countries, have to learn to live simply, so that all may simply live' (Juffermans, quoted in Roelofs, 1996). The city set within the ecological limits of the bioregion may provide the framework for such a position. The idea of the largely self-sufficient and autonomous bio-city, anchored in a set of regional ecosystems was introduced in Chapter 7. The parts of such a bio-city – its quarters – would also aim to achieve a large measure of the autonomy observed in the dynamic balance of nature's ecosystem: that is, a unit that is self-producing in terms of needs, one that reuses wastes, and exports no pollution. Such a city would share some features with the compact city. But it would differ mainly in its density, which would be lower, affording greater possibility for the production of food on the additional space allocated for private and public use. It, too would be served by public transport, though walking distances to centres and public service routes would inevitably be greater than those in the compact city: walking distances, however, would not be nearly as great as those in many Third World cities.

The concept of the eco-industrial park exemplifies the thought process which underpins the ecological approach to location decisions, both for industry and other urban land use activities. In the eco-industrial park, industries' and companies' location decisions are made in order to trade in waste and the recycling process, so that one company's waste is another's raw material. An interesting example of waste and energy trading is reported from

Kalundborg in Denmark. The partners in the park include a large coal-fired power plant, a refinery, a wallboard factory, a biotech firm making insulin and industrial enzymes, and the city of Kalundborg. 'The exchanges include:

(1) Refinery gas, previously flared off, used by the power plant to produce electricity, steam, and district heating for the city.
(2) The gas is also used by the wallboard company.
(3) Excess heat from the power plant used for fish farming.
(4) Fly ash and chemical wastes from the power plant and refinery are raw materials for other industries.
(5) Sludge from fish farming used as fertilizer on local farms.
(6) Yeast from the insulin-making process is used in feeding pigs on local farms' (Roelofs, 1996) (see Figure 8.10).

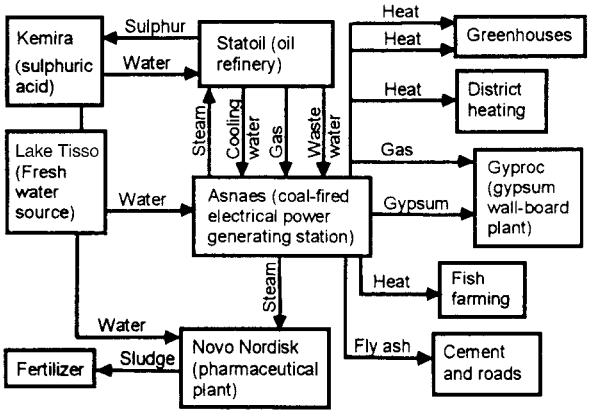


Figure 8.10 Industrial Ecology Park, Kalundborg

By taking this systemic view of industry, its ecological footprint can be reduced considerably. Industrial ecosystems, which result in a continuous cyclic flow of materials and energy, would largely eliminate the direct impact of industry. (See Tibbs in Birkeland (2002) for additional measures necessary to reduce further the environmental impact of industry.) A design policy promoting mixed land uses goes some way to achieving a balanced autonomous quarter. It is, however, a crude surrogate for the dynamic balance associated with the ecosystem in nature. A systemic analysis of the bio-city and its quarters would indicate how much of its needs could be met locally, the extent that those needs be supplemented from elsewhere in the bioregion and, as a last resort, from beyond its regional base. Such an analysis would indicate those areas of profitable exchange in terms of material and energy, using the eco-park as a model. Such analyses do not lend themselves to a neatly drawn architectural model: each bio-quarter being an environment-specific solution similar in nature to the permaculture case study reported in *Urban Design: Method and Techniques* (Moughtin *et al.*, 2003a).

THE CITY QUARTER AND NEIGHBOURHOOD IN PRACTICE

AMSTERDAM SOUTH: BERLAGE

Amsterdam has a continuous tradition of town planning unbroken since 1900. During the late nineteenth and early twentieth centuries Amsterdam was growing rapidly. For example, the city grew by 50 per cent in the first two decades of this century. To accommodate this growth there has been almost uninterrupted building activity for most of this century. Town building in Amsterdam dating from the early decades of the twentieth century is particularly interesting: at that time several new quarters were added to the city. These extensions were enhanced by a number of imaginative

architects who were members of a group which became known as the 'Amsterdam School'. In addition to Amsterdam South, which is the subject of more detailed analysis, other city extensions were built during this high point of urban design in Amsterdam: examples include a number of attractive garden villages built in Amsterdam North and Amsterdam East (Ons Amsterdam, 1973).

In London, the wonderful squares and crescents of the eighteenth century were built for the gentry and the wealthy upper middle classes (Figures 8.11 and 8.12). The boulevards of Hausmann in Paris were for the middle class, while the poor crowded into slum-like properties between the boulevards. The building in Amsterdam at the beginning of this century, in contrast, was mainly for the lower middle class and the working population. Giedion explains the development process which achieved this social programme in this way: 'Cooperatively organized building societies received building credits on very easy terms from the state, the credits being guaranteed by the community. Thus the whole tendency of the act (the 1901 Housing Act) was to make the city a decisive influence upon all building activity. At the same time the city made intensive (though not always successful) efforts to constitute itself a great land-owner and to acquire the land for its housing settlements before speculation forced up prices. And, like the nobles who were landlords in London, the city of Amsterdam leased the ground instead of selling it' (Giedion, 1954).

Figure 8.11 Bedford Square, London

Figure 8.12 Bedford Square, London

Another innovative feature of the Housing Act of 1901, in Holland, forced local authorities to determine extension plans for growth (Public Works Department, Amsterdam, 1975). As part of this programme of urban extension the well-documented plan for South Amsterdam was submitted in 1917 to the Town Council by the architect Berlage. The style of the plan and the power of its design approach set new standards in the planning of the city quarter. It may be true to say as a plan for a quarter it has not been equalled since. The planning was complemented by an architectural process which succeeded in building whole districts which were both homogeneous in design but also met the needs of the community. Developers, before receiving permission to build, submitted designs to a 'Commission for Beauty'. This commission insisted upon uniform street façades. The discipline of the commission encouraged a fine urban architecture to

develop, de Klerk and the other architects of the Amsterdam School responding to the challenge with flair and imagination (Figures 8.13–8.15).

Berlage drew up his first plan for Amsterdam South in 1902 at the time the Stock Exchange building in Amsterdam, his finest work, was nearing completion (Figure 8.16). This first plan has streets of sweeping ovals reminiscent of French garden designs in Hausmann's public parks for Paris in the mid-nineteenth century (Figures 8.17 and 8.18). The first plan is both romantic in character and organic in the shapes used to structure the quarter. The plan may also have been influenced by Sitte's strictures against the use of the forced axis and artificial grid-iron system of streets. Berlage was faced with the problem of giving identity to a large area of high-density housing. The essentially low-density garden city concept – even if Berlage had been aware of it – was not therefore appropriate for his purpose. Berlage relied upon the urban heritage derived directly from the Renaissance. Every neighbourhood within the quarter was to be dominated by an important public building. The neighbourhoods were therefore to cluster round a market, a theatre or college which was to give the neighbourhood its particular character. The quarter was structured to a human scale easily perceived and understood by its residents.

Figure 8.13 Amsterdam South, statue of Berlage

Figure 8.14 Amsterdam South

Figure 8.15 Amsterdam South
Figure 8.16 The Stock Exchange, Amsterdam
Figure 8.17 Berlage's first plan for Amsterdam South (Giedion, 1954)

8.15a

8.15b

The second scheme for Amsterdam South by Berlage was made in 1915. The plan, this time, provided a framework of streets only (Figure 8.19). The most prominent feature of the scheme is the junction of three streets to form a 'Y' which is approached from the Amstel River. The streets are wide and airy with tasteful landscaping: behind the trees which line the roads are the continuous four-storey façades typical of the expressionist architecture of the Amsterdam School. Between the roads are street blocks of four-storey development surrounding in places spacious lawns with shrubberies. Though not as innovative as his first scheme of 1902, the parts of his adopted plan which were completed are civilized and urbane. Giedion, the apologist for the modern movement in architecture, is rather dismissive of Berlage's efforts: 'The example (Amsterdam South) may

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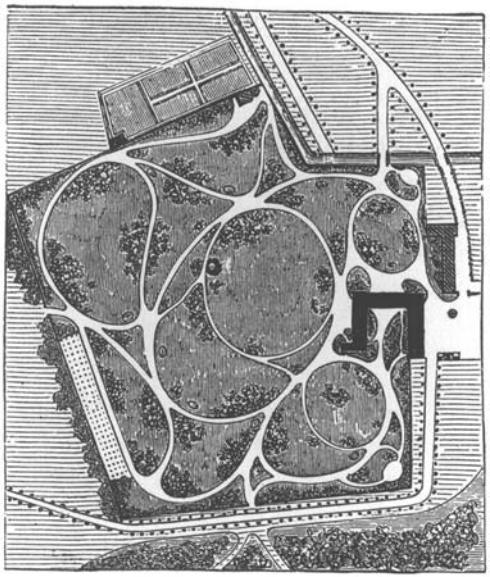

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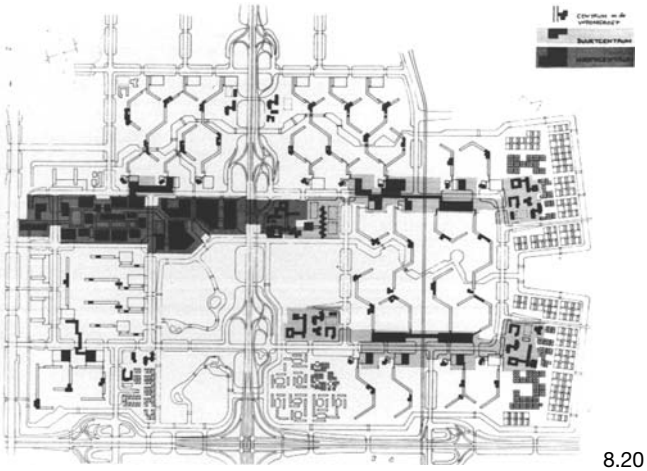

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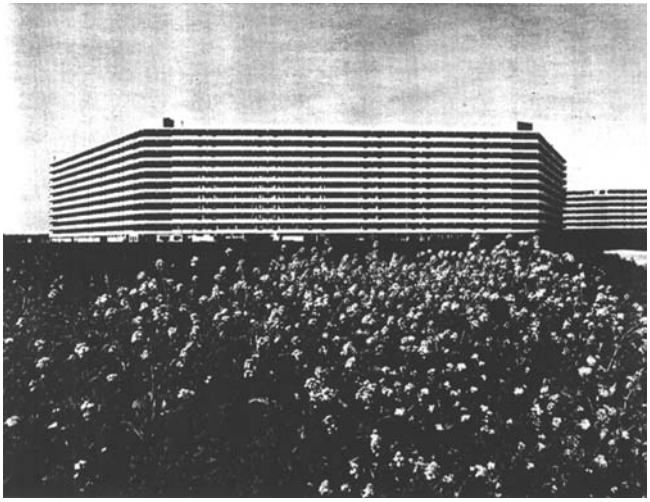
serve to show that in 1900 even the most progressive minds were affected by a tendency toward an artificial monumentality – an artificial or pseudo monumentality because it was used to hide the uncertainty and perplexity with which the organization of a town was approached, even when carte blanche had been given to the planner' (Giedion, 1954). Where quarters followed the precepts of the modern movement in architecture as at Bijlmermeer in Amsterdam, built in the late 1960s and early 1970s, they compare unfavourably with the delightful work of Berlage and his expressionist architectural collaborators (Figures 8.20 and 8.21).

VIENNA: OTTO WAGNER

Otto Wagner (1841–1918) prepared a planning scheme for a quarter in Vienna in 1910. Like his contemporary, Berlage, he did not pursue a garden city approach to planning the quarter, preferring the traditional urban form of the continental city which has as its basic module the street block of four, five or six storeys with central light well. Wagner's layout is rigidly formal, a dull rectangular grid with long axial streets (Figure 8.22). While Wagner's approach to urban design is pedantically formal, he was among the first to see that the needs of the

Figure 8.18 French nineteenth-century garden (Giedion, 1954)
Figure 8.19 Berlag's second plan for Amsterdam South (Public Works Department, Amsterdam, 1975)
Figure 8.20 Bijlmermeer (Public Works Department, Amsterdam, 1975)



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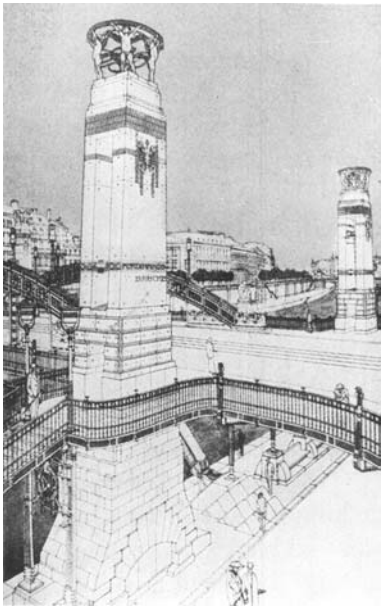

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Figure 8.21 Bijlmermeer (Public Works Department, Amsterdam, 1975)
Figure 8.22 Wagner's plan for a District Centre, Vienna (Giedion, 1941)
Figure 8.23 Drawing by Wagner (Giedion, 1941)

inhabitants of a city should govern its planning: 'Wagner's chief interest was the creation of a healthful environment for the man of ordinary means. He was one of the earliest to recognize that a great city embraces many different types of people, each type requiring a different kind of dwelling. He saw too, that the residential needs of the average city-dweller changed with his circumstances' (Giedion, 1954). It is the insights into the needs of people which is Wagner's main contribution to city planning and urban design. Wagner's work on the Vienna subway led him to an interest in movement at different levels with different modes of transport. His drawings of combinations of railroads, streets and bridges presage the complex transport interchanges of the modern city or the multilevel town centres such as Runcorn or Cumbernauld (Figure 8.23).

DOXIADIS AND ISLAMABAD

One of the many ideas contained in *Ekistics* by Doxiadis is the notion that settlements like growing organisms are

composed of cells:

> A study of growing organisms in Nature will show that in most of them the cells remain the same size regardless of the growth of the organism. The cells are the same whether a person is old or young, or whether a tree is at the beginning or prime of its life. Here we can draw an important conclusion: the search for ideal solutions has to be geared towards static cells and the dynamic growth of the organism. (Doxiadis, 1968)

Growth and transformation of settlements according to this theory should be cellular. If the village is regarded as a basic cell, then its growth should be by the addition of another cell or village and not the expansion of its nucleus or centre together with the expansion of its periphery. To save the village from the destruction caused by development pressures leading to its growth and transformation, the roads must be realigned to retain the village intact as a cell. The new functions caused by development pressures should then be transferred to a new centre to form the nucleus of the next cell. According to Doxiadis, the smallest human community is about 2000 families, with 500 and 3000 families being the lower and upper limits, respectively, for this unit. In Islamabad, Doxiadis attempted to arrange

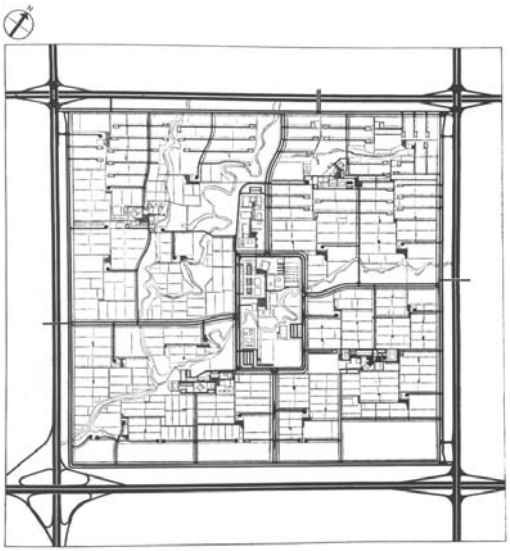

Figure 8.24 The Sector Islamabad (Doxiadis, 1968)

communities of this size, the basic cells of urban structure, into larger districts within the city. In doing this he was concerned to combine the cells according to two scales: the human scale based on walking; and the non-human scale mainly associated with fast-moving vehicles. In Islamabad, the basic cell or community is about 1 kilometre square, and it is not traversed by major roads. Four such cells combine to form a larger community or district surrounded by major highways (Figures 8.24 and 8.25). 'Here (in Islamabad) we

Figure 8.25 Islamabad

see how the non-human scale of the major transportation and communication networks that pass between the sectors with dimensions of 1800 metres (5094 feet), are gradually yielding to minor communications networks entering the sectors without crossing them and in a way not attracting through-traffic, thus defining three or four human communities within each sector' (Doxiadis, 1968). Such districts may reach a population of 40 000 to 50 000 people, though Doxiadis suggests that the grouping of communities and their size should be proportional to the size of the settlement.

HARLOW AND THE QUARTER

The new town of Harlow, which has already been discussed earlier in the chapter, is divided into four quarters or districts. As mentioned earlier, landscape and topography are the key features in the location of the main town quarters, dividing one quarter from the next. Each quarter, which has a major centre, was designed to have a population of approximately 20 000 people. The quarter comprises a cluster of neighbourhoods which focus on a major centre of fifty shops, church, health centre, branch library and hall. One of the four quarters has for its focus the town centre itself.

Mark Hall, the quarter to the north-east of Harlow, is divided into three neighbourhoods separated from each other by main roads and landscaping. The neighbourhoods focus on the district centre at the crossing of the main roads serving the quarter. Each neighbourhood was designed to have its own primary schools located at its centre which was also to contain four to six shops, a hall and a public house. Each neighbourhood is further divided into distinct housing units of 150 to 400 dwellings centred on a local play space and tenants' common room: 'There are thus four stages of community groupings in the town: the housing unit and its play space and common room; the neighbourhood with its primary school, shopping centres and hall; the neighbourhood cluster with its large shopping and community group; and the Town Centre' (Gibberd, 1955).

The housing units are linked to the centres and to the main roads by a system of spine or loop roads that run through each neighbourhood. Separate cycle and pedestrian routes were designed to link the neighbourhoods in Mark Hall with the industrial estates, town centre and the other districts of the city. Though the form of Mark Hall is quite different from the grid used by Doxiadis in Islamabad, Gibberd, the planner of Harlow, also uses the term organic to describe his design for the town: 'The resulting pattern is an organic system in which the roads increase in scale the farther they are from the heart of the housing groups' (Gibberd, 1955). The term 'organic' – when used by Doxiadis, Gibberd and other architects and planners – can result in a wide variety of forms. In the case of Harlow, the organic analogy refers to the concept of a hierarchy of facilities, centres and roads rather like the branching of a tree; it also refers to the grouping of cellular units to form larger components of the city. The arrangement of the local centre and primary school within walking distance of all homes in the catchment area is a feature of the Harlow plan which should be common practice in the planning of the sustainable city of the future. More problematic, for

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Figure 8.26 Harlow, housing and landscape
Figure 8.27 Harlow, housing and landscape

sustainable development, is the low gross density in Harlow. This feature of the quarter increases distances between its different parts. One school of thought on sustainable development suggests a higher density regime in order to support public transport. Such an urban solution, however, would not accommodate the British suburban dream home – nor would a Harlow, with its effective and attractive landscaping, be possible under such a regime (Figures 8.26–8.29).

Figure 8.28 Harlow, housing and landscape

Figure 8.29 Harlow, housing and landscape

CLIFTON ESTATE IN NOTTINGHAM

New towns were not the only post-Second World War urban developments in Britain. Around most major cities in the country large urban extensions were built by the local authorities. These estates were built for those unable to secure a mortgage, or for those with a preference for renting a home. Estates like Croxteth and Kirby in Liverpool were built in the 1950s and 1960s throughout the country. Clifton in Nottingham is one such quarter. It was built beyond the River Trent to the south of the city. The new development, consisting mainly of two-storey terraced and semi-detached housing is the bulk of the quarter. It is separated from the old village of Clifton by the A453, a trunk road carrying heavy traffic, which divides this residential quarter. The old village of Clifton sits on a ridge

Figure 8.30 Clifton village
Figure 8.31 Clifton village

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Figure 8.32 Post-war housing, Clifton

Figure 8.33 Post-war housing, Clifton

overlooking an attractive stretch of the Trent valley. Adjacent to the old village of Clifton, and on the same side of the trunk road, is a large part of the new Nottingham Trent University campus comprising teaching, administrative and residential accommodation. This quarter of the city has a population of approximately 27 000 people and is surrounded by the city green belt, the Trent valley, schools and other landscaped areas. Clifton is in effect a town on the edge of a city having its own main centre and subsidiary centres of local shops, pubs and community halls. The road pattern is not as highly structured as those in the new towns of the time. Most roads tend to be multipurpose with little evidence of planning for the pedestrian. The main local employment in Clifton is in the shops, schools and university. There is strong community activity; for example, a proposal by the Highways Agency for the widening of the trunk road and its placing in a cutting for part of its length was strongly resisted by some groups of local residents. The local resident groups, using their political muscle, persuaded the Nottingham City Council and the local MP to support them and object to the proposals at the public enquiry to be held in 1996. The community's suggestion for the building of a bypass and the development of public transport connections with the city seem more appropriate for sustainable development than the Highways Agency's environmentally destructive scheme (Figures 8.30–8.33). Existing city quarters such as Clifton would gain added political influence

if their views were represented by an elected community council, rather than by ad hoc groupings of community activists. It would be the role of the community council to define the local planning agenda, to seek to improve environmental quality and to defend the area against any forces which may threaten an erosion of its cherished environmental stock.

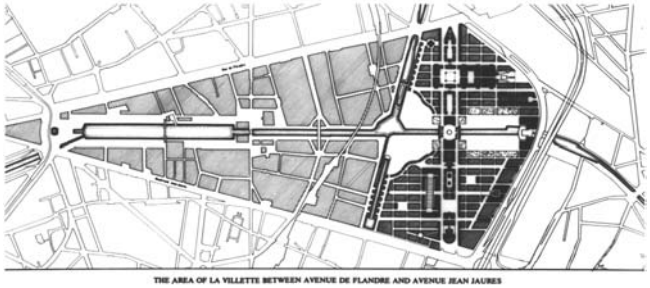
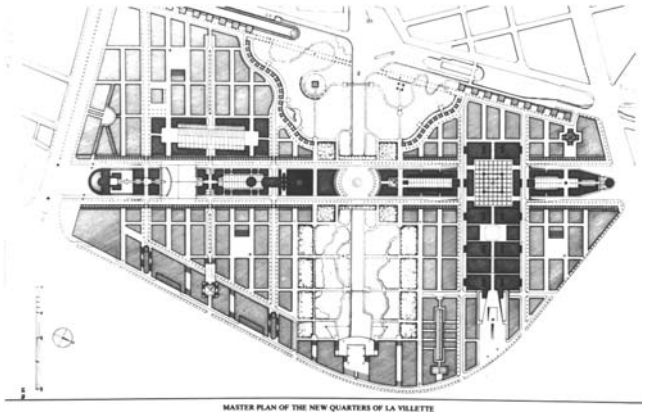


Figure 8.34 La Villette by Krier

QUARTIER DE LA VILLETTE: LEON KRIER

'A city can only be reconstructed in the form of Urban Quarters. A large or a small city can only be recognized as a large or a small number of urban quarters; as a federation of autonomous quarters. Each quarter must have its own centre, periphery and limit. Each quarter must be a city within a city. The Quarter must integrate all daily functions of urban life . . . within a territory dimensioned on the basis of the comfort of a walking man; not exceeding 35 hectares in surface and 15 000 inhabitants. . . . The streets and squares must present a familiar character. Their dimensions and proportions must be those of the best and most beautiful pre-industrial cities' (Krier, 1984). Krier has attempted to interpret, in a number of projects, this design brief for a city quarter. It is proposed here to examine one such attempt – at Quartier de la Villette in Paris – and to permit his fine drawings to speak for themselves accompanied only by a limited commentary. Krier's project for la Villette has as a theme a central park, a continuation of a recreation area which stretches along the banks of the Ourcq canal. At right angles to this canal is a grand boulevard 1 kilometre long and comprising two avenues 50 metres apart. The space formed by the avenues is occupied by large buildings having metropolitan functions such as hotels, cultural centre or town hall. In addition to these major buildings there are also major city spaces on the boulevard and spanning the space between the avenues. In the smaller neighbourhoods which are orientated towards the boulevard, there are subsidiary centres with social facilities grouped round small intimate public squares (Figures 8.34–8.36).

Figure 8.35 La Villette by Krier



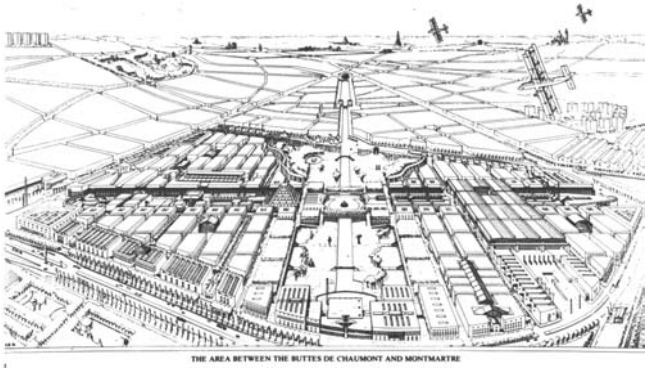


Figure 8.36 La Villetle by Krier

LAGUNA WEST, CALIFORNIA: CALTHORPE AND ASSOCIATES

In the USA, Calthorpe and Associates have been experimenting with urban forms which are sustainable in the North American context. A useful concept developed for this purpose is the TOD or Transit-Orientated Development: 'A Transit-Orientated Development (TOD) is a mixed-use community within an average 2000-foot walking distance of a transit stop and core commercial area. TOD's mix residential, retail, office, open space, and public uses in a walkable environment, making it convenient for residents and employees to travel by transit, bicycle, foot, or car' (Calthorpe, 1993). Developments of this type can be located throughout the city region on undeveloped sites in urbanizing areas, sites with the potential for redevelopment or reuse, and in new urban growth areas. They should, however, be located on or near an existing or a planned public transport route, preferably on a local feeder bus line within about 3 miles or a 10-minute travel time to the main public transport route. The ideal size of the TOD is based on a comfortable walking distance to the public transport stop, and in order to maximize the use of the land within that distance of public transport Calthorpe suggests moderate to high residential densities (Figure 8.37).

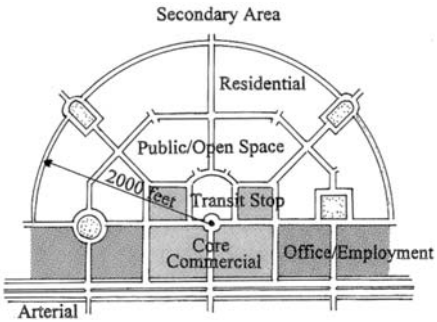


Figure 8.37 The concept of the TOD (Calthorpe, 1993)

Laguna West, an 800-acre site in Sacramento, California, was the first real test for the idea of the TOD. The planned population of the town was 10 000 people, and it was designed with tree-lined comfortable streets, parks and a 65-acre lake. There are five neighbourhoods totalling 2300 homes focused on the lake, community park and town centre. In the town centre there are an additional 1000 homes at higher densities, together with shops and offices. The mix of housing types and costs are much broader than other developments: they range from large individually designed villas on large plots, through typical suburban family homes, small bungalows, terraced townhouses, apartments and flats. In the first 18 months 200 homes were built, and the lake, village green and town hall were completed. In addition, a major employer, Apple Computer Company, requiring 450 000 square feet of space was attracted to the town. In many ways this project and the theory which supports it parallels ideas current in Europe. The needs of the car are not altogether ignored, though other public

means of transport are given priority in the arrangement of town activities and locational considerations (Figure 8.38).

REGENERATION OF BRAYFORD POOL AND THE GLORY HOLE, LINCOLN

This is a short case study of a quarter in the ancient city of Lincoln where the motor for a form of sustainable regeneration is an expanse of water, which is used to define the surrounding public spaces. Since pre-Roman times the Brayford Pool has played a significant part in the development of Lincoln. The Glory Hole was once the main trade route from Brayford Pool: it runs through High Bridge, a twelfth-century early Norman vaulted bridge which supports a late medieval, sixteenth-century timber framed house (Figures 8.39 and 8.40). More recently, with the building of the railway, Brayford quarter lost much of its former function as a busy port and consequently commercial activity was curtailed. Economic stagnation in this part of the city is the main reason for the efforts at regeneration by the Lincoln City Council and its partners.

There was a settlement in 'Bradeford' long before the Romans arrived in the first century AD when they established the hill city of *Lindum Colonia*: it was the Romans who excavated Brayford Pool, turning it into an inland harbour and then linking it to the River Trent by constructing the Fossdyke Canal. Lincoln became one of the finest cities in Europe, a major cultural centre whose wealth was built upon a prosperous trade (Lincoln City Council, undated). Lincoln remains a fine city situated on a steep, south-facing hill. The mass of the Great Cathedral dominates the city and the plain

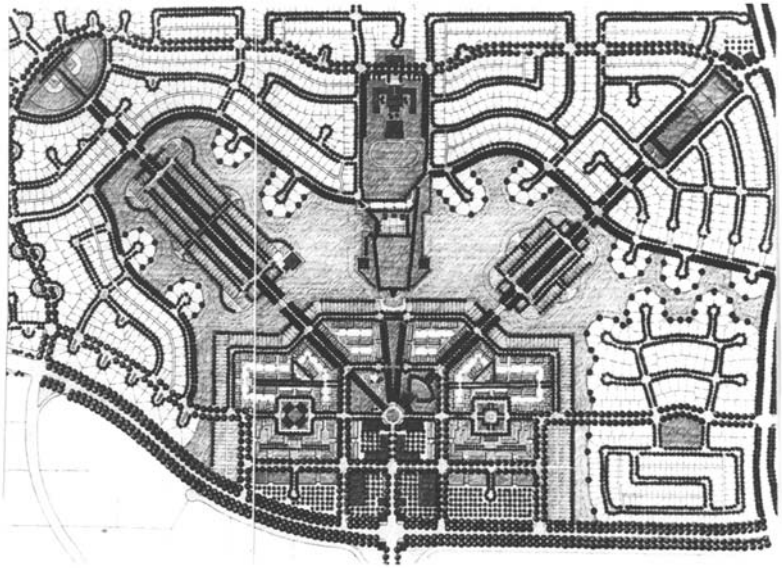
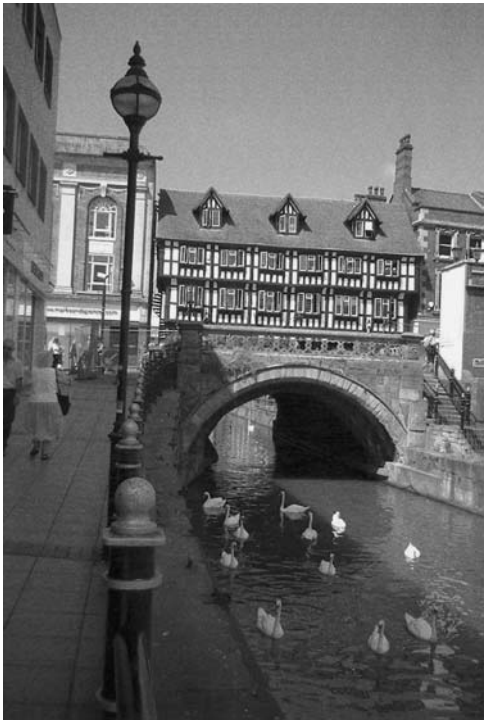


Figure 8.38 Laguna West in California (Calthorpe, 1993)

Figure 8.39 Lincoln: The Glory Hole

Figure 8.40 Lincoln: High Bridge
Figure 8.41 Lincoln: View of the Cathedral



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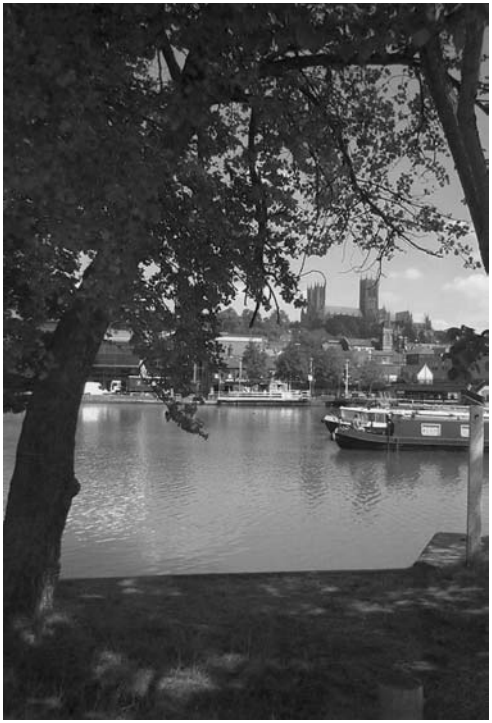

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in which it stands. It contrasts with the small-scale buildings that huddle in its shadow falling in layers to Brayford Pool below. This wonderful view has inspired artists such as Turner and Peter De Wint to portray Lincoln's tumbling townscape punctuated by delicate church spires, but with none able to compete with the dominance of the Cathedral on the heights above (Figure 8.41).

Brayford Pool has great potential in terms of tourism, recreation, transport, a fine townscape and a notable ecology: it also has the advantage of being located at the foot of a city with a long history. The city's main quarters, of which Brayford is one, have different characteristics but all have the common feature of buildings fronting directly onto streets and alleyways. The aim of regeneration is to build upon these positive qualities of the site using a combination of public and private finance (Lincoln City Council, 2001). There are two main parts of the Brayford area regeneration; there is Brayford Wharf North and the Glory Hole where the Lincoln City Council is the main actor; and the southern part of the site, which is being developed by the University of Lincoln.

Both frontages of the Pool have their problems. Brayford Wharf North is isolated and cut off from the shopping core of the city: it has many run-down properties awaiting redevelopment. To the south of the Pool the university site is bisected by the railway, which crosses, at ground level, the main road into Lincoln from the south. As rail traffic increases, the severance will

become increasingly more damaging. Unfortunately, to the south of the university site is located edge-of-town shopping, surrounded by a mass of car parking. Such development is not an appropriate foreground for a Cathedral setting, nor is it a visually exciting neighbour for the new university: in terms of attempting to develop a sustainable city, it can only be described as 'regrettable'.

Brayford Wharf North regeneration aims to reinforce the edge of Brayford Pool as an attractive lively waterfront for both residents and visitors: it is intended to continue developing the area with a mixture of land uses in a close-knit urban pattern with strong street frontages and enclosed courtyards, which mirror the existing small-scale grain of the traditional city of Lincoln. The streets are designed as part of the pedestrian network which link the waterfront walk with the High Street and the city shopping core (Figure 8.42).

The decision to locate the new University of Lincoln on the south bank of the Brayford Pool has begun to transform 20 hectares of derelict land in the heart of the city (Figures 8.43–8.48). When completed, it will form the new cultural and educational quarter for the city. The development has already stimulated renewed interest in the area from prospective developers. The University Campus provides the city with a unique opportunity for large-scale economic, social and environmental

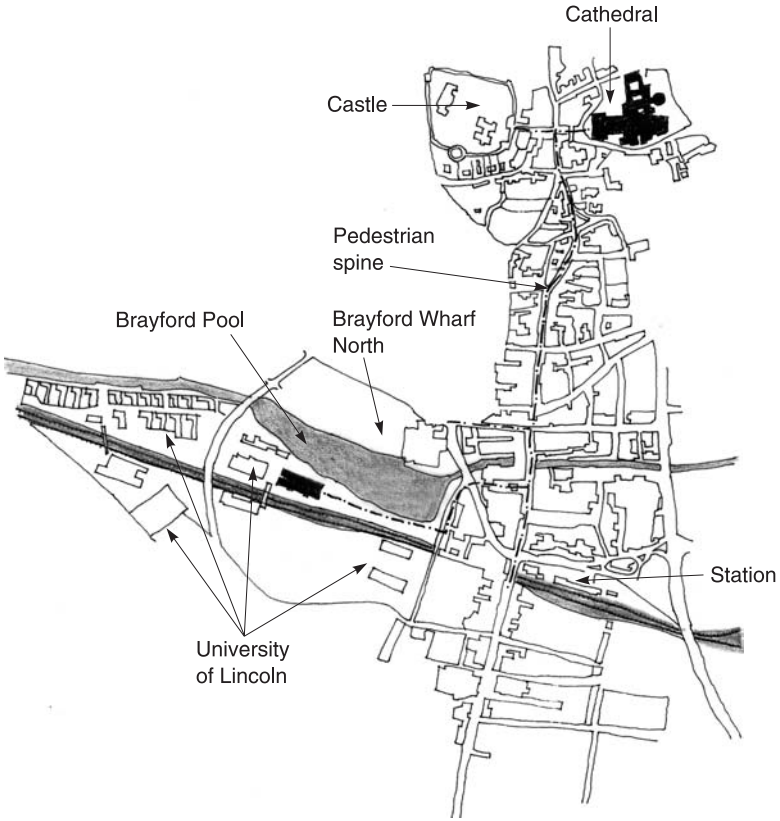

Figure 8.42 Lincoln: Pedestrian network

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Figure 8.43 Lincoln: Brayford Wharf North

Figure 8.44 Lincoln: Brayford Wharf North

Figure 8.45 Lincoln: Brayford Pool
Figure 8.46 The University of Lincoln: Main Academic Building


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8.46

regeneration. This development is ideally located to the south of the city centre close to High Street, the main axis leading to the Cathedral and Castle. Rick Mather Architects Ltd have prepared the Master Plan for the university: it is the result of a competition sponsored by the East Midlands Development Agency (Mather R, 2001).

The university site is divided into four parts by two important transport routes; a 20-metre reservation accommodates the east coast railway line and runs east–west through the middle of the site, while a recently built Brayford link-road flyover cuts the site in a north–south curving line. Both the road and railway line are dominant physical barriers, clearly delineating the four sectors of the site. Despite the problems of the fragmented site, the location of the university has many advantages, notably the inspiring Fossdyke and Brayford Pool which present the opportunity to develop a waterside university related to the magnificent views of Lincoln City Edge, Cathedral and Castle.

Already built is the student's Village, which occupies the North-West quadrant of the site facing onto the Fossdyke Canal; the Sport's Centre in the South-West quadrant: the Learning Resource Centre and the main Academic Building both in the North-East quadrant; and the Science Building in the South-East quadrant of the site. The quadrants of the site are connected by two footbridges spanning the railway and by an underpass beneath the flyover.

The maximum development for the University Campus is shown in Figure 8.49.

Figure 8.47 The University of Lincoln: Learning Resource Centre
Figure 8.48 The University of Lincoln: Student Village


8.47


8.48

It assumes rather optimistically that the railway will be tunnelled through the site and decked over. To the north is the waterfront esplanade facing onto Brayford Pool. Bridges cross the canal to the east and connect the University to High Street; to the south, the site is edged by four-storey terraces of mixed-use accommodation, forming gateways to the University and framing important views to the Cathedral and Castle. The terraces also form a hard edge to both the University and the city, forming a buffer at this point where shoddy shopping developments mar an otherwise fine development.

The project with the Brayford Pool and the canals at its heart uses water as the dominant theme unifying both banks of this former inland port. Pedestrian streets encircle the Pool, while lanes radiate from the waterfront, which together with the bridges that cross the water at strategic points form links with the main pedestrian structure of the city. At the heart of the University is yet another water feature, the Delph Drain, a flood control device used to balance the water levels of the Brayford Pool and the Fossdyke Navigation Canal. Brayford Pool Regeneration may take a number of years to complete, but already this area of the city is beginning to acquire some of the qualities associated with those European cities with quarters centred on rivers and canals, which along with streets, squares and green areas make up the public realm of cities. Using a unique location to advantage, the regeneration of the Brayford Pool quarter brings back into use land that has long been derelict. The quarter is within walking distance of the city centre and the ancient religious acropolis: it has a mix of land uses and provides welcome employment for the city of Lincoln. In many ways the quarter is a model of sustainable development following closely the ideas set out in *Towards an Urban Renaissance* (The Urban Task Force, 1999).

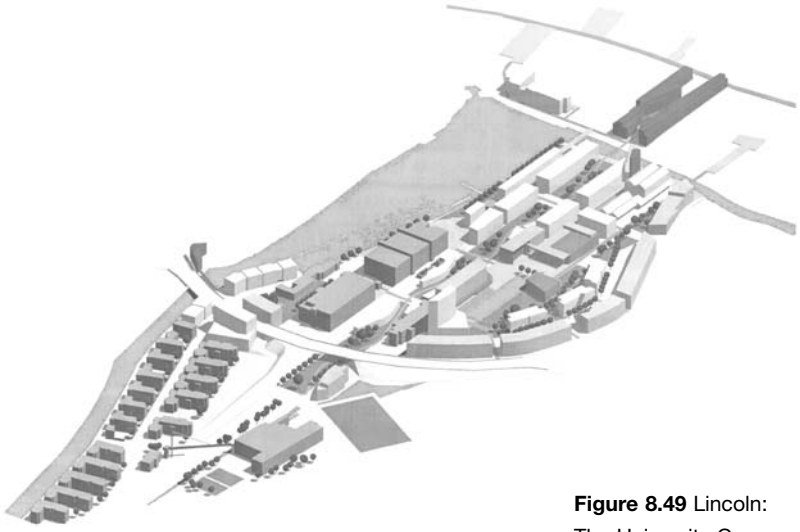

Figure 8.49 Lincoln: The University Campus

CONCLUSION

There are two divergent views about the size of the city quarter. There is that view represented by Jacobs which stresses the political function of the quarter. This view emphasizes the need for a community occupying a given territory to be able to organize itself politically. The community must be big enough and powerful enough to defend the group's interests. Jacobs believes that this is only possible for communities with a population greater than 100 000. Such groups, it is argued, have the muscle or political clout to affect the behaviour of elected representatives. At another extreme, Alexander argues that communal decision-making is only effective in small groups of 500 to 2000 people at the most. A small,

cohesive group of this size can identify and agree communal goals and then pursue those goals actively and efficiently.

Another view – held mainly by physical planners – relates the size of the quarter to a comfortable walking distance from its centre to periphery. This viewpoint is a particularly important consideration when designing a sustainable quarter. This definition of the quarter is advocated eloquently, particularly with his drawings, by Leon Krier. The size of the quarter for Krier is about 12 000 people – that is, the number of people housed at moderate to high densities who can be accommodated within 10 to 15 minutes' walk from a central place. This is a Continental European interpretation of the sustainable quarter, and follows the tradition of the Continental city where street blocks of four and five storeys are common.

British culture results in a city form which, despite the best efforts of planners and architects, is largely determined by a desire for low- to medium-density residential living conditions. The garden suburb comprising detached or semi-detached houses set in their own plots is still the ideal for most British people. The neighbourhood of about 5000 people which was a feature of the early post-Second World War, twentieth-century British new towns, was designed for easy pedestrian movement. The size was limited to 5000 so that it was a comfortable walk from the periphery to the centre while accommodating the population at, by British standards, reasonable densities. Those early new towns grouped neighbourhoods to form a district of 18 000 to 24 000 people. This district with its centre is possibly, in planning terms, the British equivalent of the Continental quarter. The gross density of the district in those early new towns was reduced still further by the introduction of landscaped areas between the neighbourhoods. This practice, while strengthening the physical identity of its component parts, increases the need for movement and makes walking, particularly to the District and Town centres, less attractive. This tendency is further compounded by the provision of additional land to facilitate both the moving and stationary motor car.

The proposals in Britain of The Urban Task Force (1999) build upon a long tradition of new town planning, adapting the ideas to achieve a more sustainable form of development by compacting urban form in order to support viable public transport. Further, it can be argued that a compact urban form of mixed land use reduces the need for movements about the city and results in economies in the use of urban land: higher local densities may also support the development of efficient neighbourhood combined heating and power systems.

Another view of the quarter presented in the chapter develops from the notion of the bioregion introduced in Chapter 4 and the concept of the bio-city developed in Chapters 6 and 7. In this view of the quarter, the basic building block is the home in its garden, or the 'Englishman's Castle'. The quarter would be developed, mainly, at densities found in the traditional British suburb. The quarter would still be served by public transport, though walking distances from home to centres of activity for some, would be greater than the half-mile which has become an unchallenged standard. The trade-off between density and walking distance has been tested neither in the market place nor by the ballot box. The quarter would be built along fingers of public transport route deeply embedded in the countryside, as indeed is the

British psyche. In such a city structure there would be no role for the artificial Green Belt – another unchallenged British planning legacy. New urban quarters should be considered as extensions of the countryside into the city. If the 'environmental pessimists' prove to be correct in their predictions, such urban forms would preserve a potential land bank for essential urban food production, where every green space, both private and public, each wall and roof could be brought into service for food production. During the Second World War in Britain, as part of a radio gardening programme there was a catch phrase 'Dig for Victory'. It spearheaded a successful campaign to make Britain less dependent on food shipped across the Atlantic from the USA. If the pessimists are correct in their assumptions, then 'Dig for Survival' may be the catch phrase of the future. Hopefully the predictions of the 'environmental optimists' will prove to be closer to the future reality: in this case Britain, at the end of the century, would inherit some attractive village-like green quarters, conforming closely to the taste of the average person in this country. The bio-quarter would also have its village streets, squares and greens, linking it to the public domain of existing urban structures.

This chapter has dealt mainly with the design of new city quarters. However, for the next fifty years when the country will begin to feel the impact of any environmental perturbations, most of the existing city structures – including the suburbs – will still be here. It is the way in which designers adapt these suburbs, where most people will continue to live, that will be the true measure of our efforts at sustainable development. It is here that the logic of the compact city and the bio-city ideals are in most conflict. The logic of the 'compact city' requires existing suburbs to be 'densified' – an ugly word, meaning to build new homes on all available spaces by combining semi-detached and detached homes into some form of the terrace. This could be described as 'town cramming'. A more civilized way to deal with the existing suburbs is by weaving into its structure, at strategic points, essential community services, using, and converting where necessary, existing houses, together with providing institutional support for local community bus services. It may also be useful for Government to consider providing financial support for homeowners to install solar heating and small wind turbines, a far more environmentally friendly prospect than the building of a new generation of Atomic Power Stations.

Clearly, there are a number of terms which have been used in this chapter to describe sections of a city: they are sector, district, quarter, neighbourhood, domain, and community. The position is complicated further by the different definitions given to these terms by those working in the field of urban design and planning. In this chapter, the term 'quarter' is used to describe a large section of the city with a population of 20 000 to 100 000 people. 'Neighbourhood' is used here for an area of the city which has a population of between 5000 and 12 000 people, and the term 'local community' is used to describe a few related streets with a population of 500 to 2000 people. There is no ideal or fixed size for a quarter, neighbourhood or local community, nor is it essential for a city to be structured to include all these urban components. It is probably true to say that the size of these urban components will vary with the size of the city. For large metropolitan cities the quarter may be large with a population of 100 000,

while for smaller cities a suitable size may be 20 000. The division of the city into autonomous quarters or districts – the name is unimportant – is necessary for achieving sustainable development. This process of dividing the city into quarters is most effective in promoting sustainable development when these divisions are legitimized politically, and when city's elected councils are given a remit to protect and enhance the quality of the local environment. The quarter has the potential to support further the process of sustainable development, when its form is compatible with – and promotes – public transport, food production, waste and energy recycling and environmentally friendly systems of heating and power supply.

THE URBAN STREET BLOCK 9

INTRODUCTION

The degree to which a city is sustainable is affected both by the form of the urban street block and also by the composition of the activities it accommodates. The way in which the street blocks are designed and the land use mix within street blocks also affects the quality of the built environment. Current conventional wisdom adopted by those in the field of sustainable development rejects the cruder notions of land use zoning, in favour of subtler urban structuring, based upon a mix of uses and activities. The traditional city with residential and office accommodation arranged over ground floor shopping streets is often cited as a model arrangement for a lifestyle which is not dependent upon high levels of mobility. It is also argued that a city with a fine grain of land use, rather than the homogeneous zones of residential commercial or industrial uses, common in modern metropolitan areas, is more likely to reduce the need for travel, and, incidentally, also be more likely to create an interesting and liveable environment. There is little doubt that a city is judged by the quality of its public streets and squares: by their form, the façades which enclose them, the floor plane on which visitors tread, and the great sculptures and fountains which delight the eye. It is, however, the size, function and structure of the street block which gives form to public space and contributes to the vitality of those spaces. This chapter examines the various ideas about the form and function of the street block and its role in structuring the city, analysing, in particular, the street block in a sustainable city.

The street and 'the street block' of the traditional nineteenth-century city received great criticism during the 1920s and 1930s from the leaders of the modern movement in architecture. Le Corbusier, for example, said of the street: 'Our streets no longer work. Streets are an obsolete notion. There ought not to be such a thing as streets; we have to create something to replace them' (Le Corbusier, 1967). Gropius was expressing similar sentiments: 'Instead of the ground-floor windows looking on to blank walls, or into cramped and sunless courtyards, they command a clear view of the sky over the broad expanse of grass and

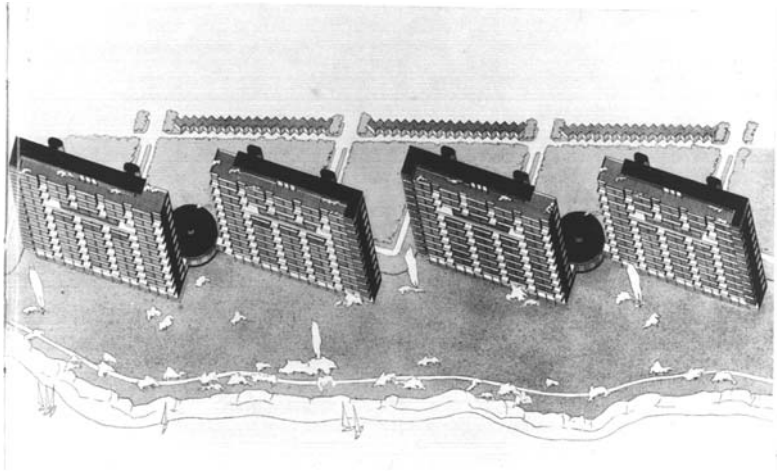

Figure 9.1 Project for a riverside or lakeside (Gropius, 1935)

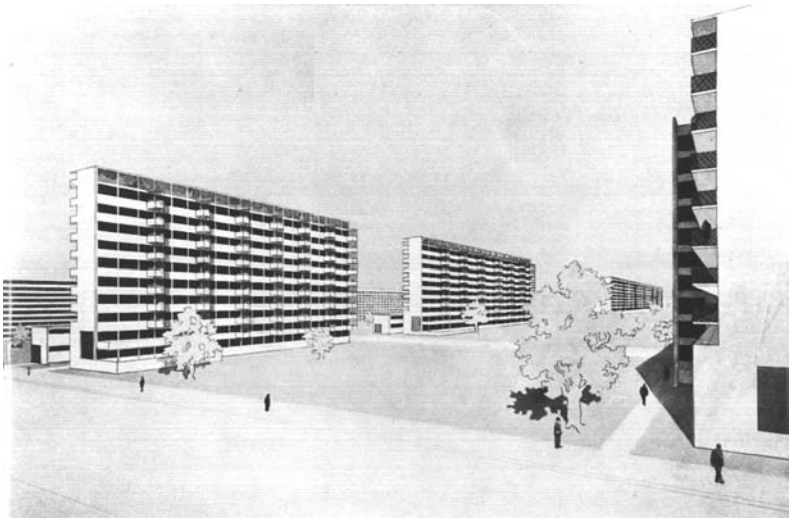

Figure 9.2 Project for a group of ten-storey dwellings (Gropius, 1935)

trees which separate the blocks and serve as playgrounds for the children' (Gropius, 1935). Projects of the time, speak most clearly to this aim of destroying the traditional urban fabric of the city and replacing it with ranks of unadorned blocks standing serenely in a field of green (Figures 9.1 and 9.2). Giedion, the apologist for the Modern movement in architecture is quite clear in his condemnation of the street block. Berlage's fine development in Amsterdam South is composed of streets and street blocks: for this and other shortcomings, Giedion dismisses Berlage as an architect of the previous century: '... Berlage's schemes reflect the central difficulty at that date: the inability to arrive at new means of expression in the solutions offered for the problems peculiar to the times. In the 1902 plans particularly (and to some extent in the later version of 1915) we sense the struggle involved in Berlage's attempt to break with the formulae of previous decades...' (Giedion, 1954). In contrast Giedion, in his discussion of the Cité Industrielle, commends Garnier for his arrangement of lots at right-angles to the road and for his elimination of the street block: 'The closed blocks and light-wells of Hausmann's time are completely eliminated' (Giedion, 1954). It is time to re-assess the value of the street and street block in the light of the new imperative of the green agenda for the city, and in particular in the light of the need to reduce atmospheric pollution caused by the burning of fossil fuels. The green agenda for the city renders obsolete the critique of the street and street block by the masters of the Modern movement in architecture. It is necessary to turn for inspiration, once again, to the great traditions of city building: to interpret those traditions in today's context in order to develop a new and enlightened vision for the sustainable city.

In the design of street blocks there are three broad sets of considerations. The first is the socio-economic function of the block; the second is the visual or physical role of the block in the city structure; and the final set of considerations is concerned with making the block work in terms of

technology and includes considerations such as the lighting, ventilation and heating of the buildings which comprise the block. When form was considered the product of function and technology, then the street block varied in size according to function and to the limits set by technological feasibility. The result is all too obvious: cities with large blocks of single use disrupting the intricate network of public paths; a coarse-grained city dying at night, a fearful place for citizens unprotected by the comforting envelope of a fast-moving car (Figures 9.3 and 9.4). Most urban functions, however, can be accommodated reasonably in urban street blocks of similar shape and form (Turner, 1992). Street blocks or insulae in historic towns dating back many centuries have been modified a number of times as they have changed ownership or use. The following paragraphs, while addressing function and technology, will place greater emphasis on the visual and structuring role of the street block in the city. If a reasonable size and form for the street block can be determined from considerations of its structuring role within the urban fabric, then it is argued here that it will accommodate, with modification, most city needs.

While the theory of sustainable development points clearly towards a mix of land uses in the city, the quarter and the street block, neither the precise nature nor the degree of intricacy of land use mix is specified. Clearly, the placing of buildings designed for large-scale noxious, noisy or dangerous activities next to family homes would be unacceptable to both professional and citizen alike. More difficult is the decision about the juxtaposition of homes where peace and quiet may be the expectations of some with pubs, 'takeaways' and other small-scale commercial activities

Figure 9.3 Broadmarsh Shopping Centre, Nottingham

which may cause noise, litter and other nuisance. Such activities in a city, however, add to its life and liveliness. To what degree, therefore, should land uses be mixed in the city? In particular, should the street block itself be of mixed use? These two questions are part of the debate in sustainable development. Theories can only give part answers; an examination of developing practice will provide the evidence for definitive answers.

Clearly, there will be single-use street blocks in the city of the future; that is, street blocks given over to, or almost entirely to, residential, commercial, industrial or some other single land use. Where possible, large areas of the city devoted to such single use should, however, be avoided. As a guide, a city quarter of 20 000 to 100 000 people should contain within its boundaries

Figure 9.4 Victoria Shopping Centre, Nottingham

a reasonable mix of city land uses. It should comprise a mix of uses to include opportunities for work, education, leisure, shopping and governance in addition to residential areas. The quarter is a town within a town, and as such it should have a balance of land uses reflecting the balance in the city as a whole. It is the quarter and not the street block which is the main instrument for ensuring a balanced distribution of land uses throughout the city. The city street block, however, with great benefit for the environment, may house a mix of activities, including such uses as residential, shopping, office accommodation and a small nursery school. Many existing city centres would have remained safer and livelier places if the tradition of 'living over the shop' had survived. Some city councils in Britain are indeed pursuing a policy which aims to bring unused accommodation over shops back into use as flats, and also the conversion into apartments of former office blocks. It seems that in the sustainable city of the future there will be a range of city street blocks varying from single-use blocks to those of multi-use in varying proportions and with varying combinations of uses.

The size of an ideal urban street block cannot be established any more precisely than the size of a quarter or neighbourhood. As a rough guide, Krier suggests that urban blocks should be: '. . . as small in length and width as is typologically viable; they should form as many well defined streets and squares as possible in the form of a multi-directional horizontal pattern of urban spaces' (Krier, 1984). The smallest street blocks are generally found in the centre of traditional cities. They represent a form of development which creates the maximum number of streets and therefore street frontages on a relatively small area: such a structure of street blocks maximizes commercial benefits. The high densities associated with this type of development stimulate intense cultural, social and economic activity – the lifeblood of city culture. The typical ground floor in this type of central city development has many doors and openings. The traditional European town centre has a quality of permeability: 'Only places which are accessible to people can offer them choice. The extent to which an environment allows people a choice of access through it, from place to place, is therefore a key measure of its responsiveness' (Bentley *et al.*, 1985). The street in the traditional centre facilitates distribution, in addition to its role in economic exchange and social intercourse. In contrast, large modern street blocks have a few guarded entrances, and most of the interchange takes place inside the building where internal corridors, private streets or splendid atria facilitate movement and distribution: the corridor replaces the street, which loses its primary function. The larger and more homogeneous the street block, the greater will be its power to destroy the social, economic and physical networks of the city. The large-scale, single-use, single-ownership street block is the instrument most influential in the decline of the city: its effect – together with that of its partner, the motor car – are among the real causes of the death of the great city.

It may be difficult to be precise about the size of the ideal urban street block, but it is possible to eliminate the block which is too large. Such blocks covering extensive areas are out of scale in a democracy, where power is vested in the people and not with the board of a conglomerate or council of a university. Street blocks in the early industrial cities increased in size towards the periphery of the urban area where land values were low and

where development could be expansive. As a city grew in both wealth and population, so too would its centre. The central city expanded and consequently land values increased at its former periphery, resulting in development pressures and large, over-developed street blocks surrounded by fewer but usually wider roads. Building programmes increased in size throughout the twentieth century, with single owners or developers building large sections of the city. The large development in single or corporate ownership, however, is not entirely recent as a phenomenon. The medieval castle or the cathedral and its ancillary buildings have, in the past, dominated the city. Where this has happened, such institutions have presented an alternative power structure independent of the city and its citizens. In this century these alternative sources of power have multiplied in the city. Large industrial complexes, hospitals, universities and extensive shopping malls are all common to most cities. These large-scale, single-ownership street blocks, or in some cases city districts, may be convenient for those who manage or own the establishment, but citizen rights are not paramount: this is private property, and those with legal possession have great autonomy within their ownership boundary. There seems, however, no reason why, for example, a city university cannot be designed to occupy small-scale city street blocks with buildings designed specifically for this purpose. A good example of such development is Oxford University with its rich mix of town and gown (Figures 9.5 and 9.6). The University of Liverpool, in contrast, followed a modernist approach to planning, destroying communities, the street pattern and also the rich grain of small-scale urban street blocks. In place of the rich nineteenth century urban structure there is a large district of the city which dies when students leave at night for the halls of residence, and atrophies almost completely during vacation when they leave the campus for home (Figures 9.7 and 9.8).

Figure 9.5 Oxford High Street. (Photograph by Bridie Neville)

The idea of the city as a 'growing whole' led Alexander to postulate a number of rules to achieve organic growth – the results of which he much admires – in traditional cities such as Venice (Figures 9.9 and 9.10). One of these rules of organic growth is that growth should be piecemeal: '... furthermore that the idea of piecemeal growth be specified exactly enough so that we can guarantee a mixed flow of small, medium, and large projects in about equal quantities' (Figure 9.11). In detail, Alexander specifies that no single increment should be too large

Figure 9.6 The Radcliffe Camera, Oxford
Figure 9.7 University Buildings, Abercrombie Square, Liverpool

9.6

9.7

and that: 'There are equal numbers of large, medium and small projects' (Alexander *et al*., 1987). The figure that Alexander places on the upper limit for projects – based presumably on the North American experience – is 100 000 square feet. This figure represents a four-storey building block, without light wells, of just under one acre in extent. The upper limits set by Alexander may be too high for the British context, where street blocks traditionally tend to be smaller than those in the USA. Sustainable development suggests an upper limit for development of three to four

Figure 9.8 University of Liverpool, Bedford Street North
Figure 9.9 Rialto Bridge, Venice

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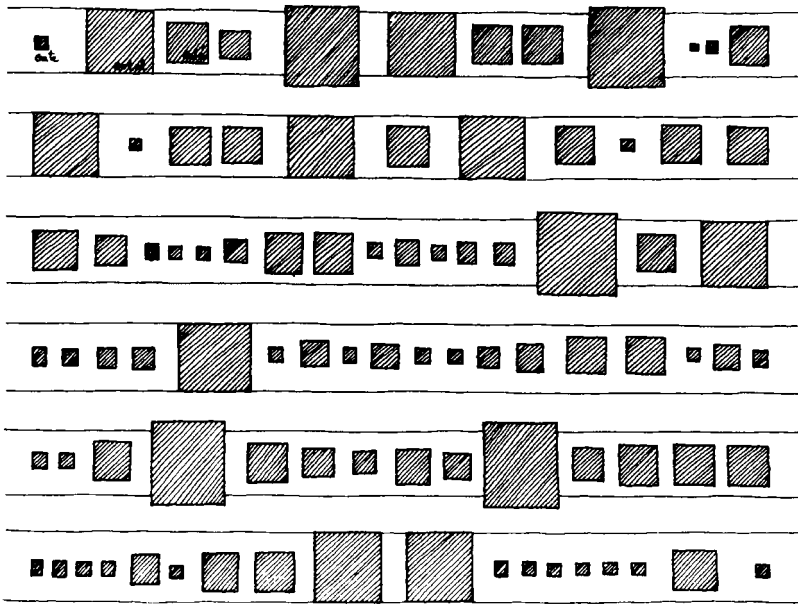

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Figure 9.10 Rialto Bridge, Venice

Figure 9.11 Sequence and size of development projects (Alexander, 1987)

storeys, which also points to development units of smaller scale than those envisaged by Alexander. There seems to be a strong case for breaking down into discrete units of single street blocks those large-scale developments which have become increasingly more common in recent years. The street block developed to three and four storeys should be the determinant of project limitation. Using the notion of a correct distribution of project sizes, then for sustainable development – particularly in the British context – a majority of small and medium-sized developments should be the strategy for city planning and design and not the equal numbers of large, medium, and small projects suggested by Alexander.

There is of course, a gain to the public purse in the building of megastructures which obliterate the finer grain of older city networks. With the megastructure, the amount of public street is reduced, and therefore there are savings to be made by the city in its maintenance. In addition, since circulation in the megastructure is along private streets the policing role can be privatized, so saving additional resources. One measure, however, of a civilized society is the degree to which its city streets and squares are public and open to all citizens to use freely and safely. This civilized society requires a city which meets Jacobs' criterion for self-policing, rather than one depending for safety on the night-time closure of whole sections of the city, which are policed in daylight hours by security firms and made safe by the ubiquitous surveillance camera (Jacobs, 1965).

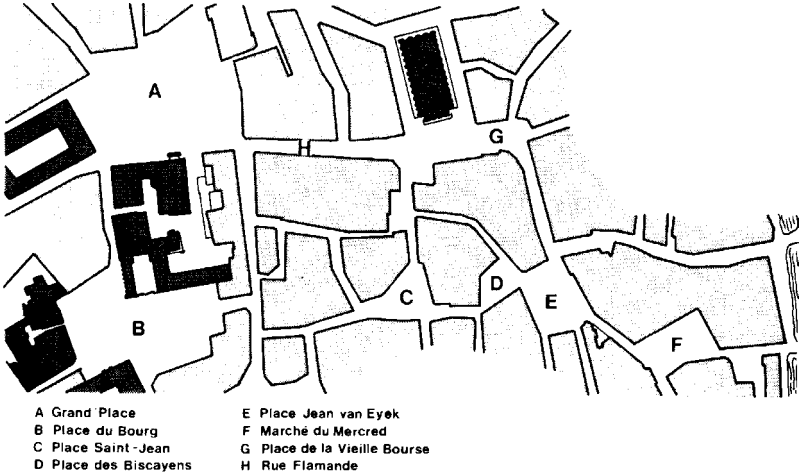

Figure 9.12 Bruges, Drawing from Sitte

People live both public and private lives. Institutions, too, have a private face and public connections. These two personae – the public and private aspects of life – meet and are resolved in the façade of the building block. The friendly and responsive environment is one which maximizes choice of access through it from place to place, while privacy requires enclosure and controlled access. Maximizing choice of access has to be balanced against the privacy for individuals, groups and corporate bodies. The delicate balance between public and private space is maintained by the system of access adopted. In some cultures, where family privacy is of profound importance there may be a whole system of semi-public and semi-private spaces linking the inner private world of the family and the public world of the street and market place (Moughtin, 1985). The richness of the environment, in part, is a reflection of the way in which these mutually conflicting requirements of privacy and access are resolved.

'Both physical and visual permeability depend on how the network of public spaces divides the environment into blocks: areas of land entirely surrounded by public routes' (Bentley *et al*., 1985). A city with small street blocks gives to the pedestrian a great choice and variety of routes between any two points. The medieval European city is a fine example of such a form: to the stranger, the city may appear almost like a maze (Figure 9.12). Large street blocks, on the other hand, give less choice of routes and also produce an increased distance between paths. Smaller street blocks in cities increase the visibility of corners which announce the junction of paths and in consequence both the physical and visual permeability is increased. As a general principle the city street block should be as small as practicable. Where street blocks since the 1950s have been enlarged for development, consideration should be given to the restoration of the traditional street pattern and block size if the opportunity presents itself.

The need for both contact and privacy in daily life leads inevitably to a built form which acts as a filter between these two opposing requirements. Until the advent of modernist thinking in city planning, the traditional and sensible solution to this problem was a building form having a public face and a private rear. In Bath, designed by John Wood and his son (also John Wood), this principle of design is given eloquent testimony by the local people who describe the great civic spaces as having: 'A Queen Anne Front and a Mary Ann Backside'. The design principle is quite simple: the front of the building should face onto the public street or square where all public activities including entrances occur, while the back of the building faces onto private space of an inner court screened from public view. When this principle is applied systematically to city development, the result is a system of insulae

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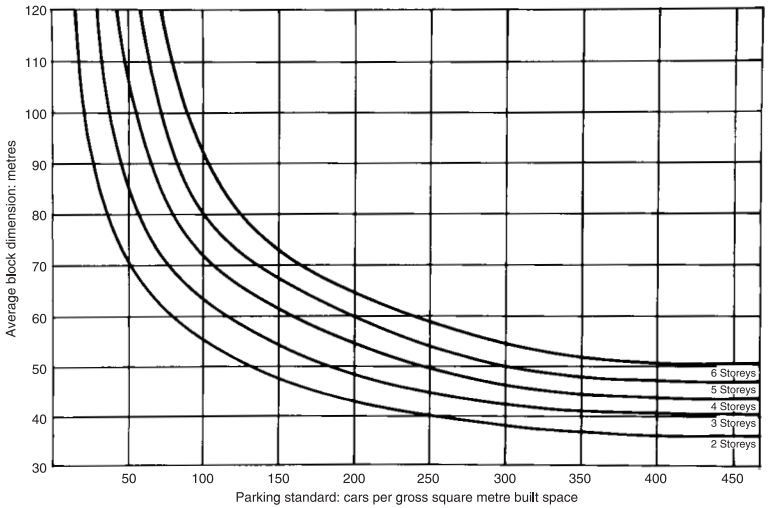
Figure 9.13 Westport, County Mayo, Ireland
Figure 9.14 Westport, County Mayo, Ireland

or street blocks surrounded by buildings along their perimeters enclosing inner private courtyards. This type of development was anathema to Le Corbusier, Gropius and the avant-garde of the modern movements in architecture and planning. The case presented by designers like Le Corbusier is made difficult to refute when – as in Ireland in particular, with the notable exception of Westport – developments literally turned their backside onto the river, which was used as an open drain. All rivers, canals and waterways in the sustainable city should be lined by building frontages and be, in their own right, important landscape features of the city (Figures 9.13 and 9.14). For a more thorough analysis of Seafront, River and Canal see *Urban Design: Street and Square*, Chapter 6 (Moughtin, 2003).

We have seen that the size of the street block should be as small as the form and the function of the buildings on its perimeter permit. In Britain, the acre has a long tradition as a measure of land surface for costing purposes and as a recognized means of land sub-division. In the more rational systems of measurement adopted in continental Europe, the hectare serves the same purpose as the acre in this country. It seems reasonable to suggest that most street block functions could be accommodated in insulae varying from 70×70 to 100×100 metres. There is a relationship between the size of the perimeter block surrounding the insulae and the private activities carried on in the private courtyard. Bentley *et al.* (1985) illustrate this relationship graphically for three main types of building use: non-residential use, flats, and houses with gardens (Figures 9.15–9.17).

Figure 9.15 Relationship of parking standards and street block (Bentley *et al.*, 1985)



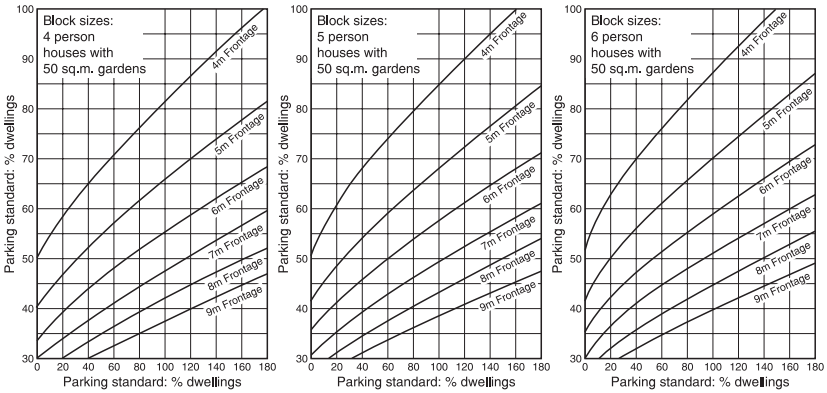


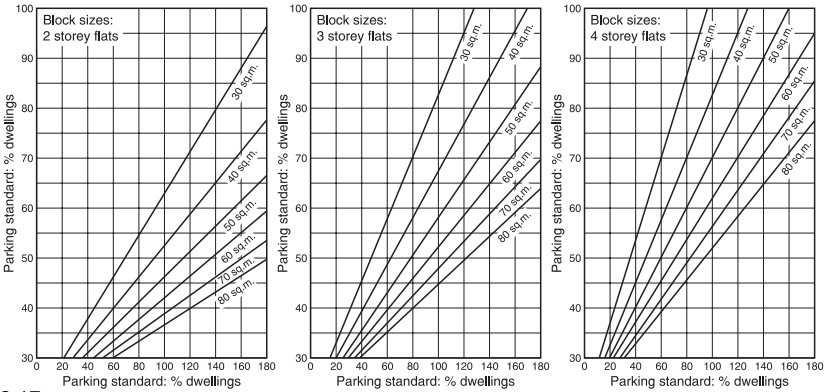
Figure 9.16 Parking standards and houses (Bentley *et al*., 1985)

Figure 9.17 Parking standards and flats (Bentley *et al.*, 1985)

Figure 9.18 Use of space within the street block, Amsterdam

Figure 9.19 Use of space within the street block, Amsterdam

Applying the results of Martin and March's analysis of the Fresnel square, it would appear that for any given size of street block, a form where perimeter buildings abut the back of the pavement give the most effective relationship between building volume and usable open space (Martin and March, 1972). Applying the graphs in Bentley *et al*. (1985) to a street block of 70×70 metres, a four-storey perimeter block of 50-square metre flats would surround a courtyard large enough to provide one car parking space per dwelling. Similarly, a 70×70 metre street block with periphery development comprising two-storey, five-person terrace houses with 50 square metres of private garden would cater for one car per dwelling, provided that the frontage of the house was less than 5 metres (Figures 9.18 and 9.19). Spaces within the courts need not necessarily be allocated for car parking, but could be given over to extra garden space or other use compatible with sustainable development. Perimeter development in street blocks, however, is clearly the most effective method of allocating space in a sustainable city.



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THE URBAN STREET BLOCK IN PRACTICE

HEMBRUGSTRAAT, SPAARNDAMMERBUURT, AMSTERDAM

This project was designed and built by de Klerk in 1921. It consists mainly of five-storey flats built for the Eigen Haard 'Own Hearth' housing association. Two terraces, the ends of street blocks, form a public square in this part of Amsterdam. The third part of the project is a triangular street block comprising flats, communal room, post office and school. The main part of the project is this small enclosed street block with perimeter development, and it is of exceptional architectural interest (Figures 9.20–9.24).

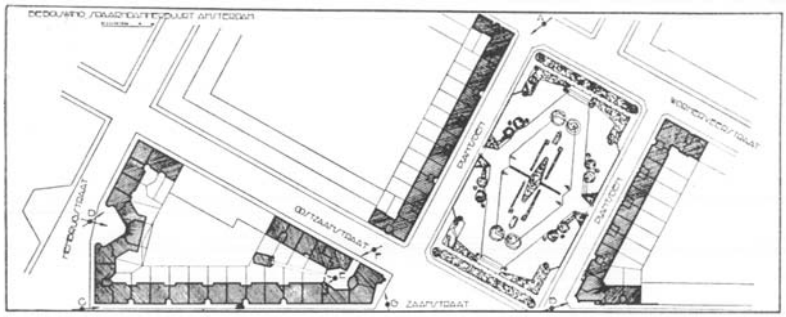

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Figure 9.20 Hembrugstraat by de Klerk

De Klerk died at the age of 39, two years after the project at Hembrugstraat was complete. He was the unofficial leader of the Amsterdam School, and greatly revered by his associates. Piet Kramer, a member of the school and a close colleague, wrote of de Klerk: 'The power of conviction that radiates from his drawings gives us that curious, happy feeling of being closer to the Almighty' (Quoted in Pehnt, 1973). De Klerk's vision was not infused with any notions of satisfying functional need; he was more interested in forms: forms with which to delight the user. In his search for personal expression he broke most rules of composition and most norms of structural propriety. De Klerk set bricks vertically in undulating courses and he clad upper floors

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Figure 9.21 and 9.22 Hembrugstraat by de Klerk

Figure 9.23 Hembrugstraat by de Klerk, use of space within the street block

in roof tiles, though this part of the building is structurally and visually part of the vertical wall plane. In places, windows follow their own capricious external pattern, with little regard for internal requirements. At the base of the triangular block is the most extravagant gesture, a tall tower, celebrating nothing more than two flats which sit beneath it and a small path within the block which leads to a small community room. The street block, nevertheless, is intensely human in scale and delightfully individual in expression. The project at Hembrugstraat remains a fine model for the treatment of a street block in the sustainable city of the twenty-first century.

THE SUPERBLOCK: UNWIN

In an essay '*Nothing to be Gained by Overcrowding*', Unwin demonstrated the mathematical truth that perimeter development is more cost-effective than the

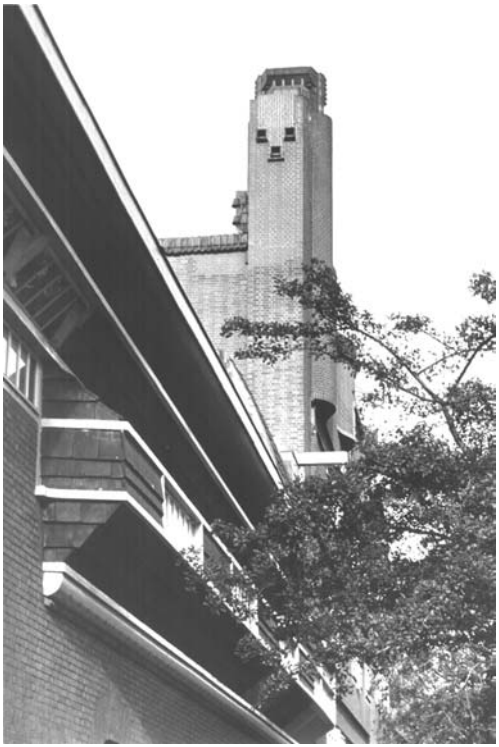

Figure 9.24 Hembrugstraat by de Klerk, details

typical nineteenth-century byelaw housing laid out in long parallel rows of streets (Unwin, 1967). In his article, Unwin presents two diagrams for a 10-acre plot. One shows typical rows of terraced housing with streets between; the other places dwellings around the perimeter. The demonstration shows clearly that when all the items making up the cost of the development are considered – including savings on roads and service runs – the cost for the more open and less crowded perimeter scheme is less. Unwin used this idea of the perimeter block in some of his work in Letchworth, incorporating, within the courtyard, allotments, for tenants, while the house fronts faced onto public greens (Figures 9.25–9.27). In the USA, experiments in superblock design were conducted by architects such as Perry, Stein and Wright (see Figures 8.1 to 8.3). The result is Radburn housing which takes the ideal of perimeter planning and distorts it out of all recognition, in order to service the motor car. In its purer forms, the Radburn system offers little privacy and an unclear definition of front and back. The superblock – as visualized by Unwin and when small in extent, or when broken by busy pathways – is still a useful concept for urban housing, particularly when perimeter development surrounds private gardens and/or allotments.

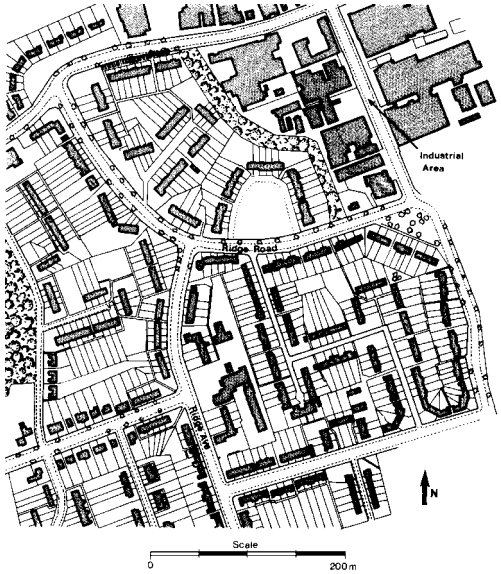

Figure 9.25 Letchworth, the superblock

Figure 9.26 Letchworth, use of space within the block

Figure 9.27 Letchworth, the Greens

RICHMOND RIVERSIDE DEVELOPMENT, SURREY: ERITH AND TERRY

Quinlan Terry's redevelopment of Richmond Riverside, completed in 1988, is a major contribution to urban design and town planning. Opinion is divided about the architectural integrity of this attempt at

Classical revival. The particular concern for those advocating an honest architecture and a unity between interior and exterior is the discrepancy between the highly mannered Classical façade and the functional interior. The comfortable office spaces are fitted with suspended ceilings which drop below the window head, air conditioning and strip lighting: they are little different from any similar office in a 'traditional 1960s' office block. The waterfront, seen from the South bank of the river, or from the bridge is a mixture of new, restored and remodelled Georgian houses, which are used for commercial purposes or as civic buildings. It is difficult for the lay person to see where the new begins and the old ends. It is also obvious that this is a popular part of Richmond. From this populist viewpoint alone, the development is highly successful. Terry has completed the street block and riverside frontage with buildings of mixed use and which have a clear front and back. The perimeter development encloses a pleasant court of classical proportions which provides semi-private space for circulation, light and air. While not wishing to put the stamp of approval on the idea of pastiche, nevertheless this development, in terms of urban design, is an elegant solution to the problem of a city block in an historically sensitive area. It is also a magnificent setting for a popular parade (Figures 9.28–9.30).

Figure 9.28 Richmond, Riverside Development

ALBAN GATE, LONDON WALL: TERRY FARRELL PARTNERSHIP

Alban Gate is a giant, twin-towered office block straddling London Wall. It replaces one of the slab-like, curtain-walled office towers dating from the 1950s that sat along the London Wall. The building, in a Post Modernist style can be compared with the nearby Barbican, an often-underrated example of Modernism (Figures 9.31 and 9.32). The Barbican, despite its faults, has a variety of uses, lavishly landscaped public spaces, water gardens and good quality residential accommodation. It is a good attempt to create an urban environment with enclosed

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9.31

Figure 9.29 Richmond, Riverside Development
Figure 9.30 Richmond, Riverside Development
Figure 9.31 Alban Gate, London

Figure 9.32 Alban Gate, London
Figure 9.33 The Barbican, London
Figure 9.34 The Barbican, London


9.32


9.33


9.34

and sheltered public spaces within the boundary of the surrounding development (Figures 9.33 and 9.34). In contrast, Alban Gate is a large building standing alone and depending for effect on its three-dimensional qualities: it creates no public space of consequence. The Barbican is quite clearly a work of urban design. Alban Gate illustrates very clearly the difficult dilemma facing the architect working at the scale of urban design. The commercial pressures of the free market, to some extent, favours an urban architecture of single-use, free-standing buildings which maximize internal floor area at the expense of external public space. The architect's role – if he or she accepts it – is to clothe the building mass in the latest fashionable style. The comprehensive planning of the 1950s and 1960s often resulted in dreary city redevelopments but, as The Barbican illustrates, it also offered the opportunity of urban design incorporating the street block.

HORSELYDOWN SQUARE, LONDON: JULYAN WICKHAM

Horselydown Square by Julyan Wickham, begun in 1987, occupies a site close to Tower Bridge (Figures 9.35 and 9.36). The project is of mixed development comprising housing, commercial and retail space. The architecture, according to Glancey, is cheerful but '. . . owes precious little to

mainstream architectural fads' (Glancey, 1989). The development completes an urban street block, and in doing so creates pleasant, enclosed and protected courts: it is an area of calm amidst the bustle and noise of the surrounding streets. The street block, which is five and six storeys, has a lively and decorative roofline in keeping with its riverside location. Possibly because it owes nothing to current architectural fashion, Horselydown Square is the type of development which in both form and function encapsulates many of the principles expected of sustainable development in a busy city urban street block.

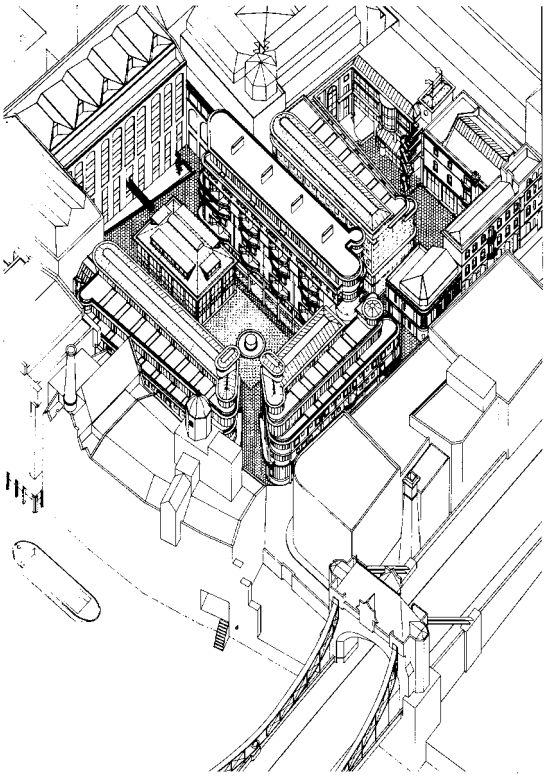


Figure 9.35 Horselydown Square (Glancey, 1989)

9.36a

9.36b

9.36c

Figure 9.36 (a,b,c) Horselydown Square

Figure 9.37 Inland Revenue Building, Nottingham

Figure 9.38 Inland Revenue Building, Nottingham

INLAND REVENUE BUILDING, NOTTINGHAM: MICHAEL HOPKINS AND PARTNERS

This is not simply a single building on one plot, the site has been developed as a group of island blocks surrounded by streets (Figures 9.37–9.39). The building is the result of a competition won by Hopkins and Partners. It occupies once derelict and under-used land adjacent to a canal. The streets within the development are tree-lined to give protection and shade from the summer heat and to help purify the air in this part of Nottingham. The building pattern adopted for the development, by breaking up the mass into strips of slimmer accommodation, permits more of the occupants to be near a window, so reducing the need for artificial lighting while giving them a pleasant view of the landscaped courts. The Inland Revenue building in Nottingham has a number of innovative features for reducing the energy used in running the buildings, and is also sited on 'brown land' rather than a greenfield site. As urban design, the complex enlivens the canal, particularly the tent-like structure which dominates the scene, while the organization of the programme into a number of semi-autonomous units has enabled a breakdown of the accommodation into blocks of small scale. This is, however, a large development of single use which is dead in 'out-of-office' hours, and the development does little to revive the architecture of the city centre. The developers, perhaps, should have considered the conversion of some of the unused office space in the city before embarking on a prestige building on the canal site. Despite these criticisms, the Inland Revenue Building in Nottingham is a great addition to the city architecture giving delight to visitors and citizen alike:

it is attractive when seen from the canal towpath. Being a major employer, the Inland Revenue Building will bring extra business to the city and is a welcome move to decentralize Government activity to the regions. Together with the other developments along the canal in Nottingham, it may give an added stimulus to the redevelopment of other degraded areas in the city centre.

Figure 9.39 Inland Revenue Building, Nottingham

APARTMENT BLOCKS, KREUZBERG, BERLIN

The area of Kreuzberg close to the site of the Berlin Wall consists of city blocks of high-density housing. The blocks are four- and five-storey apartment blocks built over shops and arranged around the perimeter of the block. In addition, there is a mix of apartments, workshops and small-scale industries grouped around courtyards. The area, run down and ripe for redevelopment, is typical of inner city areas in large European cities. The intention for many years was to demolish the properties and rebuild *de novo* on the cleared site: this was the typical reaction to run-down areas by most European city authorities in the 1950s and 1960s. After a reversal of policy, and with the residents' support, it was decided to rehabilitate the area but without causing disruption to the existing community. Buildings were made structurally sound, weatherproofed, well-insulated, and the accommodation was upgraded by adding new bathrooms and kitchens. The refurbishment had energy savings: '... since the apartments have relatively few external surfaces from which to lose heat' (Vale and Vale, 1991).

One block is of particular interest, having been designed as an ecological showpiece. Solar energy systems have been installed, waste water filtered through the roots of reed beds and methods of water economies introduced. Where flats and other buildings have been demolished, the spaces have been intensively planted. The rehabilitation of Kreuzberg with the active participation of the residents has set a pattern and model for the sustainable rehabilitation of inner city areas. The treatment of street blocks is of particular interest: this development has proved to be an effective method of urban regeneration (Figure 9.40).

BERLIN GOVERNMENT CENTRE: LEON AND BOB KRIER

Leon and Rob Krier see a project like this for the Berlin Government Centre, not only as a unique opportunity to create a governmental quarter, but also as a possibility to integrate these functions with an urban fabric of mixed

Figure 9.40 Block 103, Kreuzberg, Berlin. (Photographs by June Greenaway)

Figure 9.41 The Berlin Government Centre (Architectural Design, 1993)

use: 'Over 100 000 square metres of three/four storey high residential blocks with commercial ground floors are thus spread in a checkerboard fashion throughout the new government district. The central symbolic buildings, the Parliament (the old Reichstag building), Bundesstat and Chancellery, are grouped around a vast artificial lake which will become the largest public space in Berlin' (Krier and Krier, 1993). This is a project which illustrates clearly the thinking of both Leon and Rob Krier: it is also in the mainstream of current urban design theory (Figures 9.41 and 9.42). Like their project for the new quarter for Venta-Berri in San Sebastian, the arrangement of medium-rise

street blocks with mixed uses arranged as perimeter development is a model many urbanists would advocate for city development (Figures 9.43).

POTSDAMER PLATZ – LEIPZIGER PLATZ: HILMER AND SATTLER

The planning of the area around Potsdamer Platz was the subject of a competition. The district was badly damaged during the Second World War, and by the time of the competition in 1991 the area was an empty tract of land. The aim of the development is to rejuvenate the district so that it becomes a busy part of the city once again. The area was designed to contain a mix of uses – offices, hotels, shopping, restaurants and also residential accommodation. The plan by Hilmer and Sattler defines public spaces, squares, streets and boulevards, together with the density of development and the general building height of 35 metres. The scheme deals with general massing only: 'Our concept . . . is not based on the globally-accepted American model of an agglomeration of high-rise buildings at the core of the city, but rather on the idea of the compact, spatially complex European town. It is our view that urban life should not develop within the interiors of large-scale building complexes like glass-covered atriums and megastructures, but in squares, boulevards, parks and streets' (Sattler, 1993). Despite this reference to the compact and complex European town, the drawings of street blocks have the appearance of buildings standing as solid volumes in rows along a wide street. Richard Reid, in his discussion with Sattler, articulated this view: 'When I look at the plans of your urban blocks, and in particular the diagrams, they

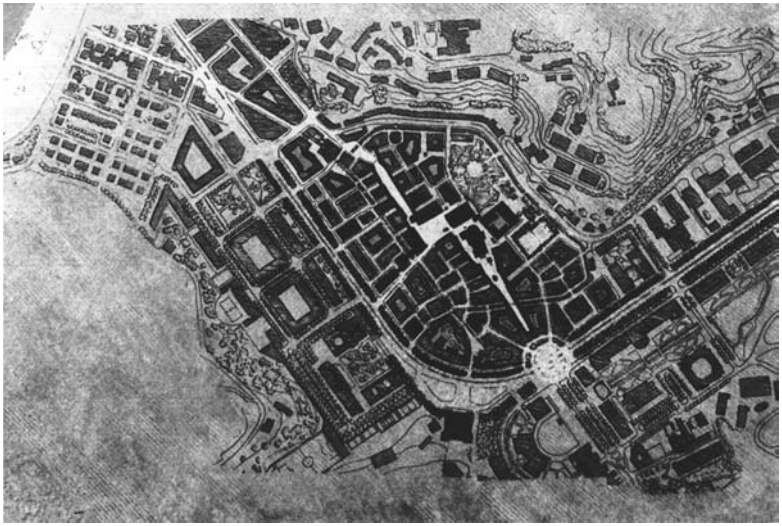
ABOVE: AXONOMETRIC RELIEF PLAN; *BELOW:* SITE PLAN; *OPPOSITE:* FLOOR PLANS OF THE NEW GOVERNMENT BUILDINGS

Figure 9.42 The Berlin Government Centre (Architectural Design, 1993)

are all a series of enclosed private spaces off the main urban grid. And in a sense that seems to be more like the American rather than the European model' (Architectural Design, 1993). The formality of this project for the Potsdamer Platz district of Berlin and its overwhelming scale has none of the subtlety found in the work of Leon and Rob Krier for the same city (Figures 9.44 and 9.45).

CONCLUSION

The main ornaments of the city are its streets and squares (Sitte, 1901). It is, however, the street block or insulae which forms the boundaries of public space. The street block is also at the interface between the public world of the street and the inner life of the courtyard and its surrounding buildings. Perimeter development is clearly the most effective way of arranging buildings to act as a filter between the public façade and the



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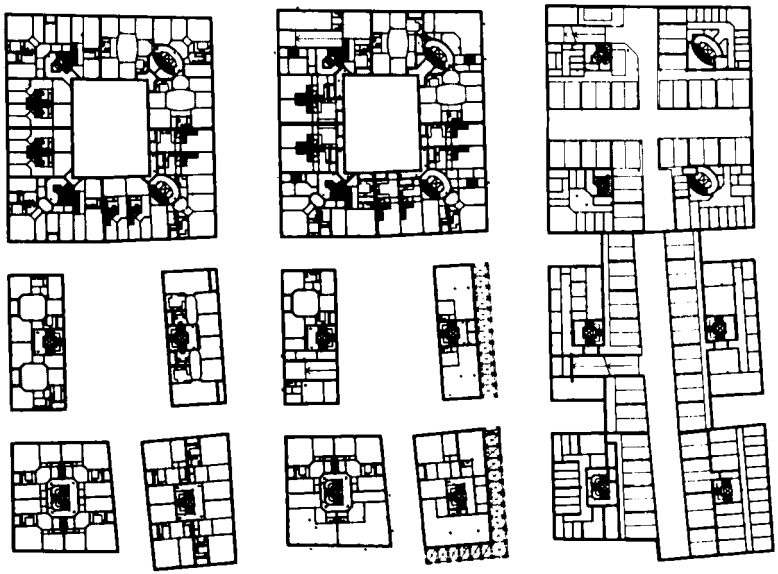

9.43b

Figure 9.43 The new quarter of Venta-Berri in San Sebastian

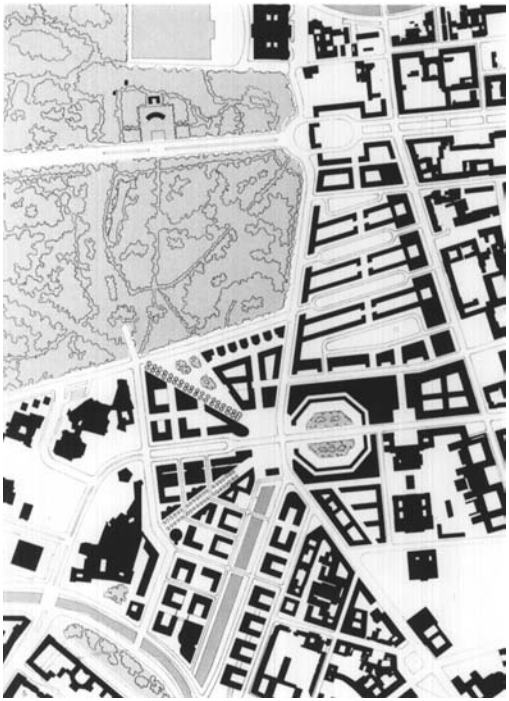

Figure 9.44 Potsdamer Platz by Hilmer and Sattler (Architectural Design, 1993)

private activities which are pursued within the block. There is general agreement that street blocks of mixed uses result in a more vital and interesting city. There also appears to be wide agreement that street blocks should be as small as is reasonably possible in order to maximize the 'permeability' of city districts. An alternative view sees the need for street blocks to be large enough to accommodate single large schemes (Bruges, 1992). It would seem, however, that it is possible for large single activities – such as those at the Inland Revenue in Nottingham – to be accommodated within a number of small street blocks. In this case, the result is a fine piece of urban architecture and a canal scene of great quality.

The conclusions derived from the debate on sustainable development support the idea of small-scale city street blocks composed of

compatible mixed activities or mixed land uses, surrounded by a perimeter block of two, three or four storeys. Sustainable forms of this type also provide a framework for the development of a city with vitality but with a friendly human scale: that is, with a scale normally associated with the morphology of a traditional European city (Krier, L., 1984). Furthermore, the perimeter block is very suitable for small-scale residential developments enclosing courtyards of public or private open space, on the model of Unwin's superblock at Letchworth, a form quite compatible with either the compact city or the bio-city models of sustainable development (see Figure 9.25).

Figure 9.45 Potsdamer Platz by Hilmer and Sattler (Architectural Design, 1993)

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CONCLUSION 10

INTRODUCTION

There is growing evidence that an environmental crisis of global proportions is inevitable. The extent of that crisis is not clear, nor is its effects on any particular region of the world apparent. What can be expected is major climatic change, including an increasing frequency of extreme weather events, a rising sea level with flooding in some areas, growing pressures on fresh water supplies, food shortages, famine and drought in some regions, growing levels of air, land and sea pollution with fierce competition for a dwindling supply of oil. This litany of hazards we may face on this small planet poses a great political challenge for human society. The professions engaged in city building and restructuring are deeply involved in the efforts to prevent and mitigate the effects of environmental damage caused by a seemingly, irreversible engine of growth. The role that can be played by urban design, in the efforts to achieve development, without causing lasting environmental damage is the theme of this book.

Sustainable development is the strategy which is generally advocated by those who wish to see human society advance without incurring the unacceptable side effects usually accompanying untrammelled economic growth. There is, however, a great danger that 'sustainable development' may come to mean 'all things to all men', and in the process lose all meaning. The previous chapters have demonstrated that there are a number of national and international documents which identify a specific set of requirements for sustainable development. There are also a number of successful experiments in sustainable development at a local level both in land use/transport planning and in architecture and the built environment. Clearly, it is necessary to develop a method and sets of policies for sustainable development which are easily implemented and effective. The results of such methods and policies should be immediately apparent and quantifiable. This chapter will concentrate on the

practical steps that can be taken to achieve a more sustainable urban environment and in particular it will outline those concepts useful in the process of urban design.

Sustainable development is concerned with improving the quality of life of human beings while protecting the biosphere by living within the carrying capacity of the global ecosystem. For those concerned with urban design, it is the meaning and application of this definition for the city and its region which is important. No city, region or even nation state can be completely self-sufficient, economically, socially or environmentally. Sustainable development, however, does imply that at all of these geographic levels the aim should be development which does not export pollution and does not import resources which adversely affect the global ecosystem or negatively affect sustainable development in other territories. Local sustainable development is concerned with improving the quality of life of the local community and, where practicable, living within the carrying capacity of the local environment. In other words, the aim of settlement planning is to ensure that the boundary of a settlement and its supporting hinterland is co-terminus with its ecological footprint. The aim, therefore, is to achieve a high degree of local self-sufficiency. Planning for sustainable development is most effective when the bioregion is the basis of the main planning and administrative unit. That is, when the city is conceived as part of an intricate and overlapping set of eco-systems that make up the bioregion. The city and its region appear to be the natural unit for many decisions affecting local sustainability. For example, sustainable transport may best be planned for 'travel to work' areas. So, too, the management of waste disposal may be most effectively organized at a local city regional scale:

> This is also the most appropriate level for reconciling conflicting demands. Windmills can be scenically intrusive; conifer plantations and short-rotation coppice are better for energy forestry than traditional mixed woodlands; new housing will often generate less extra traffic if it encroaches on a green belt than if it is built the far side of it. . . . Communities will rarely be unanimous about this kind of issue . . . sustainable development is a social goal which can only be arrived at through processes of consultation, shared responsibility and partnership. Democratically elected local government and the planning system are the means by which such choices and decisions are made openly and democratically. (Local Government Management Board, 1993)

POLITICAL FRAMEWORK

A key concept in sustainable development is participation. For citizen participation to be other than gesture, manipulation or tokenism, the structure of government must be organized so that the political process itself becomes participatory. Our current political structures emphasize decision-making by elected representatives and by those to whom power is delegated. 'Subsidiarity' – or the delegation of pertinent decision-making to appropriate lower levels of government – is built into European governance. However, in England, local authorities emasculated under former Conservative administrations do not yet, under a Labour Government, appear to have recovered their former status: a notable exception being London with its elected

Mayor. In the United Kingdom as a whole, the delegation of some powers to Scotland, Wales and potentially to Northern Ireland is a sound basis for sustainable development in those parts of the country. Some form of regional government is necessary within England itself for structured public participation in sustainable development. The precise nature of regional government best suited for implementing sustainable development is unclear, with much room for debate. The city, together with its immediate commuter hinterland, as an administrative unit has much to commend it with powerful arguments in its favour. Nevertheless, a division of England, in particular into fewer 'natural' ecological and cultural regions, is likewise attractive. A combination of a system which has the city region as the basic elected local authority, supported by elected regional governments for about twelve major cultural areas of England, may be the type of compromise which, eventually, will be acceptable. Below the level of the city, there is a need for elected authorities having limited powers, particularly associated with issues affecting local sustainable development. It is at the level of the city quarter that public participation in urban policy formulation may be most appropriate (Moughtin, 2003).

TRANSPORT AND LAND USE

A key variable, which will affect the rate that society moves towards sustainable development, is the transport system operating within the city and throughout its region. Clearly, there are powerful pressures that reinforce the trend towards a decentralized city form dependent upon the motor car. These trends are complemented by lifestyle and cultural preferences, and reinforced by a persuasive and aggressive market. The rhetoric of sustainability is strong, and despite the Government having a strategy for sustainable development since the early 1990s (Sustainable Development: The UK Strategy; DOE, 1994d), the efforts to build an effective public transport system has been less than impressive. For example, the disastrous privatization of the railways and the deregulation of the bus services have had negative effects for a move towards sustainable development, and will take many years to put right. There are hopeful signs: a number of cities have built or are procuring tram or light rail public transport systems (Moughtin, 2003). Certainly some of these transport networks – according to the National Audit Office (NAO) – have failed to attract as many passengers as forecast, or to provide value for money (*Planning*, 30th April, 2004). Since the full environmental cost of private transport is not borne by individual car owners, it is premature to make unfavourable conclusions about the effectiveness of light rail tram systems currently being installed. A closer integration, however, of the light rail systems and other forms of public transport, as the NAO are suggesting, would have a significant impact upon their use. Furthermore, road-pricing mechanisms, such as those introduced in London, when operating in other cities, will go some way towards redressing the economic balance in favour of public transport.

The concept of sustainable development has been included in British planning documents for over a decade. These official documents have been reviewed in earlier chapters. Policy guidance, for example, includes an aim to maximize the opportunity for town centre shoppers, visitors and those

working there to use transport other than the car; it also includes an objective to locate major generators of travel in existing centres at locations well served by public transport and to improve conditions for walking and cycling. Many documents issuing from government and from bodies such as The Royal Commission on Environmental Pollution indicate that sustainable development is a prime policy objective. The latest Government documents, *Consultation Paper on PPS1, Creating Sustainable Communities* and *Community Involvement in Planning: The Government Objectives*, continue the strategy of placing sustainable development at the heart of Government policy (ODPM, 2004a; 2004b). The three key themes of the Government's planning policy are; sustainable development, spatial planning, and community involvement (*Planning*, 2nd April, 2004).

Transport and land use patterns are closely linked. The design of this link can exert a great influence on the level of urban sustainability. The number of trips taken in the motor car has increased over the last few decades, partly because of relatively low motoring costs, but also due to the inadequacy of public transport and because of the changes in land use patterns and the development of road infrastructure. The pattern of development and pattern of investment that favours the car has to change to one where urban form and its infrastructure encourages and supports non-motorized travel and more journeys by public transport, on foot or by bicycle. The urban form, which may make it possible for the behavioral changes that would achieve this objective, would maximize self-sufficiency in cities and their quarters. Movements between and within cities would be reduced if communities were largely self sufficient in employment, environmental services, community, health and educational facilities, shopping and recreation. Such a settlement would be served by public transport with development arranged to support the public transport network. Each quarter of the city would be large enough to support a viable centre, within walking distance of its supporting population.

THE COMPACT CITY

The 'compact city' has been suggested as one way of achieving sustainable urban forms. In this type of city – which has its origins in continental Europe – compact, high-density urban structures of mixed land use are thought to promote walking and cycling as the main modes of movement for short journeys of one mile or less, while reducing considerably the need for longer journeys, which would be made by public transport. High densities are also associated with terrace development and therefore with energy-efficient buildings, and also with economies in the provision of infrastructure such as sewers, drain and water mains. High densities also have advantages for the installation of combined heat and power schemes. High-density urban development is usually associated with the rich townscapes of medieval European cities such as Venice, Florence or Montepulciano. With such a pedigree, the high-density model for sustainable urban form is endowed with a clear aesthetic appeal. This model of sustainable development, in general terms, is being strongly advocated in Continental Europe where it has a long and distinguished cultural history.

Interesting policies for creating the compact city were developed in Holland in

the 1990s. In 1991, there was a change in planning philosophy in Amsterdam which insisted that new urban developments of high density occur within or on the periphery of existing cities, thus reducing the need for mobility. The change in attitude to development involved classifying all proposed developments and redevelopments according to their transport mobility needs and their accessibility characteristics. The policy was specifically designed for urban areas and the location of the main generators of journeys: offices, shops, services, entertainment, recreation and cultural facilities, schools and health facilities. These policies steered developments to appropriate sites. Locations are given accessibility profiles and developments mobility profiles. The aim of the planning process is to match the profile of the developments' needs and the locations' qualities. Existing and potential urban sites were given one of three classifications:

(1) Class A locations are served mainly by public transport, centred on a main railway station and served by a frequent inter-city service to other towns and cities. Stringent car parking standards are applied with the aim that no more than 10 to 20 per cent of commuters travel by car. The area should be pleasant and easy to use by pedestrians, cyclists, the disabled and those with special needs: it should also be well served by other means of public transport.
(2) Class B locations are reasonably well served by good public transport, and have good accessibility from road and motorway interchanges. These areas may be centred on a suburban rail station, a major metro station, a Sneltram (Light Rail) stop or the hub of bus services in a small town. Parking is mainly restricted to the needs of businesses which are moderately dependent on the car for their work.
(3) Class C locations are sited close to motorway interchanges with no plans or requirements for public transport, whereas collective transport such as car and van pooling is encouraged. These locations are intended for business and other activities that have a low work intensity but are dependent on road freight.

The Amsterdam method remains of great interest, for its attempt to distribute activities throughout the urban area, based on a rational analysis of mobility requirements, indeed for the thorough way in which public transport is prioritized (Sturt, 1993).

The British version of the 'compact city' has been fully explored in *Towards an Urban Renaissance* (Urban Task Force, 1999). The main features of this version of the compact city have been mentioned in earlier chapters, but in summary it is based on a regime of densities higher than those normally found in a British suburb. However, these densities are not excessively high. Figure 10.1 illustrates three different ways in which densities of 150 persons per hectare can be accommodated. Figure 10.2 shows a cross-section through a medium-rise residential street block for this density of 150 persons, or 75 residential units per hectare. The compact city of mixed land uses with densities of about 150 persons per hectare supports a bus service and viable centres at the heart of neighbourhoods within a maximum

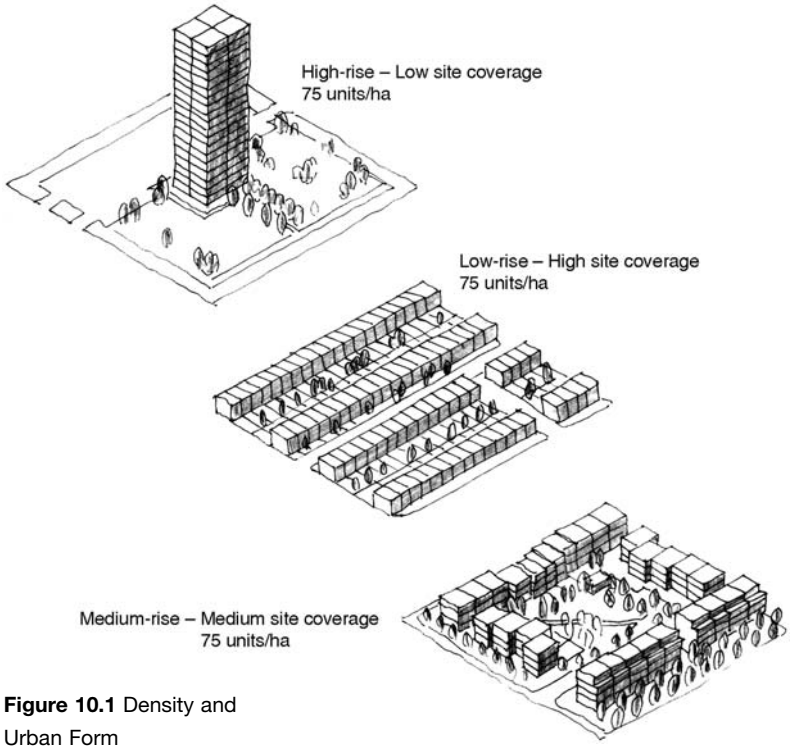
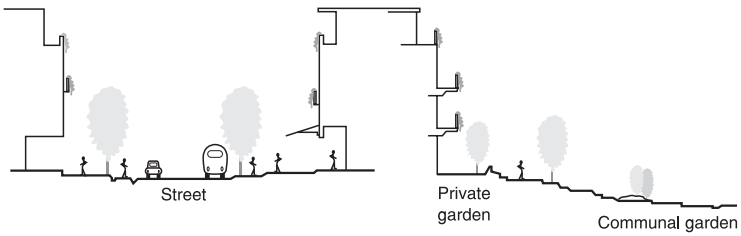


Figure 10.1 Density and Urban Form

walking distance of 500 metres from all homes. A public realm of streets, squares and open spaces link neighbourhoods to each other, the centre and the open countryside. This form of the compact city also follows the long British tradition which extols the virtue of a clear distinction between town and country aiming to contain urban sprawl.

Figure 10.2 Cross-section through a street of mixed uses



LOW-DENSITY SUSTAINABLE DEVELOPMENT

There is another school of thought which proposes low-density settlement as the best way to achieve a sustainable future for humankind. The 'eco-village' with its 'back to basics' philosophy has a long pedigree, its lifestyle representing a worthy aim. It is obviously a practical proposition for a small-dedicated group living in the countryside, but as a solution to the immediate problems of a highly urbanized country such as Britain it has strictly limited relevance. It is at an extreme end position of a scale or continuum of possible sustainable development strategies. At the other extreme of this continuum, is the very high-density compact city, as illustrated by Rogers' (1997) thought-provoking project for *Lu Zia Sui*, an extension to *Shanghai* (Figure 10.3).

Closer to the mid point of this continuum of urban forms that purport to deliver sustainable development is the very British Garden City and its offshoot, the garden suburb. Those who advocate these forms of development point out that low densities have many advantages for sustainable development, such as the ease of installing solar heating for each home, the possibility of extensive vegetable gardens and allotments, and the recycling of organic domestic wastes. It is argued that, while the compact city may result in urbane landscapes, it does little to meet the cultural preference of the British public. The argument develops further by pointing to the centrality of public participation in the delivery of sustainable development, and surely the voice of the British public could not make clearer – both through the findings

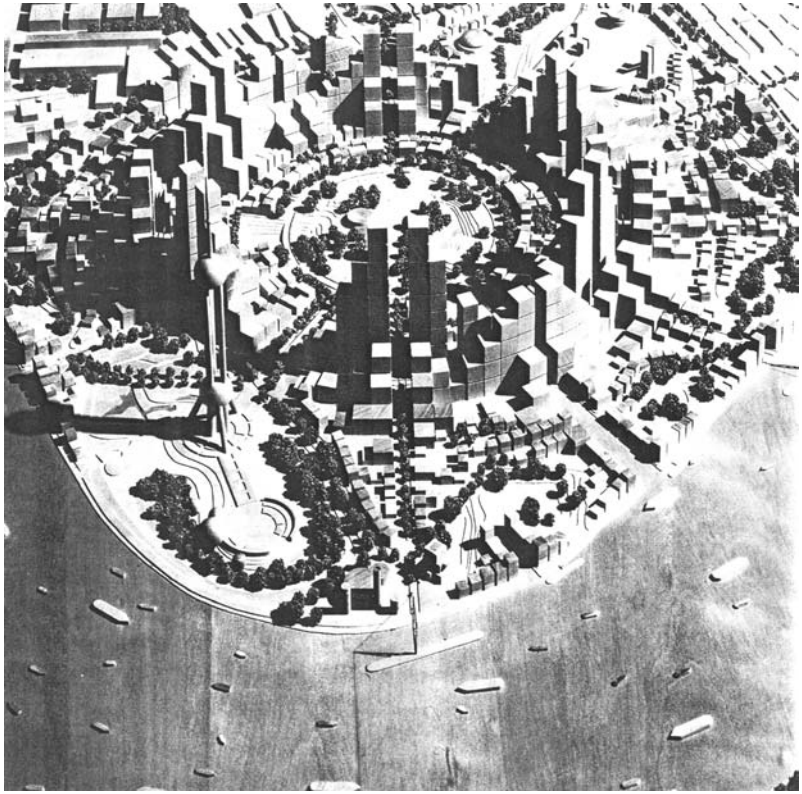


Figure 10.3 Project for Lu Zia Sui, Shanghai (Rogers and Gumuchdjan, 1997) © Eamonn O'Mahony. The Richard Rogers Partnership.

of public participation exercises and by their market preferences – a strong preference for the home in its own garden. Sustainable city planning must come to terms with the vast suburbia enveloping most towns and cities that will survive for many decades. This existing suburbia is also determining the housing preferences for the next generation. In this country any move towards higher net densities will be slow if the views of the British people are taken into account (*Urban Design Quarterly*, 2004 Spring Issue).

Open green space in and around cities is important for a number of reasons. These include: the function of soil and its vegetation as a carbon sink; the function of the tree cover as an 'atmospheric scrubber' removing particulate pollution; the function of green areas as protectors of flora and fauna; and the maintenance of biodiversity. In addition to these environmental functions, the green areas associated with cities provide areas for recreation, food production and economic tree cropping. The reasons for protecting the countryside and enhancing the landscaping in and around cities are manifold. An important by-product of caring for the natural landscape is the great aesthetic pleasure it affords the citizen. With such great benefits to mankind, there should be no problem with conservation of the landscape in and around cities, as Barton *et al*. (1995) point out: 'Nature conservation is not contentious in principle, but when

"balanced" against need for development, tends to be marginalized in reality. Sustainable development takes more account of the intrinsic value of the natural capital, and requires that any proposed development – once justified in terms of actual human need – respects the natural environment as the context within which it should fit.' (See Chapter 5 for a full account of the natural environment and the need for its protection.)

The concept of the bio-city has been introduced in earlier chapters. The bio-city – like the British version of the compact city and the Garden City – sits somewhere in the mid-range along a continuum of ideas for sustainable urban forms. The bio-city is structured around public transport with residential densities close to the Garden City model and in tune with housing preferences in this country. There may be higher densities in existing centres and at points of urban concentration, but generally speaking a bio-city gives priority to the need for space in the city. Walking distances between home, public transport stop and central facilities are longer than the 500 metres which is a feature of the compact city. The bio-city, however, incorporates many desirable features of the compact city, such as preference for mixed land uses, a mix of house types and a spine of public domain linking the parts of the city with the surrounding countryside.

The bio-city is connected to, and is an intrinsic part of, the overlapping eco-systems that comprise its bioregion: it extends nature into the heart of urban areas. There is no sharp boundary between town and country: no 'ha-ha' to separate the manicured town from the dirt, mud and untidiness of the country. The boundary between town and country is simply a zone of transition, the kind of messy edge that surrounds all settlements in the countryside. Fingers of linear development arranged along public transport routes stretch out from the countryside to embrace the city, accepting human settlement as a part of nature's bioregion.

The star-shaped city is an urban form that may prove to be useful for the spatial organization of small to moderately sized bio-cities. It offers a prospect for the development of urban corridors based on a public transport spine, alternating with continuous landscape features, connecting the innermost parts of the urban areas with the working countryside. Green corridors permit the movement of wildlife within cities and, if formed of indigenous vegetation, they provide a rich habitat for a diversity of flora and fauna. A number of cities – Leicester for example – are developing this idea of the green corridor as a tool both for the protection of biodiversity and to provide a sense of continuity between town and country. Other features of the city's landscape plan would include the protection of large-scale refuges for the management of areas of ecological interest. Where it is not possible to connect refuges and other landscape features into corridors, small stepping stones or areas of vegetation can be used to provide shelter for local wildlife in transit between them: areas of private open space such as networks of rear gardens, green building façades and roof gardens complete a system of havens for small creatures.

THE QUARTER

The quarter is the main component of urban design. It is also fundamental for sustainable

development, particularly when the idea of a physical area of homogeneous architectural character is linked with the notion of the quarter as a political unit within the city. Effective sustainable development is linked with the idea of public participation in decision-making and with people taking responsibility for the environment. For example, the catch phrase; 'think globally; act locally' is linked with the Local Agenda 21 movement, which exhorts people to become involved with the concerns for their immediate environment. Local action, built on public participation, requires the legitimacy of a political structure and a population or power base big enough to challenge the views of the city authority, but small enough to encourage high levels of participation. The area it occupies and the density of occupation determine the population of a quarter. There is a growing consensus which would limit the area of a quarter to one which is determined by the comfortable walking distance from the perimeter to its centre. There is no absolute or perfect population size for the quarter. Ideas vary from Jacobs' recommendation of a population of 100 000, to the British 1950s' new town neighbourhood of 5000 people. The size of the quarter may vary with the size of the city, the densities acceptable in the locality, or the general culture of the community occupying the city. Most cities, however, are sub-divided into traditional quarters, which can be named and recognized by the inhabitants of the city. These traditional quarters should be the starting point for the definition of the political unit for purposes of public participation. More important than size is delegated political power, in the form of an elected body, with a recognized role. Anything short of a political structure is the emasculation of the idea of the quarter for purposes of local action for sustainable development: the quarter in these circumstances is little more than a device for developing areas with distinctive visual identity, but without social raison d'être.

THE STREET BLOCK

The street block of between an acre and hectare in extent, surrounded by two- three- or four-storey perimeter development, appears to be the basic urban form being advocated for city infill by a growing consensus of designers. It is a particularly appropriate form of street block for the higher densities associated with the compact city. This form of urban insulae, when it comprises a mix of uses, has advantages for the purposes of sustainable development. City centres, where large street blocks were formed when redevelopment occurred, have resulted in the destruction of the original fine grain of the traditional city. Large street blocks occupied by single uses, often in single ownership, destroy the vigour and vitality of the city, particularly if the sections of the city they occupy die at night or at the weekend. The arrest and reverse of this process is one of the reasons for the current preoccupation with the design of small-scale insulae or street blocks generating many different types of activity. Where street blocks are designed primarily for residential use, the backs of the properties can face onto shared external semi-private space: 'A small area of external space can be directly related to each housing group, dedicated to shared activities and uses. . . . The distribution of open spaces relating directly to small housing groups may result in a more economical use of space, of higher quality, with better maintenance, than

the specification of a single large area of public open space' (Barton *et al.*, 1995). There is a fine model at Letchworth designed by Unwin for this method of siting small groups of housing. The homes arranged around the perimeter of the block have individual gardens and, in some cases, there is also a communal vegetable garden or allotments in the internal court (see Figures 9.25 to 9.27). The traditional morphology of the medieval European town on which Unwin based many of his own writings, is still a sound basis for developing a form of insulae suited to the needs of the sustainable city.

BUILDING FORM

There are two types of energy used in buildings (Vale and Vale, 1993). The first is the energy used to construct the building, which becomes the energy capital, analogous to the capital value of the completed property. The second is energy revenue or energy used to service, operate and maintain the building. In any decision to demolish, rebuild or refurbish a building, both types of energy-consumption in each option should be assessed and, in theory, the decision should favour the development that is most economic in the expenditure of energy, particularly from non-renewable energy sources. There are a number of design principles which help in this delicate balancing act and which assist in achieving energy conservation in buildings. The first principle of sustainable building is a preference for – and a presumption in favour of – the conservation of buildings and their adaptation to new uses. An extension of this principle is a strong preference for the re-use and recycling of building materials and components in the construction of new buildings and infrastructure, as opposed to the use of new materials and components straight from the factory or quarry. The second principle requires the use of local or regional materials where possible and particularly, where those materials require low energy inputs in fabrication, transportation to the site and in the construction process itself. The third principle is to avoid those materials that cause environmental damage such as the destruction of the tropical rain forest, or which leave behind scars on the landscape. The fourth principle is to relate buildings to the local environment and particularly to the local climate: for example, in a cold climate to insulate the building effectively; to reduce to a minimum the amount of external wall surface; to orientate the building towards the sun; to provide a buffer on the cold north face; and to build conservatories on the sunny façades. The fifth principle is to design flexible buildings that will stand up to the test of time. Buildings should be designed to accommodate many types of activities and uses beneath the same roof, so that floor plans can be adapted for different purposes during their lifetime. Finally, new buildings should be located on public transport routes and with close connections to other parts of the urban infrastructure. Wherever possible, buildings should be erected on urban infill sites, providing the site is not of ecological importance. Buildings should fit into the street block as perimeter development and complement the local street scene, with most development being two, three to four storeys high and therefore without the need for lifts.

CONCLUSION

The requirements of sustainable development can be accommodated within the current agenda in urban design. Some current preoccupations of the urban designer, such as the form of urban space, the vitality and identity of urban areas, qualities of urbanity, respect for tradition and the preferences for developments of human scale, can all be encompassed within the schema of sustainable development. Sustainable development and urban design are closely linked. However, good urban design is not sufficient, alone, for the delivery of sustainable development: whole sets of actions in other fields such as governance, bioregional planning, alternative technologies, rural and economic development may have greater significance for achieving sustainable development. The aim of sustainable development gives functional legitimacy to the process of urban design, but the delivery of sustainable development is dependent more upon the regional form of governance rather than upon a particular city form. Sustainable development is more likely to occur when local communities take responsibility for their own particular environment, though to take such responsibilities seriously effective power must return to local communities. It is effective public participation that is also the foundation of good urban design.

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BIBLIOGRAPHY

Abercrombie, P. (1945) *Greater London Plan*, London: HMSO.

Alberti, L.B. (1955) *Ten Books on Architecture* (trans. Cosimo Bartoli into Italian and James Leoni into English), London: Tiranti.

Alexander, C. (1965) 'A City is not a Tree': *Architectural Forum*, April pp. 58–62, May pp. 58–61.

Alexander, C. (1979) *The Oregon Experiment*, Oxford: Oxford University Press.

Alexander, C. (1979a) *A Timeless Way of Building*, New York: Oxford University Press.

Alexander, C. *et al.* (1977) *A Pattern Language*, New York: Oxford University Press.

Alexander, C. *et al.* (1987) *A New Theory of Urban Design*, Oxford: Oxford University Press.

Amourgis, S. (ed.) (1991) *Critical Regionalism*, California: University of Pomona.

Architectural Design (1993) *New Practice in Urban Design*, London: Academy Editions.

Aristotle (1981) *The Politics* (trans. T.A. Sinclair, revised by T.J. Saunders), Harmondsworth: Penguin.

Banister, D. *et al.* (2000) *European Transport Policy and Sustainable Mobility*, London: Spon.

Barker, G. (1997) *A Framework for the Future: Green Networks with Multiple Uses in and Around Towns and Cities*, English Nature Report No. 256.

Barton, H. *et al.* (1995) *Sustainable Settlements*, Luton: L.G.M.B.

Barton, H. *et al.* (2003) *Shaping Neighbourhoods*, London: Spon Press.

Bennett, H. *et al.* (1961) *The Planning of a New Town*, London: HMSO.

Benson, J. F. and Roe, M.H. (2000) *Landscape and Sustainability*, London: Spon.

Bentley, I. *et al.* (1985) *Responsive Environments*, Oxford: Butterworths.

Beresford, M. (1967) *New Towns of the Middle Ages*, London: Lutterworth Press.

Birkeland, J. (2002) *Design for Sustainability: A Source Book of Integrated Eco-logical Solutions*, London: Earthscan.

Birmingham City Council (1997) *Nature Conservation Strategy for Birmingham*, Birmingham: Birmingham City Council.

Blowers, A. (ed.) (1993) *Planning for a Sustainable Environment*, London: Earthscan.

Blumenfeld, H. (1949) 'Theory of City Form: Past and Present', *Journal of the Society of Architectural Historians*, Vol. 8, July.

Bongaarts, J. (2002) ''Population: Ignoring its Impact'' in *Scientific American*, January pp. 65–67.

Box, J. and Harrison, C. (1993) ''Natural Spaces in Urban Places'', *Town and Country Planning*, 62, pp. 231–235.

Boyd, A. (1962) *Chinese Architecture and Town Planning*, London: Tiranti.

Boyd, C. *et al.* (1945) *Homes for the People*, London: HMSO.

Breheny, M. and Rookwood, R. (1993) 'Planning the Sustainable Region', in *Planning for a Sustainable Environment*, ed. A. Blowers, London: Earthscan.

Bruges, J. (1992) 'Changing Attitudes to the City': *Urban Design Quarterly*, July, Issue 43, pp. 23–25.

Brunckhorst, D.J. (2000) *Bioregional Planning: Resource Management Beyond the New Millennium*, London: Routledge.

Buchanan, C.D. (1963) *Traffic in Towns*, London: HMSO.

Buchanan, C.D. (1963a) *Traffic in Towns: The Specially Shortened edition of the Buchanan Report*, Harmondsworth: Penguin.

Buchanan, C.D. *et al*. (1966) *South Hampshire Study*, London: HMSO.

Callenbach, E. (1978) *Ecotopia*, London: Pluto Press.

Calthorpe, P. (1993) *The Next American Metropolis*, New York: Princetown Architectural Press.

Camblin, G. (1951) *The Town in Ulster*, Belfast: Mullan.

Capra, F. (1985) *The Turning Point*, London: Flamingo.

Carmona, M. *et al*. (2003) *Public Places – Urban Spaces*, Oxford: Architectural Press.

Carpenter, R. (1970) *The Architects of the Parthenon*, Harmondsworth: Penguin.

Carson, R. (1962) *Silent Spring*, Harmondsworth: Penguin.

Civic Trust and Ove Arup (2001) *Sustainable Suburbs: Developing the Tools*, London: Civic Trust.

Chadwick, G.F. (1966) 'A Systems View of Planning': *Journal of the Town Planning Institute*, Vol. 52, pp. 184–186.

Christaller, W. (1933) *Die zentrallen Orte in Suddeutschland*, Jena: Gustav Fischer.

Christaller, W. (1966) *Central Places in Southern Germany* (trans. C.W. Baskin), Englewood Cliffs, New Jersey: Prentice Hall.

Clifton-Taylor, A. (1972) *The Pattern of English Building*, London: Faber and Faber.

Colvin, B. (1948) *Land and Landscape*, London: John Murray

Commission for Architecture and the Built Environment (2001) *Better Places to Live: a Companion Guide to PPG3*, London: CABE.

Commission for Architecture and the Built Environment (2004) *Design Reviewed*, London: CABE.

Commission of the European Communities (1990) *Green Paper on the Urban Environment*, Luxembourg: CEC.

Commission of the EC (1992) *Towards Sustainability: A European Community Programme of Policy and Action in relation to the Environment and Sustainable Development*, Official Publication of the EC (Cm (92) 23/11 Final).

Constanza, R. *et al*. (1997) 'The Value of the World's Ecosystem Services and Natural Capital', *Nature*, Vol. 387, pp. 253–260.

Constanza, R. *et al*. (1998) 'The Value of Ecosystem Services: Putting the issues in perspective', *Ecological Economics*, Vol. 25, pp. 67–72.

Countryside Agency (2001) *Public Park Assessment*, Heritage Lottery Fund.

Cullen, G. (1961) *Townscape*, London: Architectural Press.

Day, C. (1990) *Spirit and Place*, Oxford: Architectural Press.

de Bono, E. (1977) *Lateral Thinking*, Harmondsworth: Penguin.

Denyer, G. (1978) *African Traditional Architecture*, London: Heinemann.

Department for Environment, Food and Rural Affairs (2002) *Foundations for our Future*, London: DEFRA.

Department for Environment, Food and Rural Affairs (2003) *Regional Quality of Life Counts – 2002: Regional versions of the National Headline Indicators of Sustainable Development*, London: DEFRA.

Department of the Environment (1969) *Committee on Public Participation: The Skeffington Report*, London: HMSO.

Department of the Environment (1990) *This Common Inheritance, Britain's Environmental Strategy*, CM 1200, London: HMSO.

Department of the Environment (1992a) *Development Plans, A Good Practice Guide*, London: HMSO.

Department of the Environment (1992b) *Planning, Pollution and Waste Management*, London: HMSO.

Department of the Environment (1993) *Planning Policy Guidance: PPG6, Town Centres and Retail Development (Revised)*, London: HMSO.

Department of the Environment (1993a) *Reducing Transport Emissions Through Planning*, London: HMSO.

Department of the Environment (1993b) *Environmental Appraisal of Development*, London: HMSO.

Department of the Environment (1993c) *Planning Policy Guidance, Town Centres and Retail Developments, PPG6 (Revised)*, London: HMSO.

Department of the Environment (1994) *Planning Policy Guidance Note 9: Nature Conservation*, London: HMSO.

Department of the Environment (1994a) *Climate Change: The UK Programme*, London: HMSO.

Department of the Environment (1994b) *Biodiversity: The UK Action Plan*, London: HMSO.

Department of the Environment (1994c) *Sustainable Forestry: The UK Programme*, London: HMSO.

Department of the Environment (1994d) *Sustainable Development: The UK Strategy*, London: HMSO.

Department of the Environment and Department of Transport (1994) *A Guide to Better Practice: Reducing the Need to Travel through Land Use and Transport Planning*, London: HMSO.

Department of the Environment, Transport and the Regions (1999a) *The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999*, London: Stationery Office.

Department of the Environment, Transport and the Regions (1999b) *Planning Policy Guidance Note 12, Development Plans*, London: Stationery Office.

Department of the Environment, Transport and the Regions (1999c) *Planning Policy Guidance Note 11, Regional Planning: Public consultation draft*, Norwich: HMSO.

Department of the Environment, Transport and the Regions (1999d) *A Better Quality of Life: A Strategy for Sustainable Development in the UK*, London: HMSO.

Department of the Environment, Transport and the Regions (2000) *Transport 2010: The 10 Year Plan*, Norwich, HMSO.

Department of the Environment, Transport and the Regions (2000a) *Planning Policy Guidance, Note 3, Housing*, London: Stationery Office.

Department of the Environment, Transport and the Regions (2000b) *Climate Change: Draft UK Programme*, Norwich: HMSO.

Department of the Environment, Transport and the Regions (2000c) *The Government's Response to the Environment, Transport and Regional Affairs Select Committee's Report: UK Climate Change Programme*, London: Stationery Office.

Department of the Environment, Transport and the Regions (2000d) *Planning Policy Guidance Note 11, Regional Planning*, London: Stationery Office.

Department of the Environment, Transport and the Regions (2000e) *Our Countryside: A Fair Deal for Rural England (The Rural White Paper)*, London: Stationery Office.

Department of the Environment, Transport and the Regions (2000f) *Our Towns and Cities: The Future (The Urban white Paper)* London: Stationery Office.

Department of the Environment, Transport and the Regions (2001a) *Planning Policy Guidance, Note 13, Transport, PPG13*, London: Stationery Office.

Department of the Environment, Transport and the Regions (2001b) *Planning Policy Guidance Note 25, Flood Risk*, London: Stationery Office.

Department for Transport, Local Government and the Regions (2001a) *Better Places to Live: A companion guide to PPG3*, London: HMSO.

Department for Transport, Local Government and the Regions (2001b) *Green Spaces, Better Places: Final Report of The Urban Green Spaces Task Force*, London: Stationery Office.

Department for Transport, Local Government and the Regions (2002) *Planning Green Paper, Planning: Delivering a Fundamental Change*, London: DTLR.

Dethier, J. (1981) *Down to Earth* (trans. Ruth Eaton), London: Thames and Hudson.

Diamond, J. (1997) *Guns, Germs and Steel*, London: Vintage.

Dobson, A. (1990) *Green Political Thought*, London: HarperCollins Academic.

Dobson, A. (1991) *The Green Reader*, London: Andre Deutsch.

Doxiadis, C.A. (1968) *Ekistics*, London: Hutchinson.

Dutt, B.B. (1925) *Town Planning in Ancient India*, Calcutta: Thacker, Soink. (Reprint 1977, Delhi: Nai Sarak.)

Elkin, T. *et al*. (1991a) *Reviving the City*, London: Friends of the Earth.

Elkin, T., *et al*. (1991b) *Towards Sustainable Urban Development*, London: Friends of the Earth.

English Nature (1992) *Strategic Planning and Sustainable Development*, Peterborough: English Nature.

Engwicht, D. (1992) *Towards an Eco-city, Calming the Traffic*, Sydney: Envirobook.

European Conference of Ministers of Transport (ECMT) (1993) *Transport Policy and Global Warming*, Paris: OECD.

Farmer, J. (1996) *Green Shift: Towards a Green Sensibility in Architecture*, Oxford: Butterworth Architectural Press.

Fairman, H.W. (1949) 'Town Planning in Pharaonic Egypt', *Town Planning Review*, April, pp. 32–51.

Fawcett, C.B. (1961) *Provinces of England, revised edition*, London: Hutchinson.

Forestry Commission, *England Forestry Strategy: A new Focus for England's Woodlands, Strategic Priorities and Programmes*, Cambridge: Forestry Commission.

Fox, A. and Murrell, R. (1989) *Green Design*, London: Architectural Design and Technology Press.

Frankfort, H. (1954) *The Art and Architecture of the Ancient Orient*, Harmondsworth: Penguin.

Futagawa, Y. (ed.) (1974) *Le Corbusier – Chandigarh, the New Capital of Punjab, India 1951*, Tokyo: A.D.A Edita.

Geddes, P. (1949) *Cities in Evolution*, London: Williams and Norgate.

Ghazi, P. (1995) 'Motorists to Face Blitz on Pollution': *The Observer*, 12 February, p. 2.

Gibberd, F. (1955) *Town Design*, London: Architectural Press.

Gibson, T. (1979) *People Power*, Harmondsworth: Penguin.

Giedion, S. (1954) *Space, Time and Architecture*, 3rd edition, enlarged 1956, Cambridge, Massachusetts: Harvard University Press.

Gilbert, O. L. (1989) *The Ecology of Urban Habitats*, Chapman & Hall.

Giradet, H. (1992) *The Gaia Atlas of Cities*, London: Gaia Books.

Giradet, H. (1999) *Creating Sustainable Cities*, London: Green Books.

Glancey, J. (1989) *New British Architecture*, London: Thames and Hudson.

Glasson, J. (1978) *An Introduction to Regional Planning, second edition*, London: Hutchinsons.

Glasson, J., Therival, R. and Chadwick, A. (1994) *Introduction to Environmental Impact Assessment*, London: UCL Press.

Gordon, W.J.J. (1961) *Synectics: the Development of Creative Capacity*, New York: Harper Row.

Gosling, D. and Maitland, B. (1984) *Concepts of Urban Design*, London: Academy Editions.

Government Office for the East Midlands (2003) *Regional Planning Guidance for the East Midlands to 2021: Towards a Regional Spatial Strategy, Public Consultation Draft*, East Midlands, East Midlands Regional Local Government Association.

Gropius, W. (1935) *New Architecture and the Bauhaus* (trans. P.M. Shand and F. Pick), London: Faber and Faber.

Guidoni, E. (1975) *Primitive Architecture*, London: Faber and Faber.

HRH The Prince of Wales (1989) *A Vision of Britain*, London: Doubleday.

Hagan, S. (2001) *Taking Shape, A New Contract between Architecture and Nature:* Oxford, Architectural Press.

Hardin, G. (1977) 'The Tragedy of the Commons', in *Managing the Commons*, eds. G. Hardin and J. Baden, San Francisco: Freeman and Co.

Harvey, D. (1973) *Social Justice and the City*, London: Edward Arnold.

Herbertson, A.J. (1905) 'The Major Natural Regions', *Geographical Journal*, Vol. 25.

Holdren, J. P. (2002) 'Energy: Asking the Wrong Question', in *Scientific American*, January, pp. 63–65.

Horton, R. (1971) 'Stateless Societies in the History of West Africa', *History of West Africa, Vol. 1*, eds. J.F.A. Ajayi and M. Crowder, London: Longmans.

Houghton-Evans, W. (1975) *Planning Cities: Legacy and Portent*, London: Lawrence and Wishart.

House Commons, Environment, Transport and Regional Affairs Committee (2000) *Twenty Second Report of The Royal Commission on Environmental Pollution: Energy and the Changing Climate*, cmnd 666, Norwich: HMSO.

House of Commons, Environment, Transport and Rural Affairs Committee (5th July 2000) *Minutes of Evidence*, London: HMSO.

Howard, E. (1965) *Garden Cities of Tomorrow*, London: Faber and Faber.

Hugo-Brunt, M. (1972) *The History of City Planning*, Montreal: Harvest House.

Irving, R.G. (1981) *Indian Summer*, New Haven: Yale University Press.

Jacobs, J. (1965) *The Death and Life of Great American Cities*, Harmondsworth: Penguin.

Jenks, M. *et al.* (1996) *The Compact City: A Sustainable Urban Form?* London: Spon.

Kenny, M. and Meadowcroft, J. (eds.) (1999) *Planning Sustainability*, London: Routledge.

Koenigsberger, O.H. *et al.* (1973) *Manual of Tropical Housing, Part 1, Climate Design*, London: Longman.

Kopp, A. (1970) *Town and Revolution* (trans. Burton), London: Thames and Hudson.

Korn, A. and Samuelly, F.J. (1942) 'A Master Plan for London': *Architectural Review*, No. 546, June, pp. 143–150.

Krier, R. (1979) *Urban Space*, London: Academy Editions.

Krier, L. (1978) *Rational Architecture*, Brussels: Archives d'Architecture Moderne.

Krier, L. (1984) *Houses, Palaces and Cities*, ed. D. Porphyrios, London: Academy Editions.

Krier, L. and Krier R. (1993) 'Berlin Government Centre', in *Architectural Design, New Practice in Urban Design*, London: Academy Editions.

Le Corbusier (1946) *Towards a New Architecture*, London: Architectural Press.

Le Corbusier (1947) *Concerning Town Planning*, London: Architectural Press.

Le Corbusier (1967) *The Radiant City*, London: Faber and Faber.

Le Corbusier (1971) *The City of Tomorrow*, London: Architectural Press.

Le Corbusier and de Pierrefeu, F. (1948) *The Home of Man*, London: The Architectural Press.

Leicester City Council (1989) *Leicester Ecology Strategy*, *Part One*, *Leicester*: Leicester City Council.

Leicester City Council (1995) *A City Centre for People (Draft)*, Leicester: Leicester City Council.

Lincoln City Council (undated) *Lincoln's Brayford Area: Towards the Millennium*, Lincoln: Lincoln City Council.

Lincoln City Council (2001) *Brayford Wharf North Area*, Lincoln: Lincoln City Council.

Ling, A. (1967) *Runcorn New Town Master Plan*, Runcorn: Runcorn Development Corporation.

Lip, E. (1989) *Feng Shiu for Business*, Singapore: Times Editions.

Llewellyn-Davies, R. (1966) *Washington New Town Master Plan*, Washington: Washington Development Corporation.

Llewellyn-Davies, R. (1970) *The Plan for Milton Keynes*, Bletchley: Milton Keynes Development Corporation.

Lloyd, K. and Fawcett, P. (24th October 1996) 'Building Study: University of Lincolnshire and Humberside', in *Architects Journal* pp. 30 and 31.

Lloyd Wright, F. (1957) *A Testament*, New York: Horizon Press.

Lloyd Wright, F. (1958) *The Living City*, New York: Mentor Books.

Local Government Management Board (1993) *A Framework for Local Sustainability*, Luton: LGMB.

Lomborg, B. (2001) *The Skeptical Environmentalist, Measuring the Real State of the World*, Cambridge: Cambridge University Press.

London Wildlife Trust (2002) *Brownfield? Greenfield? – The Threat to London's Unofficial Countryside*, London: London Wildlife Trust.

Lovejoy, T. (2002) 'Biodiversity: Discussing Scientific Process', in *Scientific American* January pp. 67–69.

Lovelock, J. (1979) *Gaia: A New Look at Life on Earth*, Oxford: Oxford University Press.

Lynch, K. (1960) *The Image of the City*, Cambridge, Massachusetts: MIT Press.

Lynch, K. (1981) *A Theory of Good City Form*, Cambridge, Massachusetts: MIT Press.

March, L. (1974) 'Homes beyond the fringe', in *The Future of Cities*, ed. A. Blowers, London: Hutchinson, pp. 167–178.

Marras, A. (ed.) (1999) *Eco-tec*, *Architecture of the In-Between*, New York: Princeton Architectural Press.

Martin, L. (1974) 'The Grid as Generator', in *The Future of Cities*, ed. A. Blowers, London: Hutchinson, pp. 179–189.

Martin, L. and March L. (eds.) (1972) *Urban Space and Structures*, London: Cambridge University Press.

Mather, R. (2001) *University of Lincoln: Masterplan Report*, London: Rick Mather Architects Ltd.

Matthew, R. (1967) *Central Lancashire: Study for a City*, London: HMSO.

Macdonald, R. (1989) 'The European Healthy Cities Project', *Urban Design Quarterly*, April, pp. 4–7.

McHarg, I. (1969) *Design with Nature*, New York: Natural History Press.

McKei, R. (1974) 'Cellular Renewal', *Town Planning Review*, Vol. 45, pp. 274–290.

McLaughlin, J.B. (1969) *Urban and Regional Planning: A Systems Approach*, London: Faber.

Meadows, D.H. *et al.* (1972) *The Limits to Growth*, London: Earth Island.

Meadows, D.H. *et al.* (1992) *Beyond the Limits*, London: Earthscan.

Miliutin, N.A. (1973) *Sotsgorod: The Problem of Building Socialist Cities*, eds. G.R. Collins and W. Alex (trans. A Sprague), Cambridge, Massachusetts: MIT Press.

Millon, R. (1973) *Urbanization at Tetihuacan*, Mexico, Austin: University of Texas Press.

Mollinson, B. (1996) *Permaculture: A Designer's Manual*, 5th edn. New South Wales: Tagari.

Morris, A.E.J. (1972) *History of Urban Form*, London: George Godwin.

Moughtin, J.C. and Simpson, A. (1978) 'Do it yourself planning in Raleigh Street': *New Society*, 19th October, pp. 136–137.

Moughtin, J.C. (1985) *Hausa Architecture*, London: Ethnographica.

Moughtin, J.C. (ed.) (1988) *The Work of Z.R. Dmochoski*, Nigerian Traditional Architecture, London: Ethnographica.

Moughtin, J.C. *et al.* (1992) *Who Needs Development? Planning with the poor in Third World Countries*, Nottingham: The University of Nottingham.

Moughtin, J.C., Oc, T. and Tiesdell, S.A. (1995) *Urban Design: Ornament and Decoration*, Oxford: Butterworth.

Moughtin, J.C. (2003) *Urban Design: Street and Square*, Oxford: Architectural Press.

Moughtin, J.C. *et al*. (2003a) *Urban Design: Method and Techniques*, Oxford: Architectural Press.

Mumford, L. (1938) *The Culture of Cities*, London: Secker and Warburg.

Mumford, L. (1946a) *City Development*, London: Secker and Warburg.

Mumford, L. (1946b) *Technics and Civilization*, London: George Routledge.

Mumford, L. (1961) *The City in History*, Harmondsworth: Penguin.

Nicolas, G. (1966) 'Essai sur les structures fondamentales de l'espace dans la cosmologie hausa', *Journal de societié des Africanistes*, Vol. 36, pp. 65–107.

Nicholson-Lord, D. (2002) *Green Cities – And Why We Need Them*, New Economics Foundation.

Norberg-Schulz, C. (1971) *Existence, Space and Architecture*, London: Studio Vista.

Office of the Deputy Prime Minister (2002), *Planning Policy Guidance, Note 17: Planning for Open Space, Sport and Recreation*, London: Stationery Office.

Office of the Deputy Prime Minister (2003) *Draft Consultation Paper on a New Planning Policy Statement 7 (PPS7) – Sustainable Development in Rural Areas*, London: ODPM.

Office of the Deputy Prime Minister (2003a) *Consultation Paper on Draft New Planning Policy Statement 22 (PPS 22): Renewable Energy*, London: ODPM.

Office of The Deputy Prime Minister (2003b) *Reducing Local Plan Requirements (Circular)*, London: ODPM.

Office of the Deputy Prime Minister (2004) *Changing the Culture: How the Planning Reforms are Set to Reinvent the Profession*, London: ODPM and Planning.

Office of the Deputy Prime Minister (2004a) *Consultation Paper on PPS1: Creating Sustainable Communities*, London: ODPM.

Office of the Deputy Prime Minister (2004b) *Community Involvement in Planning: The Government's Objectives*, London: ODPM.

Ons Amsterdam (1973) *Amsterdamse School*, Amsterdam.

Osborn, F.J. and Whittick, A. (1977) *New Towns*, London: Leonard Hill.

Owens, S. (1991) *Energy Conscious Planning*, London: CPRE.

Oxford, M. (2000) *Developing Naturally: A Handbook for Incorporating the Natural Environment into Planning and Development*, The Association of Local Government Ecologists and English Nature.

Pateman, C. (1970) *Participation and Democratic Theory*, Cambridge: Cambridge University Press.

Pearce, D. *et al*. (1989) *Blueprint for a Green Economy*, London: Earthscan.

Pearce, D. *et al*. (1993) Blueprint 3, *Measuring Sustainable Development*, London: Earthscan.

Pearce, D. and Moran, D. (1994) *The Economic Value of Biodiversity*, London: Earthscan Publications.

Pehnt, W. (1973) *Expressionist Architecture*, London: Thames and Hudson.

Perry, C. (1929) *The Neighbourhood Unit*, *The Regional Plan of New York and its Environs*, Vol. 7, New York: Regional Plan Association.

Plato (1975) *The Laws* (trans. T.J. Saunders), Harmondsworth: Penguin.

Platt, C. (1976) *The English Medieval Town*, London: Martin Secker and Warburg.

Ponting, C. (1991) *A Green History of the World*, Harmondsworth: Penguin.

Public Works Department, Amsterdam (1975) *Amsterdam*, *Planning and Development*, Amsterdam: The Town Planning Section, Public Works Department.

Riddell, R. (1981) *Ecodevelopment*, Farnborough: Gower.

Riddell, R. (2004) *Sustainable Urban Planning*, Bodmin: Blackwell.

Redclift, M. (1999) 'Pathways to Sustainability: Issues, Policies and Theories', in Kenny, M. and Meadowcroft, J. *Planning Sustainability*, London: Routledge, pp. 66–77.

Rees, M. (2003) *Our Final Century: Will the Human Race Survive the Twenty-First Century?* London: Heinemann.

Richards, B. (2001) *Future Transport in Cities*, London: Spon.

Roelofs, J. (1996) *Greening Cities*, New York: Bootstrap Press.

Rogers, R. (1995a) 'Looking Forward to Compact City: Second Reith Lecture', *The Independent*, 20th February.

Rogers, R. (1995b) 'The Imperfect Form of the New: Third Reith Lecture', *The Guardian*, 21st February.

Rogers, R. and Gumuchdjan, P. (1997) *Cities for a Small Planet*, London: Faber and Faber.

Rogers, R. and Power, A. (2000) *Cities for a Small Country*. London: Faber and Faber.

Rose, R. (1971) *Governing without Consensus*, London: Faber and Faber.

Rosenau, H. (1974) *The Ideal City*, London: Studio Vista.

Royal Commission on Environmental Pollution (1974) *Fourth Report, Pollution Control, Progress and Problems*, Cm. 5780, London: HMSO.

Royal Commission on Environmental Pollution (1994) *Eighteenth Report, Transport and the Environment*, Cm. 2674, London: HMSO.

Royal Commission on Environmental Pollution (1997) *Twentieth Report, Transport and the Environment – Developments Since 1994*, Cm. 3752, London: Stationery Office.

Royal Commission on Environmental Pollution (1998) *Twenty-First Report, Setting Environmental Standards*, Cm. 4053, London: Stationery Office.

Royal Commission on Environmental Pollution (2000) *Twenty-Second Report*, *Energy – The Changing Climate*, Cm. 4749, Norwich: The Stationery Office.

Royal Commission on Environmental Pollution (2002) *Twenty-Third Report*, *Environmental Planning*, Norwich: The Stationery Office.

Royal Society for Nature Conservation (1993) *Stepping Stones: The BT Environment City Review of Sustainability*, Lincoln: RSNC The Wildlife Trusts Partnership.

Rowland, B. (1953) *The Art and Architecture of India*, Harmondsworth: Penguin.

Sanders, W.S. (1905) *Municipalisation by Provinces*, London: Fabian Society.

Sattler, C. (1993) 'Potsdamer Platz – Leipziger Platz,' in *Architectural Design*, *New Practice in Urban Design*, London: Academy Editions, pp. 86–91.

Schneider, S. (2002) 'Global Warming: Neglecting the Complexities', in *Scientific American*, January pp. 60–63.

Schumacher, E.F. (1974) *Small is Beautiful*, London: Abacus.

Schwartz, B. (2004) *The Paradox of Choice: Why More is Less*, New York: HarperCollins Publishers.

Senior, D. (1965) 'The City Region as an Administrative Unit': *Political Quarterly*, Vol. 36.

Sherlock, H. (1990) *Cities are Good for Us*, London: Transport 2000.

Shukla, D.N. (1960) *Vastu-Sastra: The Hindu Science of Architecture*, Vol. 1, Lucknow: Vastu-Vanmaya-Praksana-Sala.

Sitte, C. (1901) *Der Stadt-bau*, Wien: Carl Graeser.

Spreiregen, P.D. (1965) *Urban Design: The Architecture of Towns and Cities*, New York: McGraw-Hill.

Stamp, L.D. and Beaver, S.H. (1933) *The British Isles*, *A Geographic and Economic Survey*, (6th edn. 1971), London: Longmans.

Stevenson Smith, W. (1958) *The Art and Architecture of Ancient Egypt*, Harmondsworth: Penguin.

Stroud, D. (1950) *Capability Brown*, London: Country Life.

Sturt, A. (1993) 'Putting Broad Accessibility Principles into Planning Practice': *Town and Country Planning*, October.

Svensson, O. (1981) *Danish Town Planning: Guide*, Copenhagen: Ministry of the Environment.

Thomas, R. (ed.) (2002) *Sustainable Urban Design*, London: Spon.

Toffler, A. (1973) *Future Shock*, London: Pan Books.

Toffler, A. (1980) *The Third Wave*, London: Collins.

Turner, T. (1992) 'Wilderness and Plenty: Construction and Deconstruction,' *Urban Design Quarterly*, September, Issue 44, pp. 20–21.

Ulrich, R.S. (1984) 'View Through a Window May Influence Recovery from Surgery', *Science*, Vol. 224, pp. 420–421.

United Nations (1992) *Conference on Environment and Development*, New York: United Nations.

United Nations (1992b) *United Nations Conference on Environment and Development: Earth Summit, Press Summary of Agenda 21*, Brazil: United Nations.

United Nations Centre for Human settlements (HABITAT) (2001) *Cities in a Globalizing World*, London: Earthscan Publications.

United Nations Environmental Programme (2002) *Global Environmental Outlook 3*, London: Earthscan Publications.

United Nations Population Division (2001) *World Population Prospects: The 2000 Revision*, London: Earthscan.

Unstead, J.F. (1916) 'A Synthetic Method of Determining Geographical Regions', *Geographical Journal*, Vol. 48.

Unstead, J.F. (1935) *The British Isles: Systematic Regional Geography*, (5th edn. 1960), London: London University Press.

Unwin, R. (1909) *Town Planning in Practice*, London.

Unwin, R. (1967) 'Nothing to be Gained by Overcrowding', in *The Legacy of Raymond Unwin: A Human Pattern of Planning*, ed. W.L. Crease, Cambridge, Massachusetts: MIT Press.

Urban Task Force, Department of the Environment, Transport and the Regions (1999) *Towards an Urban Renaissance*, *Final Report of the Urban Task Force Chaired by Lord Rogers of Riverside*, London: Spon.

Vale, B. and Vale R. (1991) *Green Architecture*, London: Thames and Hudson.

Vale, B. and Vale, R. (1993) 'Building the Sustainable Environment', in *Planning for a Sustainable Environment*, ed. A. Blowers, London: Earthscan Publications.

Vidal de la Blanche, P. (1931) *Principles of Human Geography*, ed. E. de Martonne (trans. M.T. Bingham), New York: Holt.

Walker, D. (1981) *The Architecture and Planning of Milton Keynes*, London: Architectural Press.

Webber, M.M. (1964) 'The Urban Place and the Non Place Urban Realm', in *Explorations of Urban Structure*, ed. M. Webber, *et al*. London: Oxford University Press.

West Midlands Local Government Association (2002) Draft Regional Planning Guidance for the West Midlands (RPG11), Birmingham: WELGA.

Whatmore, S. *et al*. (2003) *Living Cities: A New Agenda for Urban Natures*, Milton Keynes: The Open University.

Wheatley, P. (1971) *The Pivot of the Four Quarters*, Edinburgh: Edinburgh University Press.

Wiebenson, D. (undated) Tony Garnier: *The Cité Industrielle*, London: Studio Vista.

Williams-Ellis, C., *et al*. (1947) *Building in Cob*, *Pise*, *and Stabilized Earth*, London: Country Life.

Wilson L.H. (1958) *Cumbernauld New Town*, London: HMSO.

Wilson, L.H. (1959) *Cumbernauld New Town*, *1st Addendum Report*, London: HMSO.

Wilson, L.H. *et al*. (1965) *Report on Northampton*, *Bedford and North Buckinghamshire Study*, London: HMSO.

World Commission on Environment and Development (1987) *Our Common Future: The Brundtland Report*, Oxford: Oxford University Press.

Worldwatch Institute (2002) *Vital Signs 2002-2003*, London: Earthscan.

Worldwatch Institute (2003) *State of the World: Progress towards a Sustainable Society*, London: Spon.

Wotton, H. (1969) *The Elements of Architecture*, London: Gregg.

PAPERS AND JOURNALS

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The Observer
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Scientific American
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