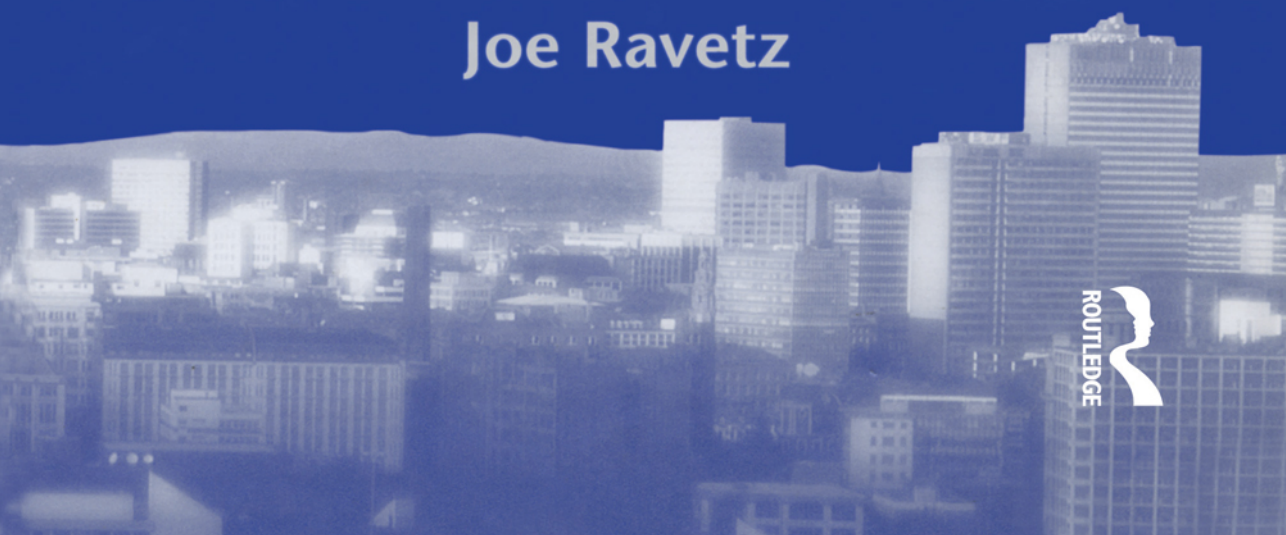


City Region 2020

Integrated Planning for
a Sustainable Environment

Joe Ravetz



ROUTLEDGE


City-Region 2020

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Integrated planning for a
sustainable environment

Joe Ravetz

with the
Sustainable City-Region Working Group
chaired by

Peter Roberts



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Members of the Sustainable City-Region Working Group, drawn from the TCPA and the local authorities and universities in Greater Manchester, have each contributed immense amounts of time and expertise. The working group was chaired by:

Professor Peter Roberts, University of Dundee

The full working group included:

Prof Andrew Blowers, Open University; Prof Michael Breheny, University of Reading; (the late) Michael Brown, Landscape Architect; Glyn Carter, London Borough of Barnet; Dr Mike Clark, University of Central Lancashire; Nic Clifford, Manchester City Council; Mike Gordon, Mike Gordon Consultancy; Jon Fox, Peterborough City Council; Herbie Girardet, Footprint Films Ltd; Prof David Hall, Oxford Brookes University; Dr Peter Hopkinson, University of Bradford; Dr Ros Howell, Manchester Metropolitan University; Brian Parker, Transport Consultant; Ralph Rookwood, former Chair of TCPA; Lee Shostak, EDAW; Adrian Webb, Planning Consultant; Paul Winter, Eversheds; Dr Stephen Young, Manchester University.

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FOREWORD

Rt Hon Michael Meacher MP

*Minister of State for the Environment and
Member of Parliament for Oldham West*

Sustainable development implies a commitment to quality in every sense of the word. It is also about quality of analysis, of our situation and needs, as well as those of future generations. This detailed analysis of a long-established metropolitan area illustrates the extraordinary challenge of knowing and understanding major cities, and of anticipating and guiding their future evolution.

In developing a coherent national sustainable development strategy we need more systematic and in-depth analysis of urban environments. This is a useful contribution to the debate on how to take forward sustainable development in the UK. I congratulate the Town & Country Planning Association for grappling assiduously with the dynamics of an urban region as large and complex as Greater Manchester, and producing this stimulating study.

PREFACE

Peter Roberts

*Professor of European Strategic Planning, University of Dundee,
and Chair of the Sustainable City-Region Working Group*

This book builds on the research which was undertaken during the early 1990s by the Town & Country Planning Association's Sustainable Development Group. A report of this work was published in 1993 as *Planning for a Sustainable Environment*. This set out an agenda for change, based around the concept of 'social city-regions' in which a balanced portfolio of policies could be applied, to help avoid environmental damage, social distress and economic decline.

The next step for the TCPA was to demonstrate in practice the ideas and models that had been advanced. From a number of potential case studies, the Greater Manchester metropolitan region was eventually selected as a test-bed. A research partnership and working group was established between the TCPA, Manchester Metropolitan University and the ten local authorities of Greater Manchester, with funding from these partners together with the European Regional Development Fund.

The research gathered a huge body of evidence, and developed a powerful organizing framework. It has now produced a report at the leading edge of international thinking on sustainable urban development, particularly for the older industrial city-regions. Conurbations such as Greater Manchester are home to a substantial part of the European population, and the successful management of change in such regions is a test of the ingenuity and determination of politicians, planners, the private sector and communities alike.

Our great cities are pools of opportunity and potential. However, they have often been deflected from achieving a quality lifestyle for everyone, due to the unthinking and irresponsible rush for growth that has characterized much of the past two hundred years. At long last the 'muck and brass' philosophy of the past is shifting to a more responsible and balanced approach to the planning and management of change. This report brings together much of this new thinking and practice and, in addition, it provides a practical model to help co-ordinate and integrate both strategy and action.

It is appropriate that this book will be published in 1999. This year marks the centenary of the establishment of the TCPA, and *City-Region 2020* is a worthy successor to Ebenezer Howard's *Tomorrow: a Peaceful Path to Real Reform*. The book is a tribute to the dedication and diligence of Joe Ravetz and his colleagues who have undertaken this research, and the TCPA owes them a considerable debt of thanks.

In addition, on behalf of the TCPA, can I express my thanks to everyone who has participated in the 'Sustainable City-Region' research programme. As part of our continuing programme of work we will monitor and review the response to this book, and we welcome your comments and reactions to the ideas and messages contained in the following pages.

ABOUT THIS BOOK

Author's note

I would like to pay tribute to the memory of Michael Brown, Landscape Designer, who died in 1996. His inspired contributions to this project among many others will be missed by all who worked with him.

I would like to pay special thanks to Peter Roberts, without whose enthusiasm and foresight this project would not have happened. I would like to thank the staff at Earthscan, and the researchers at the Centre for Urban & Regional Ecology, for their boundless patience.

Finally, the long journey in forming these ideas, and from ideas to publication, would not have been possible without Amanda, Jerry and Alison.

Scope: For such a wide ranging investigation we have focused only on the key themes. Each sector or topic is in outline form, summarizing arguments which are often complex and controversial, and there will be inevitable gaps in the coverage of many technical subjects.

Sources: Information is taken from local sources wherever possible, but many topics are only covered at a regional or national level, and many 'best guesses' have been made for local data. All charts and graphs refer to Greater Manchester (GM) unless otherwise specified. Targets refer to 2020, and trends and changes for the period 1995–2020 unless otherwise specified. Boundaries are taken as the local authority boundaries of the 10 GM Districts unless otherwise specified. All data for GM is drawn from official sources unless otherwise specified.

Further information: This publication has been drawn from a more detailed 'Technical Report' which covers in some depth each of the key sectors. An 'Overview' and 'Methods and Tools' working papers are also available. The Sustainable City-Region research programme continues with related projects including appraisal methods, integrated economic evaluation, resource flow audits, scenario workshops and a web-based 'Sustainability Atlas'. Details are on the Sustainable City-Region website at www.art.man.ac.uk/planning/cure.

Attribution: The views expressed are those of the author as advised by the Sustainable City-Region Working Group, and do not necessarily reflect the views of the TCPA or the sponsoring organizations. While every effort has been made to ensure accuracy, the author and the Working Group cannot accept responsibility for any errors or omissions.

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PART I

Context

The story begins with the question – what does sustainable development mean, if anything, in cities and regions? ‘The State of the City-Region’ shows the dynamic and problematic reality of the case-study, the conurbation of Greater Manchester. ‘Trends and Prospects’ follows the moving picture, and points to alternative paths or scenarios for the future. ‘City-Region 2020’ shows one of these paths in outline, as a vision and guide for the journey to follow.

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INTRODUCTION

1

*Sustainable, a. (f.prec.+ABLE. Cf. SUSTENABLE)
capable of being upheld or defended: maintainable*

What if ...?

Sustainability is the watchword for the new millennium, and a guiding theme for all human activity. It is also a never-ending quest for 'having our cake and eating it' – not only economic growth with social justice, but environmental protection into the bargain.

For the 'developed' nations of the North, the race for affluence stretches their environmental limits, even while their social fabric is fragmented by unemployment and exclusion. For 'developing' nations the need for basic shelter and services is overwhelming, but 'development' too often destroys the natural resource base. For the world in total, problems such as climate change and species loss are raising the stakes to the brink of catastrophe – and as five billion people reach out for western levels of affluence, current trends cannot continue.

What has this global agenda got to do with cities, regions, or planning? This is a multi-layered question, which we explore through a detailed case study.

In most industrial countries most people live in or near cities, and the workings of such cities are implicated in most environmental damage. But urban activity now reaches right across 'city-region' territories, from city centres to remote countryside. And while each city-region is the

result of a unique history, for the future there are many forking paths, from utopias to nightmares. Planning, in its widest sense – strategic management of environmental, economic and social change – has the challenge of steering large and complex city-regions towards more benign futures.

To begin this, we need some kind of vision or goal to work towards. That is why we start with the question:

'what if ...?'

What if a city-region was to become truly 'sustainable' within our lifetimes? What changes could we see on the ground? Would economics, politics or technology provide the answers? Would there be jobs for the unemployed, and where would the money come from? What if plans and policies could be fully integrated between all sectors? These are the kind of questions which guide this inquiry into 'integrated planning for long term sustainable development'.

A hundred years ago Ebenezer Howard took up a similar challenge, in the waste and deprivation of both town and country. The result was not only a physical model for garden cities, but an economic model for local industry and social welfare.¹ More recently the TCPA set out envi-

¹ Howard 1898: Hall & Ward 1998

ronmental goals for all areas of urban development.²

Here we follow through that agenda. We ask how such ideas might fit together on the ground – not so much in a one-off new settlement, as in the much larger ‘reality test’ of restructuring and re-engineering existing cities and regions.

And the reality test here is challenging indeed – the dynamic and problematic conurbation of Greater Manchester (GM).³ GM is a world icon for style and sport, and a thriving centre for finance, media, education and culture. It is also a city where a million people live amidst poverty, obsolete industry and crumbling buildings – the ‘human landfills’ of a post-industrial wasteland.⁴ GM contributes 1/700th of the global climate change effect, air pollution is high, life expectancies are short, suicide and depression are rife. Just as the industrial revolution began here, so might the post-industrial sustainability revolution – but it will not be a simple or easy transition.

Complexity & contradiction

Such a challenge depends on a high level of ‘joined-up thinking’ – but this is a perennial quest, with many contradictions and few simple solutions. So we have taken a sceptical view of many claims, both from the ‘business as usual’ and the ‘sustainability’ camps. In practical terms we tread a very thin line between ‘cynical greenwash’ and ‘misplaced idealism’. Both are plentiful.

At the start we find that most real-time problems cross the boundaries of subjects and sectors, and that most available information doesn’t seem to fit the problem. We find that many sustainability goals are in conflict – for instance, bottom-up decision-making versus strategic planning. We find huge gaps between principles and practice – the core concept of sustainability is about long term thinking, but most of us struggle with uncertainty day by day. We find that any practical question is surrounded by trade-offs such as efficiency vs equality, with

few clear answers in sight (*Box 1.1*). It is no wonder that busy practitioners take the ‘S’ label and stick it on whatever they were doing anyway.

Putting it together

Faced with this, we have aimed to see the wood for the trees. We have used best available information, and we have invented methods and tools where none existed. The result is a demonstration of what is possible in the integrated planning and restructuring of a major conurbation. It is a source-book for long term policy and strategy. It is also a demonstration of methods and tools for similar projects elsewhere.

These methods have been developed around the basic sustainability themes – balance and integration – to be explored below.

Our starting point is the physical city-region, its form and fabric, its resource inputs and outputs, and its pressures and impacts on local and global environments. But to tackle such physical problems we have to look ‘upstream’ at their roots and causes in sectors such as housing or transport, and look at how far these sectors meet human needs or demands. We also have to look ‘downstream’ of the problem, at the environmental impacts caused, and the final outcomes for individuals or societies. Overall, we can look at the balance of ‘needs’ and ‘outcomes’, upstream and downstream, and put the question of how far it is ‘sustainable’ in the shorter and longer term – whether we get the totality of what we need, as individuals, city-regions or nations. This balance of needs and outcomes is at the core of the methods below.

Box 1.1 COMPLEXITY & CONTRADICTION

A fine example is the question of ‘where will the people go?’ (*Chapter 5*). Households in the UK are becoming smaller as people live longer and more independently, and huge numbers of new dwellings will be needed. Should we allow everybody to trade up, and build all over the countryside? Should we protect rural land, and keep the poor in high density urban areas? Is there a win-win solution that keeps everybody happy, and if so, why has it not yet worked?

Adapted from Breheny & Hall 1997

² Blowers 1993

³ GM is used for Greater Manchester throughout: not to be confused here with genetic modification, or General Motors

⁴ Davis 1998

Another theme is integration – or in more topical terms ‘joined-up thinking’. The solutions to many problems in transport, for instance, are often in other sectors such as housing or industry, and vice versa. But in practice each sector tends to draw a line around its own concerns – so a ‘sustainable’ transport strategy has to extend mainstream transport thinking towards wider issues, from climate to communities. On the principle that the whole is greater than the sum of the parts, we look at a hundred industries in a dozen sectors, to see the linkages and the bigger picture – less detail, but more synergy.

A third theme is that of space and time. Just as people live and work in places, rather than sectors, there is a clear logic for putting together problems and opportunities by territory – the neighbourhood, city, bio-region or whichever is the most appropriate for the task. This project looks beyond many others at the implications ‘on the ground’ of sustainable development.⁵ It also looks at the time dimension of restructuring and re-engineering, as a process over a medium and long horizon.

The case-study approach here also brings special opportunities – a kind of mental laboratory where a city can be taken to pieces and put back together again. Looking at one city-region in depth can help to show the linkages between many problems and solutions. GM is of course a unique mix, but not unlike many post-industrial cities. The core themes, if not the fine detail, will be relevant to most cities and regions in the developed world and elsewhere. If we substituted Birmingham, Barcelona or Berlin for GM, how much would be different or common between them?

Applications

Such a quest, in the long tradition of envisioning the ideal city, is a fascinating journey in its own right. But meanwhile there are urgent and controversial policy debates in the UK, Europe and elsewhere:

- Housing, transport, waste management and many other sectors show rising pressures and

conflicts between economic growth, social needs and environmental protection.

- New regional governance in the UK aims to bring together economic, social and environmental strategy, but the institutions, resources or methods are not always up to the job.
- Urban regeneration appears more intractable than ever, as many former approaches have failed, while again the needs outstrip the resources.
- Public services are perennially short of funds, even while the fabric of society is torn by unemployment and exclusion.
- Local and regional economies are caught in the race for global competitiveness, where the pace of change, and the risks of dependency and polarization seem greater than ever.

For these and similar issues there are few simple solutions – each is a tangle of economic, social and environmental problems with many conflicting viewpoints. For such issues, the principle of sustainability is not just a cosy marketing label, or a clever academic game, or a mediaeval theology. Sustainability has to be an over-arching guiding theme, a combination of vision and practice, to be interpreted at every step of the way.

Caveats

In practice, one person’s vision is another’s blind spot, especially where it concerns the broad and fuzzy theme of sustainability. Decision-makers often assume that sustainability can be ‘achieved’, as if cities were like machines whose problems can be fixed with a tune-up or a new part. Our analysis suggests quite the opposite – a view of cities which lurch restlessly between crisis and opportunity, where today’s solutions become tomorrow’s problems.

Another misconception is that sustainability is a scientific quantity to be measured on a scale. Again we suggest the opposite – that there is rarely a single ‘true path’ of sustainability, more often a tangle of interactions, the results of which may be more or less efficient, equitable and risk-avoiding, depending on who measures them.

There is also a view that a city-region can somehow be an island of sustainability, as if insulated from the world around it. Cities may be autonomous in some ways, but they are driven by the global system in most other ways. If the sustainable development of a city is like turning round a supertanker, the crew cannot ignore the storm-force gale of the global economy around them, or the disputes over who is captain.

The upshot is that everything said here about GM is conditional – a local transport strategy, for instance, will not get very far without linking actions at national and global scale. At the same time higher level actions need to take account of how they fit together at the local or

regional level. This interplay of scales and functions is another recurring theme.

Finally we have to keep asking ‘who or what’ we are trying to sustain.⁶ If we can demolish an obsolete house to make way for one which is more beautiful and efficient, could we do the same with an obsolete city? Are we setting out to sustain the city, its people, the global environment, or all of these? The question of ‘who or what’ is at the heart of this project and its approach to linking different kinds of knowledge. That is why, at the end of the day, we avoid simple conclusions and ten-point lists, in favour of in-depth debate. If this book enriches such debate it will have achieved its aims.

BACKGROUND

World leaders met in 1992 at the UN Conference on Environment and Development – the Rio Summit – and then again at New York in 1997.⁷ There was a common agenda, in that environmental damage caused by economic development was endangering the well-being, and possibly the survival, of present and future generations. Major global environmental problems, such as disruption to the climate, had finally produced a commitment to address their causes. The result was a large set of declarations – ‘Agenda 21’ – aimed at improving the environmental sustainability of economic development.⁸ Agenda 21 was based on the commonly accepted definition of sustainable development, from the ‘Brundtland Report’:⁹

‘to provide for the needs of the present generation without compromising the abilities of future generations to meet their needs’

One way to interpret this definition is through the concept of a ‘balance’ of needs – between

local and global, present and future, and material and environmental (*Fig 1.1*).¹⁰

Behind the environmental rhetoric, the real business of Agenda 21 was overtly political – the link between economic development, international trade, environmental impacts, and the gap between rich and poor. Since 1960, income inequality between the richest and poorest 20% of the world’s population has increased from 30:1 to 75:1, and the 200 richest individuals now possess as much wealth as half the world’s population (*Fig 1.2*).¹¹ In this sense the environmental agreements – the Conventions on Biological Diversity, Climate Change, Desertification, Forestry, and the Commission on Sustainable Development – were diversions from the core agenda, while being major achievements in their own right.

Rio gave a huge impetus to discussion at every level, but results, unsurprisingly, have fallen short of promises.¹² The full Agenda 21 programme was costed at \$128 billion, one tenth of the global arms budget, but only a small fraction of this has been found. Some environmen-

6 Mitlin & Satterthwaite 1996

7 This section was kindly drafted by Ralph Rookwood

8 Centre for Our Common Future 1993

9 World Commission on Environment & Development 1987

10 the vital distinctions between ‘need’, ‘demand’ and ‘greed’ are so problematic that we coined the term ‘gneed’

11 United Nations Development Programme 1998

12 Dodds & Biggs 1997

Fig 1.1 **SUSTAINABILITY BALANCE**

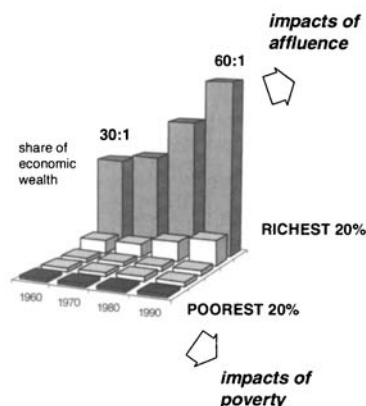
Balance of opposing goals and values.
Source: based on WCED 1987.

tal problems have been contained, such as ozone depletion, while others continue almost unabated, such as forest destruction.

While the gap between rich and poor grows, the GATT world trading system excludes social and environmental policies which might hinder international trade. The current instability in the world economy is a sign that there are no simple solutions or safe fall-back positions – the global roller coaster is effectively out of control.

The urban agenda

One of the most alarming global trends is runaway urbanization in developing countries – three-quarters of the world's 30 largest conurbations are in the South and East, each of them larger than many nations, and containing the most extreme environmental problems.¹³ Meanwhile, in countries such as the UK, 80% of people are already in urban areas, and there is an opposite trend of 'counter-urbanization' or outward migration – threatening the viability of both urban and rural areas, and dependent on high-impact lifestyles and technologies.¹⁴ Urbanization and counter-urbanization can be seen as two sides of the same coin, reflecting different stages in a general urban development path, where cities are both the 'engines' and the 'dustbins' of economic growth (Fig 1.3).

Fig 1.2 **RICH vs POOR**

Income disparity of top & bottom 20% of world population.
Source: UNDP 1996

There is a clear linkage between urbanization and Agenda 21, and this is the focus of global meetings such as 'Habitat II'.¹⁵ Such meetings tend to be once removed from mainstream decisionmaking, but are essential for building networks and spreading 'best practices', some of which are used as examples here.¹⁶ In Europe, the urban agenda was set out in the Green Paper on the Urban Environment.¹⁷ It was then developed through the Aalborg Charter, the Lisbon Declaration, the EU Climate Alliance, the EU Sustainable Cities Project,¹⁸ the Euronet database, and many others.¹⁹

In the UK the 'sustainable city' is now a guiding theme, and there is some consensus on a model of more compact, mixed use urban form.²⁰ But the principle is often slippery in practice – not least with the evidence that current policies would at best save a tiny proportion of urban climate emissions.²¹ And in practice, long term environmental risks are secondary to present-day needs for jobs and houses: local government is still under-funded and disempowered; and for most hard decisions – such as where to build the houses – there is much conflicting advice. While policy-makers grasp for simple fixes

13 Girardet 1994
14 Herington 1990

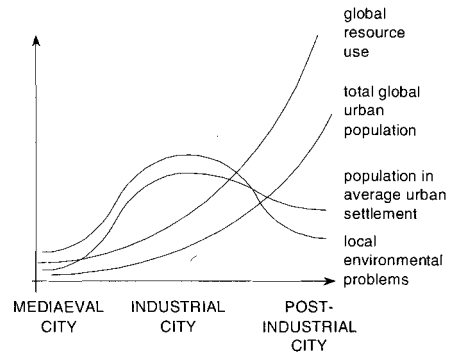
15 Binde 1996
16 UNCHS 1996
17 CEC 1990
18 EU Expert Group 1996
19 <http://www.euronet.uwe.ac.uk>
20 DETR 1998: 'Sustainable Urban Development'
21 Breheny 1995

and print glossy leaflets, there is widespread confusion over the complex and many-layered challenge of the 'sustainable city'.

Global linkages

Southern cities appear to be increasing their environmental impacts faster than those in the North, where relatively stable populations and more advanced technology have contained most local environmental problems. But cities in the North are the consumers and financiers of material and products from the South – the '20% with the 80%' – the affluent minority who consume the majority of global resources.²² So while city-regions such as GM grapple with their own social and environmental problems, they also have a wider responsibility to the cities of the South. As well as reducing their expropriation and colonization of Southern resources, they can provide examples, incentives and transfers to Southern cities of low-impact technology, market infrastructure, consumer aspirations and political institutions – the essential components of a sustainable development path.

Fig 1.3 **URBANIZATION & ENVIRONMENT**



General trends in urban development / environmental impact, with 'environmental Kuznets curves'.
Source: adapted from Kuznets 1963, Ekins 1997, World Bank 1992

At the same time there is much that Northern cities can learn from their Southern counterparts, where activities such as recycling, self-build and social trading are often much more advanced. We aim to show that sustainable development in a northern city-region depends on global linkages and transfers both ways.

URBAN ENVIRONMENTAL SUSTAINABILITY

In the rest of this chapter we look at ways to unravel some of the tangled questions raised above. We look at how the principles of sustainable development apply to cities and regions, and outline the methods and tools developed during the research.

To simplify the task we start with three linked definitions:²³

- 1) 'Urban environmental sustainability' – the balance of urban systems with their long term environmental resource base. As each of these has many definitions and constantly

changes, 'sustainability' is a direction not a fixed goal.

+

- 2) 'Urban development': the evolution and restructuring of urban systems in their global context – also a direction, not a goal.

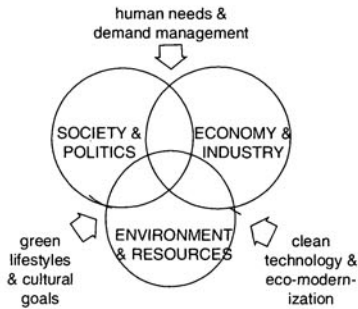
=

- 3) 'Sustainable urban development': actions which steer the evolutionary process of 'urban development' towards the moving balance of 'environmental sustainability'.

²² Galbraith 1977

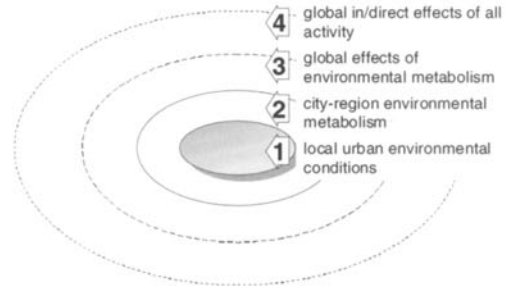
²³ In this section the term 'urban' is taken generally to mean a city, regional or city-region system:

Fig 1.4 **ENVIRONMENT ~ ECONOMY ~ SOCIETY**



Overlapping agendas and discourses in sustainable development

Fig 1.5 **LADDER of LOCAL SUSTAINABILITY**



Layers of analysis and responsibility for urban systems and global impacts.

Another approach is to look at the role of cities as providers of economic, social and environmental functions – as shown by the well-known three-ball sign (Fig 1.4):

- environment: to reduce environmental impact and resource use to 'sustainable' levels, and enhance environmental quality and safety.
- economy: to enhance long term resilience, competitiveness, employment, and equitable distribution of resources.
- society: to enhance health, education, security, equity, cohesion, diversity and 'quality of life'.

Each of these is instrumental to the others – environmental protection is essential for all human life, economic development is needed for environmental protection, and social progress is needed for a stable economy. Actions that hit the bullseye or the overlap between three circles, are the 'win-win' strategies that attract support from all directions. In reality there are many 'win-lose' strategies – solving one problem while creating several others.

Such goals might be applied directly to a self-contained island – but cities and regions are by nature specialized and intensive hubs of activity, taking resources and producing goods and

services for elsewhere. So we need to look at the city-region with several kinds of linkages to the outside world, as with a 'ladder' of local sustainability (Fig 1.5).²⁴ Most cities are seeking to improve their local environments, such as air quality or derelict land. Some cities are starting to look at the urban-hinterland or 'bio-region' system of energy, water and nutrients.²⁵ A third level concerns the global impacts of the urban system, such as energy and climate change. A wider and deeper view looks at the direct and indirect effects, global and local, of all activity – physical, economic, social and political. If a company headquarters is sited in GM, for instance, how much responsibility does the city bear for that company's subsidiaries on the other side of the world? Such a question may have more to do with ethics than science.

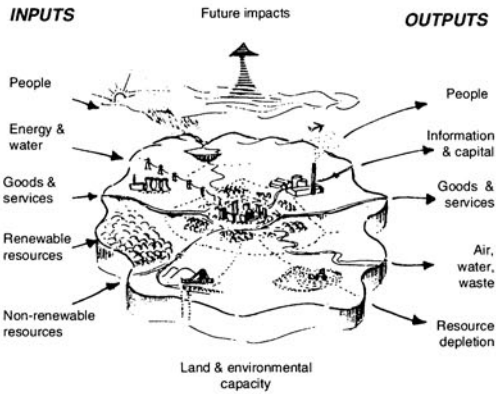
Environment & resources

The middle steps of this ladder focus on the environmental 'metabolism' of a city-region – a system of activity which maintains itself with continuous flows of inputs and outputs – as does a living organism (Fig 1.6). For a conurbation such as GM, the total flow, including water, is about 2000 million tonnes per year, or about 0.2% of the world total, and the overall efficiency or ratio of primary to 'useful' materials can be estimated at less than 5% (Chapter 8).²⁶

²⁴ Stren, White & Whitney 1994
²⁵ Sale 1988

Fig 1.6

URBAN ENVIRONMENTAL METABOLISM



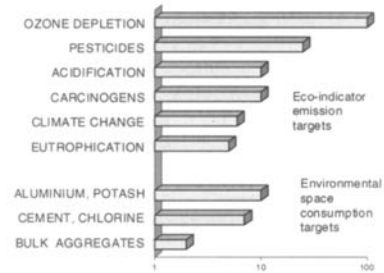
General outline of material inputs and outputs.
Source: based on Douglas 1983; Girardet 1994.

The concept of 'eco-cycles' in environmental metabolism looks at how flows of substances such as water and carbon continuously circulate through the biosphere. Cities tend to disrupt such natural and self-organizing cycles with a 'linear' metabolism – natural resources are sucked in, and pollution and wastes are pushed out. A city or region which contains its own eco-cycles would tend to be less vulnerable and damaging, or more 'sustainable' – such a cycle might be food which is locally grown, digested and its nutrients returned to the soil. Even where the cycle is on the global scale it can still be 'sustainable', if its side-effects or risks are acceptable. GM for instance could operate a 'carbon cycle', offsetting its emissions by planting forests elsewhere which also supply its timber needs (*Chapter 9*).

An urban metabolism can be analysed in terms of its environmental 'stocks' such as the urban fabric and renewable resources, and 'flows' such as direct resource inputs and waste outputs. Some types of stock are obvious and measurable, such as the area of urban greenspace – but others are more intangible, such as the human welfare provided by the same greenspace.

Fig 1.7

ENVIRONMENTAL TARGETS



'Environmental space': aggregated long term targets for reductions in environmental impacts and material throughput.
Source: based on Sachs 1998, Carley & Spapens 1998, Pre Consultants 1995, Wackernagel & Rees 1995, McLaren et al 1997

Such stocks and flows are organized in 'patterns' – structural arrangements of land-uses or activities in space and time. Within the same area of greenspace, for instance, different layouts or management systems might change its social amenity function. Any city-region accounting system should include estimates for both tangible and intangible stocks, flows and patterns.²⁷

Each eco-cycle's stocks and flows take place within certain limits, or 'capacities' – the ability of environments and eco-systems to absorb pollution and disruption without damage or adverse effects. But environments and eco-systems are continually changing, and the definition of uncertain or irreversible effects needs both human and technical judgement. Even for simple questions, causes and effects can be complex – the link between a smoky chimney and ill-health may be obvious but difficult to prove. To tackle this there are new methods for capacity assessment at local and global scales, and these are the basis for the environmental targets used throughout this project (*Fig 1.7*):

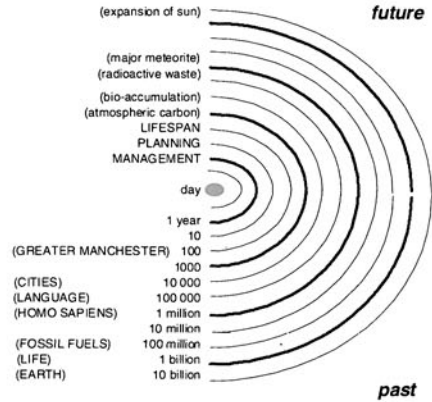
- **Critical Capacity:** level of pollution which causes significant or irreversible damage to human or ecological health.²⁸

Fig 1.8

LOCAL & GLOBAL

Very approximate orders of spatial scales.

Fig 1.9

NOW. SOON and LATER

Very approximate orders of temporal scales.

- Ecological Footprint: the notional land area needed to supply primary energy, materials and products.²⁹
- Environmental Space: estimates the global equal distribution of resources and assimilation capacity.³⁰
- Ecological Rucksack: a ratio of total material consumption to useful outputs of goods or services.³¹
- Eco-indicators: global targets for environmental pressures to minimize human and ecological risk.³²
- Natural Step: long term goals for zero emissions, zero minerals use and zero toxic chemical accumulation.³³
- Urban Capacity: acceptable pressures and thresholds in the physical, environmental, social and economic functions of cities.³⁴

The most far-reaching environmental capacity problem is perhaps global climate change, of which the largest human cause is fossil fuel use, and we give this a special priority in Chapter 9.

Space & time

The themes of metabolism, eco-cycles and capacity above are each relative to units in space and time, and there may be different thresholds for global, national, or local levels. The majority of the impacts of an urban system are indirect and non-local – while cleaner technology may improve local air quality, heavy industries may move overseas to produce materials which are then imported back. So a total impact and capacity assessment has to look at supply chains at local, regional, national and global scales.

In this project, for practical reasons, we draw a line at the political boundary of GM, while keeping in view other units such as the bio-region where relevant (*Chapter 14*). Putting together all possible spatial scales, it turns out that a city-region is halfway between an individual and the world (*Fig 1.8*). At each of these scales there are activity patterns and a functional territory where a metabolism and capacities can be identified.

This also raises the question – what is a city-region? The concept was put forward with the term 'conurbation', as a territorial system of city-hinterland relationships.³⁵ A city-region

30 Carley & Spapens 1997

31 Sachs 1997

32 Pre Consultants 1995

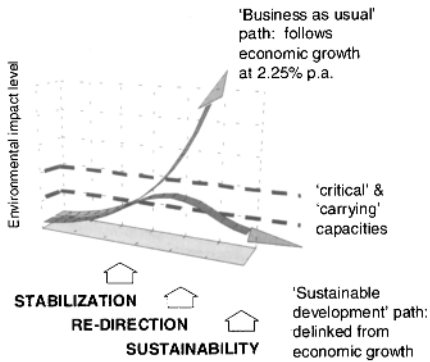
33 Hawken 1996

34 Entec 1998; Jacobs 1998

35 Geddes 1915

Fig 1.10

PHASES of SUSTAINABLE DEVELOPMENT



General outline of key phases in the 'de-linking' of economic growth from sustainable levels of environmental impact.

might be defined by its politics, industry, commuting, river basins or others, and there are perennial efforts to re-arrange the political map around the optimum pattern (*Chapter 14*).³⁶

At higher spatial levels, location is crucial – the position of GM as gateway to a peripheral region is crucial to its prospects. At lower spatial levels, within the city-region each area type contains a profile of problems and opportunities, and the phenomenon of 'uneven development' is the focus for urban regeneration (*Chapter 12*).³⁷ The spatial implications of environmental strategy in each area type are outlined at the end of each 'key sector' chapter in Part II.

The time dimension also shows nesting layers, from past to present and future – putting in modest perspective the one-generation horizon of this project (*Fig 1.9*). Longer term risks, such as atmospheric carbon or radio-active waste, can be seen in relation to the lifespan of a human, a city-region, or the earth itself.

Steering the course of urban development towards environmental sustainability implies a major restructuring and re-engineering of urban form and fabric. This of course takes time. Long term trends show rising economic growth linked to rising environmental impact, and sooner or later such impacts cross environmental capacity limits. So the 'de-linking' of economic growth from environmental damage is essential to allow one to rise while the other reduces. Such a de-linking process is different in each sector or industry, but there are several key stages (*Fig 1.10*):

- 'Stabilization' of environmental impacts and pressures – slowing the rate of growth in material damage in the shorter term.
- 'Redirection' of trends in impacts and pressures, towards significant reduction in the medium term.
- 'Sustainability' in levels of impacts and pressures, taking all activity to within long term capacity limits.

With a medium and longer time horizon we can also look at alternative 'scenarios' – composite explorations of possible future conditions, trends and transitions (*Chapter 3*). In each chapter we review four possible scenarios, with a focus on a 'business as usual' (BAU) projection, and a 'sustainable development' (SD) scenario, this last being explored in depth. Such scenarios include both discussion and technical calculation, as shown in the boxes and charts of Parts II and III. For practical reasons again we focus on the year 2020 and the decade 2020–30 as a horizon. This allows actual 1995 base data to be projected to 2020 – or estimated for 2000 and projected to 2025. Such a generation timescale is short enough to be grounded in current trends, and long enough to see major restructuring of the urban system.

³⁶ Senior 1967

³⁷ Breheny & Rockwood 1993

URBAN DEVELOPMENT

Urban environmental sustainability is not a fixed blueprint on a blank sheet – cities are continually evolving and interacting with the world around them. And of course this world itself is in an overwhelming state of flux. Alongside the endless race of economic growth, there are several key transitions:

- ‘Globalization’: integration of investment, production, trade and consumption.³⁸
- ‘Connexivity’: global networks through information and communications technology (ICT), media, international travel.³⁹
- ‘Post-fordism’: dissolution of former more stable economic, social and political structures.⁴⁰
- ‘Exclusion’: new patterns of polarization, unemployment and dependency for large sections of the population.

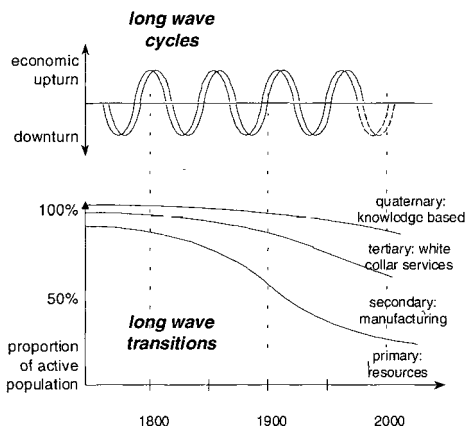
Behind such trends lie the ‘long waves’ of economic development, a combination of technol-

ogy, communications and economic changes (*Fig 1.11*).⁴¹ And in parallel is another transition of human activity itself – from ‘primary’ resource-based sectors, to ‘secondary’ manufacturing, to ‘tertiary’ services, to ‘quaternary’ knowledge-based and cultural activity. For several centuries secondary activity was the basis of the industrial city, of which GM was arguably the world’s first. Local and imported materials were processed via labour, land and capital, producing goods for export along water or railway corridors. Economic specialization and ‘advantage’ could be defined in terms of the city-region’s location and resources as a ‘material processor’ (*Fig 1.12*).⁴²

That model is now in transition to a more post-industrial ‘city of flows’.⁴³ The city-region now functions more as a node in a global ‘hypergrid’ – networks of motorways and airports for movement of people and goods, and networks of satellites and wires for movement of information and capital. Many patterns of urban activity and urban form are turning inside out, as the growth nodes of production and consumption migrate to the urban fringe or ‘edge city’ – retail, leisure and business parks with easy links

Fig 1.11

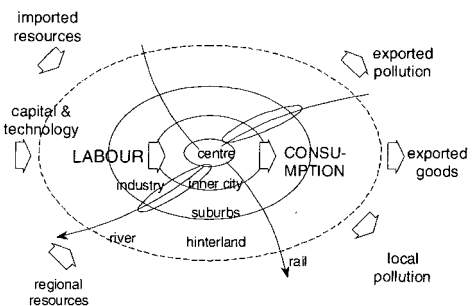
CYCLES & TRANSITIONS



Overview of structural cycles and transitions in economy, technology and society.
Source: adapted from Schumpeter 1939, Handy 1992.

Fig 1.12

CITY as MATERIAL PROCESSOR



General system flows in a typical industrial city-region:
based on geography of Greater Manchester.

38 Townroe 1996; Dicken 1998

39 Mulgan 1997:

40 Amin 1994

41 Schumpeter 1939; Brothie Hall & Newton 1987

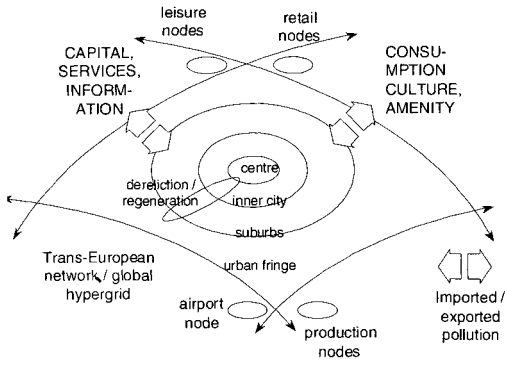
42 Solow 1970

43 Castells 1998

44 Garreau 1994

Fig 1.13

CITY as INFORMATION PROCESSOR



Flows of capital, information and cultures in a post-industrial globalized city-region; based on geography of Greater Manchester.

to the hypergrid (Fig 1.13).⁴⁴ The city itself, and its people's 'reason for being there', centres on services and consumption, and its cultural 'cachet' competes in a global hierarchy.

There are many paradoxes in such a transition – GM contains 19th and 21st century cultures and economies side by side. And while production and consumption globalize, there is a counter trend of 'localization' – a new kind of 'place advantage' in culture and amenity.⁴⁵ In physical terms, edge cities are 'counter-urbanized', while historic centres are 're-urbanized' and industrial areas 'regenerated'. In social terms, 'uneven development' creates clusters of unemployment and exclusion. In environmental terms, the bulk of a city-region's resources and impacts come and go through the global hypergrid which is increasingly privatized and deregulated, and where environmental management is an even greater challenge than before.

URBAN SUSTAINABLE DEVELOPMENT

The concept of 'urban sustainable development' brings together 'environmental sustainability' with 'urban development' – a rich mixture indeed. One starting point looks again at the triangle of economy-environment-society, and the resource management concepts of stocks, flows, patterns and limits. Then there is one more crucial factor – 'dynamics' – meaning the evolutionary potential of human activity and ingenuity to turn problems into opportunities.

Economy & environment

Economic activity has traditionally been the exploiter of natural resources – so how can there be a 'sustainable economy'? A very simple balance is shown in the equation $I = P \times A \times T$, which shows environmental impact as a function of population, affluence and technology (Fig

1.14).⁴⁶ Doubling average levels of affluence, while halving environmental impact, requires a 'factor of four' increase in material efficiency.⁴⁷ If the world population also doubles in the meantime, a factor of eight or ten increase is needed – a full-scale 'de-materialization'.⁴⁸

In reality the economic stocks and flows represented by 'affluence' are not only in money, but in social and environmental resources, 'capital' or 'welfare'. Some of these resources can be traded on the market, some of them can be measured but not traded, and others can be valued only as functions or intangible qualities.⁴⁹ If such resources are to be protected they have to be 'internalized' within economic markets and social systems. Different kinds of stocks and flows can be seen in a mapping of production, consumption and 'welfare' (Fig 1.15).⁵⁰ This

45 Dicken 1998

46 Meadows, Meadows & Randers 1992

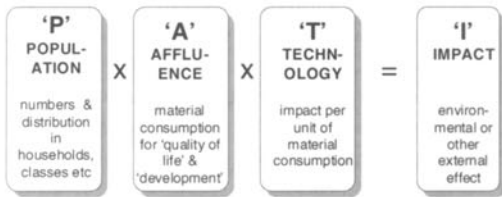
47 von Weizsacker & Lovins 1997

48 World Business Council for Sustainable Development 1994

49 CAG & Land-Use Consultants 1997

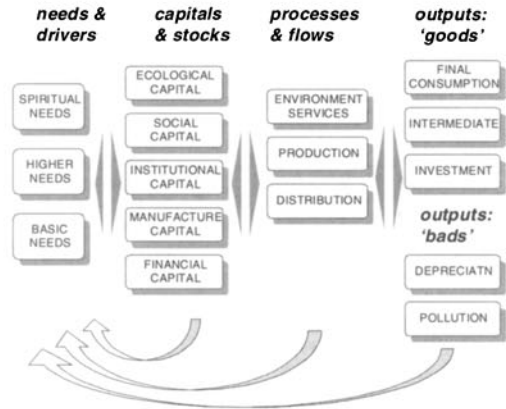
50 Ekins 1994

Fig 1.14

AFFLUENCE & EFFLUENCE

Basic ratios linking population, affluence, technology, environment.
Source: Meadows et al 1992; Olson 1993

Fig 1.15

CAPITAL STOCKS & FLOWS

General framework for linking different forms of capital and consumption.
Source: simplified and re-arranged from Ekins & Max-Neef 1994.

highlights the flows between different kinds of capital, and the challenge of environmental economics – how to define market values for non-market resources (*Chapter 13*).⁵¹

Beyond the static balance sheet picture of stocks and limits are the 'dynamics' of economic and business activity.⁵² Such dynamics might include innovation, skills, competitiveness and indeed optimism – the factors which turn environmental problems into economic opportunities. Fostering such dynamics is the general aim of 'ecological modernization', reducing ecological impacts while expanding the economy, by transforming production and consumption.⁵³ Its overall goal of a 'sustainable economy' has many layers (*Chapter 10*):

- Environmentally sustainable economy: activity and trading systems which co-exist with local and global capacities and limits.
- Socially sustainable economy: provision and equitable distribution of income, goods, services, security and employment.
- Financially sustainable economy: a viable balance of investment, savings, consumption, added value, autonomy and competitiveness.

Society & environment

Following through the logic of the 'affluence' equation above, we can explore the human 'needs' which lie behind it. A needs equation cannot sensibly be put into numbers, but would include:

$$\text{human needs} \times \text{cultural factors} \times \text{fulfilment factor} = \text{affluence levels}$$

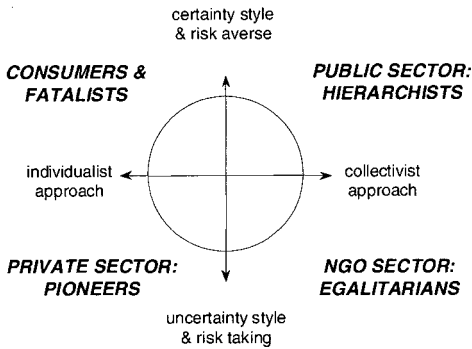
This shows very simply that social systems with cultural norms which encourage non-material needs are more likely to be environmentally sustainable.⁵⁴ For instance, the GM climate emission targets could be met tomorrow if thermal clothing was worn at all times – but current lifestyle factors make this highly unlikely (*Chapter 11*). A balance sheet approach looks at stocks of human 'welfare' from the service provided by environmental resources. Some of these can be measured through economic markets, but other welfare factors are more qualitative – a sense of 'place', for instance, is crucial for neighbourhood vitality, but it cannot necessarily be measured or traded.⁵⁵

As for the dynamics which turn problems into opportunities, there are actions at every level

51 Bowers 1996
52 Ravetz 1999d
53 Hajer 1995

54 Max-Neef 1994
55 Ravetz 1997

Fig 1.16

CULTURAL TYPES

General outline of human types in cultural theory. ('NGO' = 'non governmental organization').
Source: adapted from Douglas & Wildavsky 1986; Thomson 1994.

and sector of society. 'Social capacity' enables the cohesion and integrity of individuals, families, groups and networks: 'political capacity' enables empowerment of individuals and communities: and 'cultural capacity' enables diversity, identity, and the values which support sustainability

In practice such values, often taken as self-evident, contain many contradictions:

- 'Futurity': responsibility to future generations is fundamental: but most individuals operate with very short time horizons.⁵⁶
- 'Equity': equity in the present generation is difficult to define, let alone achieve: even the concept of 'sustainability' can be seen as a trick to further the exploitation of the poor South by the rich North.⁵⁷
- 'Risk': the 'precautionary approach' seeks responsible action in the face of environmental risk: in practice there are many other kinds of risk to be balanced.⁵⁸
- 'Ecology': a 'deep green' approach sees nature as sacrosanct, while a 'pale green' approach gives priority to human needs: there may not be an objective truth behind one or the other.⁵⁹

In this project we have focused on a middle way approach – 'mid-green' and 'mid-equity', which aims to bridge the gap between principles and practice. While these differences cannot always be reconciled, awareness of alternative views can help to mediate conflict and build consensus. One approach is 'cultural theory', a typology of the styles of individuals and institutions, showing different combinations of risk aversion and collective mentality (*Fig 1.16*).⁶⁰ Meanwhile investigation of alternative views has to find out what people really think – street-level research in Lancashire has shown huge alienation and distrust between different sections of society.⁶¹

Economy & society

For the third side of the triangle, we have to admit now – we have no masterplan to solve all human problems. But sustainability themes do provide a fresh approach to perennial debates.⁶²

In almost all public services there is a dire shortage of resources, while elsewhere many people lack useful or fulfilling activity. The obvious step is to link one with the other through the 'third sector' (*Chapter 10*). But to bypass the money system needs not only new policies, but new channels for social interaction. In practical terms cooperation is crucial for the success of public transport, housing, urban ecology and others – where people share gardens with friends, for instance, they may increase amenity while using less space.⁶³

Such cooperation and mutual aid in turn depends on rebuilding social cohesion and shared norms and values. But in practice there is an explosion of diversity – in organizations, networks, activities and cultures, as now manifest in the boundless jungle of the internet.⁶⁴ Such diversity is potentially unstable, and many future scenarios envisage civic breakdown, cyber-drugs and corporate gangsterism.⁶⁵ Such diversity is also a potential strength, encouraging deeper levels of human capacity, and again turning problems into opportunities.

⁵⁶ Rabi 1996

⁵⁷ Redclift 1994

⁵⁸ O'Riordan 1995

⁵⁹ Pearce 1993

⁶⁰ Thompson 1990

⁶¹ MacNaghten & Urry 1997

⁶² Jacobs 1996

⁶³ Ravetz 1998

⁶⁴ Mulgan 1997

⁶⁵ Gibson 1984

All this is a backdrop to the visible and practical agenda for sustainable urban development – re-claiming land, re-structuring economies, re-engineering the infrastructure, re-imaging urban identity, and re-defining new roles for cities and their people in a globalized era. Sustainable urban development is a many-headed theme, with

politicians, designers, economists, activists, engineers and managers each bringing their own angle and their own language. Coordinating such diversity is a huge but essential challenge if cities and regions are to steer towards a more sustainable development path.

METHODS & TOOLS

Here we take a step back and look for common threads and ways to link different forms of knowledge. The result is a set of methods and tools which were developed during the research, and which should be useful to similar projects.

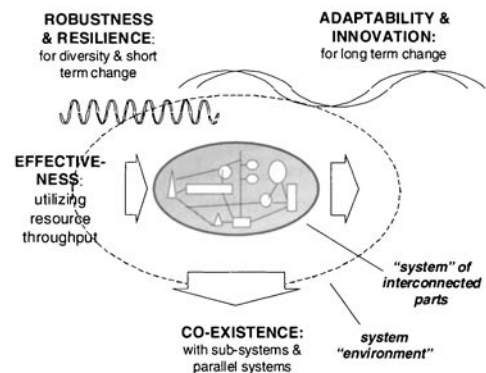
Systems thinking

In reality an urban economy or urban environment is not a simple or predictable unit at any scale – it is more like a ‘complex system’, where many parts constantly interact and organize themselves into ever-more intricate patterns.⁶⁶

Almost every natural habitat – such as a woodland – contains endless layers of complexity, at every scale down to the microscopic. Any definition of ‘sustainability’ depends on the frame of reference – even sudden change or catastrophe, such as a forest fire, may be part of a longer term cycle.⁶⁷ As there are few fixed boundaries around any ‘system’, its definition depends on the nature of the question – if we are looking at a woodland, the watershed might be one kind of boundary, but the species types might be another. Likewise in a city-region, almost any component – a house, a housebuilder, or a housing industry – can each be seen as a ‘system’. Each system responds to changing pressures, problems and opportunities, to sustain its existence and its functions.

A systems perspective on sustainability looks at the qualities of viability, integrity and longevity – sustainability, in other words – of any system, as manifest in a set of system functions (*Fig 1.17*).⁶⁸ A system has to survive by utilizing its available resources and throughput of energy and materials.⁶⁹ It has to deal with diverse conditions, respond to short term changes, and adapt to long term changes. Most importantly it has to co-exist with other systems, both larger and smaller, by containing its exter-

Fig 1.17 **SYSTEMS PERSPECTIVE**



General functions of systems & their 'sustainability'.
Source: adapted from McLoughlin 1969; Bossel 1996; Clayton & Radcliffe 1996

66 Funtowicz, O'Connor & Ravetz 1994
67 Hollings 1986

68 Bossel 1996; Clayton & Radcliffe 1996
69 Odum 1983

nal impacts which could affect its resource base. To fulfil these functions there are key qualities which reflect the system's capacity for survival, resilience and integrity:

- cybernetic feedback and communication – ability to respond to pressure or change.⁷⁰
- self-organization – capacity to innovate and generate diversity.⁷¹
- emergence – capacity to evolve to higher levels of self-organization.

With a systems perspective, seemingly unpredictable behaviour can be traced via 'attractors' – relatively stable or recurring patterns of organization and activity.⁷² Self-organizing patterns can be seen in every aspect of the natural world – sustainable agriculture also depends on synergy with such patterns.⁷³ Human-made patterns can be seen in the spatial arrangement of cities – with the same stocks of houses and streets, different spatial patterns might aid or reduce human amenity.⁷⁴ Looking at cities as complex systems opens the door to understanding how cities can evolve, organize and regenerate themselves.⁷⁵

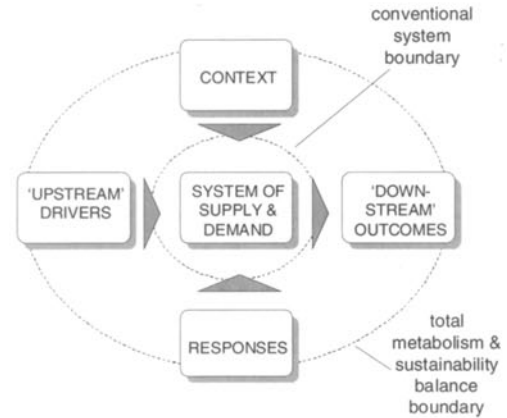
Integrated assessment

The systems view is also very useful in seeing how different kinds of stocks and flows work together, both environmental, economic and social. But the sustainability theme seems to demand more than this. A housebuilding firm, for instance, might be successful and profitable, but do its products respect the global climate? Does the housing industry as a whole improve local services? Wherever we look, the sustainability theme combines the economic, environmental and social. It also extends beyond the conventional boundaries of each industry or sector – in our finite world almost everything is connected to almost everything else.⁷⁶

The systems view above hinges on the concept of metabolism – the flows of energy, materi-

Fig 1.18

TOTAL METABOLISM



General concept of integrated assessment of a 'total metabolism': a causal chain which translates upstream 'drivers' to downstream 'outcomes'.
Source: Ravetz 2000

als and activity patterns, for example in the house above.⁷⁷ For the sustainability question, we have to ask what lies 'upstream' of the house – the social needs fulfilled, or economic demand met, which are not necessarily the same thing. Then we have to ask what lies 'downstream' of the house – its final outcomes or impacts. In this way we can see the house and its functions, not just as a physical metabolism, but a total or 'informational' metabolism, with social, economic and environmental dimensions (Fig 1.18).

One way to picture this total metabolism is by a kind of mental mapping of cause and effect, or 'upstream' and 'downstream'.⁷⁸ It seems that for the kind of sustainability issues relevant at the city-region scale, environmental problems are typically caused by economic activity, and economic activity is typically caused by social needs and demands. Putting these together, the result is a very approximate chain of cause and effect from upstream to downstream, and this shows directly the balance of sustainability between 'what we need' and 'what we get'. For example, the total metabolism of the transport sector

70 Ashby 1956

71 Kay & Schneider 1994

72 Gleick 1993

73 Mollison 1988

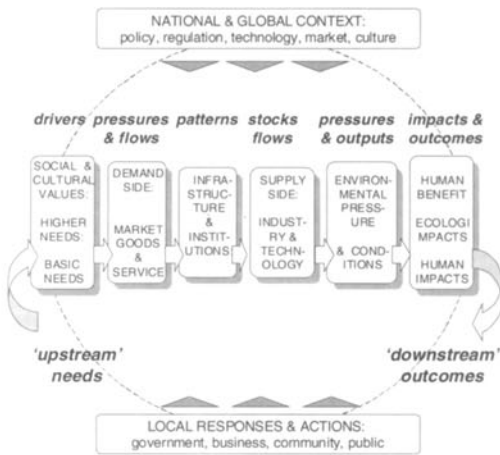
74 Alexander 1986

75 Portugal 1997

76 Mulgan 1997

77 O'Regan & Moles 1996

78 Ravetz 2000

Fig 1.19 **INTEGRATED ASSESSMENT**

Integrated assessment framework for mapping of 'total metabolism' and 'sustainability balance'.
Source: adapted from EEA 1995, OECD 1993.

shows such a balance – we need access and opportunity, but we end up with congestion and climate change, unless there are changes at each step between. A total metabolism mapping should include cultural, social, economic, political, spatial, technological, environmental and ethical dimensions, arranged in a rough order from upstream to downstream (Fig 1.19):

- The left hand column shows cultural and life-style factors – needs and desires for mobility, identity and so-on.
- These pressures translate to economic markets and mode activity levels – 'demand' for trips in cars or buses.
- Market demands interact with the urban infrastructure both physical and human – such as the road network or the police force.
- 'Supply-side' technology provides services together with external impacts – emissions and congestion.
- These externalities cause pressures and impacts on environmental resources – climate change or acid rain.
- Human outcomes can be both positive and negative, with the final balance weighted by social priorities or ethical values.

- The context of assumptions on national or global policy, regulation, markets and technology can be shown above.
- Local actions which may alter various links in the system, aiming to improve its performance or sustainability, can be shown below.

Such an 'integrated assessment' mapping only puts on one piece of paper what every good manager knows instinctively. Its structure is an extension of the common OECD 'pressure-state-response' and the EEA 'driving forces' frameworks.⁷⁹ It is not an objective description as such, more a tool for investigation. It provides a total systems mapping, with 'hard' supply-demand equations in the centre, and more 'soft' or intangible social and cultural values surrounding them. It can be used as a guide to 'hard' systems modelling or 'soft' systems analysis of social and political 'discourse'. It is also a linking framework for identifying strategies, agencies, indicators, targets, and appraisals as below.

As with any mapping or mental model, there are endless possible levels of detail: the very general level shown here is akin to a route map showing only the very largest features. Even this shows how sectors such as housing or transport, can meet multiple needs with single actions, or single needs with multiple actions, and each generating multiple outcomes. It also shows how simple actions often backfire – for instance why building new roads can increase congestion.

This combination of 'integrated assessment' mapping with the 'total metabolism' systems approach is a powerful double tool for exploring the sustainability theme. The systems mappings at the beginning of each chapter in Parts II and III show in outline the main features of each sector, as a route-map for more detailed discussion.

Integrated Sustainable Cities Assessment Method

Following the logic through, we applied the 'integrated assessment' and 'total metabolism' mapping approach to this research. One result is this book. Another result is a prototype package of methods and tools, the 'Integrated