



CLIFF MOUGHTIN
with Peter Shirley

URBAN DESIGN
Green Dimensions

SECOND EDITION



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Architectural Press is an imprint of Elsevier



Architectural
Press

Architectural Press
An imprint of Elsevier
Linacre House, Jordan Hill, Oxford OX2 8DP
30 Corporate Drive, Burlington MA 01803

First published 1996
Reprinted 1997, 2002
Second edition 2005

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British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library.

Library of Congress Cataloguing in Publication Data

A catalogue record for this book is available from the Library of Congress.

ISBN 0 7506 62077

For information on all Architectural Press publications
visit our website at <http://books.elsevier.com>

Typeset by Keyword Typesetting Services Ltd
Printed and bound in Great Britain

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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, roof-line, 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

ACKNOWLEDGEMENTS

Every effort has been made to trace owners of copyright material but the publishers would be glad to hear from any copyright owners of material produced in this book whose copyright has unwittingly been infringed.

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 authoritative 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 CO₂ 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 CO₂ 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.

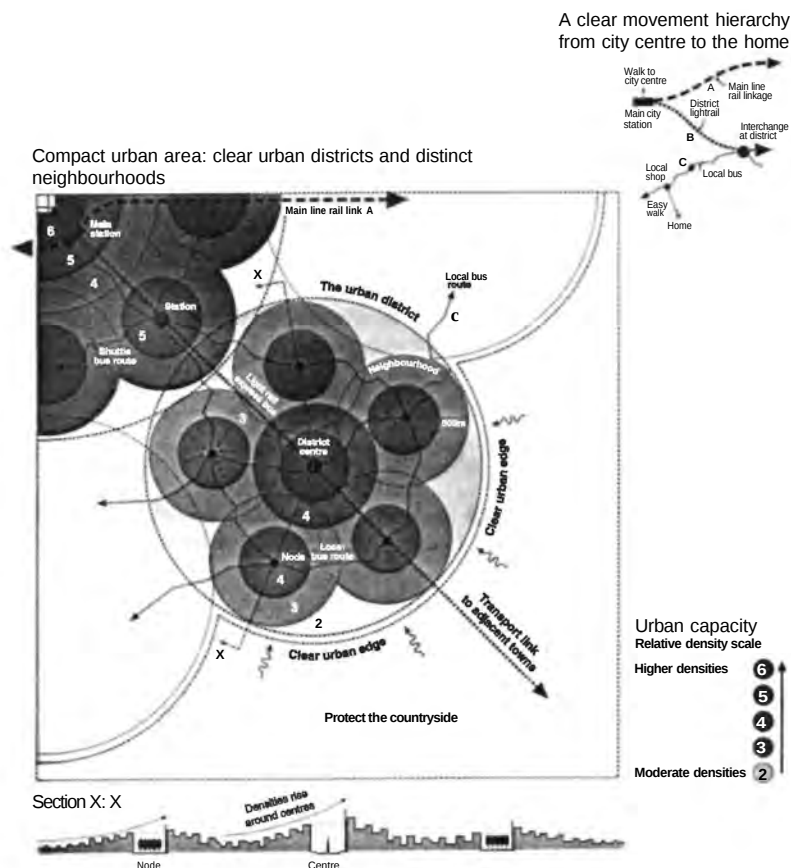
Competition between our political parties means that no Government, of whatever political persuasion, can afford to alienate too many voters. Most of us living in Britain own a car: we use it daily and with it we conduct a long and tender love affair. How many voters in 'Middle England' will gladly accept 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 intro-

duced 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*

Figure 1.1 Urban structure: the compact city



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.

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