SUSTAINABLE URBAN DEVELOPMENT VOLUME 3

THE TOOLKIT FOR ASSESSMENT

EDITED BY
RON VREEKER, MARK DEAKIN AND
STEPHEN CURWELL

Sustainable Urban Development

Sustainable Urban Development Volume 3: The Toolkit for Assessment provides case studies drawn from locations across Europe. It offers best-practice examples of the protocols that planners, property developers, designers and construction professionals have selected and the assessment methods which have been adopted to evaluate the sustainability of cities, districts, neighbourhoods and buildings. Set within the BEQUEST (Building Environmental QUality Evaluation for SusTainability) framework, the book brings together contributions on the use of the protocols and assessment methods as a decision support system. The volume:

- sets out the links and connections between the framework for analysis, protocols and assessment methods available to evaluate the sustainability of urban development
- demonstrates how they combine to form a decision support system
- shows how this prototype toolkit provides the information system and technology to support an integrated methodology, evaluation and vision of sustainable urban development
- identifies what this vision communicates about the environmental, economic and social future of our cities, districts, neighbourhoods and buildings.

This is the third volume in the research and debate of the BEQUEST network funded by the European Commission. Together the first three books provide a framework, set of protocols, environmental assessment methods and toolkit for policy-makers, academics, professionals and advanced-level students in urban planning, urban property development, urban design, architecture, construction and related areas of the built environment.

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Sustainable Urban Development
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Sustainable Urban Development Volume 1
The Framework and Protocols for Environmental Assessment
Stephen Curwell, Mark Deakin and Martin Symes (eds)

Sustainable Urban Development Volume 2
The Environmental Assessment Methods
Mark Deakin, Gordon Mitchell, Peter Nijkamp and Ron Vreeker (eds)

Sustainable Urban Development Volume 3
The Toolkit for Assessment
Ron Vreeker, Mark Deakin and Stephen Curwell (eds)

Sustainable Urban Development Volume 4
Changing Professional Practice
Ian Cooper and Martin Symes (eds)

These volumes are based on the research and debate of the European BEQUEST network (**B**uilding **E**nvironmental **QU**ality **E**valuation for **S**us**T**ainability). Together the books provide a toolkit of interest and value to policy-makers, professionals and advanced-level students in a variety of disciplines.

Sustainable Urban Development

Volume 3: The Toolkit for Assessment

Edited by Ron Vreeker,
Mark Deakin and Stephen Curwell

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1

Introduction

Mark Deakin, Ron Vreeker and Stephen Curwell

The Building Environmental QUality Evaluation for SusTainability (BEQUEST) network was first formed in 1996 as a pan-European network of physical, economic and social scientists and practitioners working in the areas of property development, urban planning, urban design and construction. It was supported from 1998 to 2001 by the European Union Research Directorate under the fourth Framework Programme theme, Human Dimensions of Environmental Change, as a 'concerted action' (BEQUEST, 2000, 2001). Fourteen research groups in six EU countries form the original core of the network. The overall aim of BEQUEST is to contribute to the practice and realisation of sustainable urban development (SUD).

The vision behind the network, the working methodology and the detailed objectives are described in chapter 2 of Volume 1 of this book series (Curwell *et al*., 2005) and Bentivegna *et al*. (2002). This volume, the third in the series, builds upon and extends this earlier work, setting forth the increasingly advanced understanding of SUD and mankind's ability to evaluate the sustainability of urban development.

BEQUEST has sought to identify the common issues underlying the growing interest in SUD and to structure them in such a way as to provide a framework for analysis. This has been done by adopting the PICABUE definition of sustainable development, 'mapping out' the 'fuzzy buzzwords' associated with the concept and modifying what it means to include the sustainability issues underlying the urban development process. This has meant:

- foregrounding the question of urban sustainability;
- agreeing the sustainability issues underlying the urban development process; and
- identifying the environmental, economic and social structure, spatial level and time frames of SUD.

Visioning urban sustainability in this manner allows a wide range of issues to surface concerning the environmental, economic and social structure, spatial level and time scales of development. The methodology developed to support this visualisation

of SUD is that of an integrated, iterative process of collaboration and consensus-building. As the BEQUEST framework of activities, issues, levels and scales of analysis, this vision and methodology are based on a four-dimensional 'model' of SUD that:

- adequately represents, but simplifies, the breadth and complexities of the issues which are faced in consensus-building exercises of this type;
- forms the basis for common understanding, and therefore for integration between a wide range of stakeholders;
- provides a framework for integrating the analysis of SUD across activities, issues, levels and scales;
- calls for a set of protocols that allow the planning, property development, design, construction and operational components of SUD to be integrated within and as part of the environmental, economic and social issues underlying the sustainability of cities; and
- allows decision-makers to select the assessments capable of evaluating the sustainability of urban development.

The framework's vision and methodology primarily provide a collaborative platform for building consensus, supported by a set of protocols and assessment methods which come together to form a decision support toolkit for evaluating the sustainability of urban development.

The integrating mechanism or tool in question is the vision and methodology of an integrated SUD and the framework for analysis this provides – the 'trans-disciplinary language' of collaboration and consensus-building adopted by BEQUEST to 'bring together the diversity of interests', the planners, property developers, designers, constructors and operators represented as stakeholders in the environmental, economic and social structure of SUD. That diversity of interests which makes up the syntax and vocabulary of the said stakeholders and provides them with the opportunity to devise, agree, adopt and use the trans-disciplinary language previously missing from the debate on SUD (Cooper, 2002). For not only has the BEQUEST network undertaken an extensive review of the existing literature available on the subject, but its academic partners have gone on to frame the debate as one about the gateways through which stakeholders need to pass as part of the search for SUD. Furthermore, the network has formalised these gateways as 'hard and soft' junctions, the 'crossing points' in the journey towards SUD, where the stakeholders find themselves crossing over their own boundaries of knowledge and embarking on a journey that takes them into other domains. The journey to these domains is by way of the BEQUEST protocols. They represent an accepted

or established code, set of rules and guidelines for stakeholders to follow in the search for SUD.

While the BEQUEST framework itself represents a significant step forward in our knowledge and understanding of SUD, the contribution that the protocols make is something which should not go unrecognised. This is because they provide a formal link that goes back to the issues, spatial levels and time scales of the framework that connects them to the assessment methods. As such, they provide a 'roadmap', which not only links the 'top-level' issues, spatial levels and time frames to the middle ground of 'first- and second-level' protocol(s), vis-à-vis procedures, but connects them as a set of co-ordinates to follow in 'getting to the bottom of the matter' and adopting the assessment method capable of evaluating the sustainability of urban development. Taking this form, it is possible to say that the BEQUEST framework, protocols and assessment methods, set out the grid references which allow the network, along with its representative community of stakeholders, to take the matter of evaluation full circle: that is, from a framework for analysis to a protocol to follow and procedures to adopt in selecting the assessment methods which are best able to evaluate the sustainability of urban development.

VOLUME 1

Volume 1 of this series began by outlining the principles, underlying concepts, models, vision and methodology of an integrated SUD (Curwell *et al*., 2005). This drew attention to the framework BEQUEST has developed for such an understanding of SUD and went on to set out the protocol(s) the network argues should be followed in carrying out an environmental assessment. It argued that:

- SUD's goal is to improve the quality of life for an increasingly urban population;
- actions aiming to improve the quality of life need a simple, clear framework for analysing the sustainability of urban development;
- this framework for analysis needs to provide a vision and methodology that bring such concerns into the scope of actions taken to bring about improvements in the quality of life;
- within this vision and methodology, protocol(s) provide a middle ground between the various environmental assessment methods available to evaluate SUD and bring about improvements in the quality of life;
- such evaluations of SUD must transcend purely environmental factors, and embed themselves securely in more comprehensive and integrated environmental, social and economic assessments; and

- a community of academic and professional advisers is emerging, willing and able to use new information technology as a means of supporting such assessments, and to make the evaluations they produce available to local, regional, national and international agencies.

Having set out the BEQUEST framework, Volume 1 elaborated the protocols for environmental assessment, which were presented as a set of guidelines to follow in:

- 'screening' urban development activities;
- 'scoping' key sustainable development issues;
- 'clarifying' what activities, environmental, economic and social issues need to be addressed;
- carrying out the required 'consultations' with affected parties;
- 'procuring' environmental assessments of urban development plans, programmes and projects;
- 'assessing' whether the said urban development plans, programmes and projects build the capacity which cities need to carry their cultural heritage and produce forms of human settlement that are sustainable;
- 'reporting' on the ecological integrity and equity of the resulting resource distribution and ability of the public to participate in decisions taken about the future of the city, its cultural heritage and forms of human settlement; and
- using cities to 'monitor' the sustainability of urban development.

The BEQUEST protocol has its origins in the European Commission's (1997, 2001) Directives on Environmental Impact Assessment (EIA) and subsequently in Strategic Environmental Assessment (SEA), and focuses attention on the procedures to follow in assessing whether urban development plans, programmes and projects provide the capacity that cities need to carry their cultural heritage and produce forms of human settlement which are sustainable. However, as Volume 1 pointed out, while such a representation of the protocol is valuable for the generic description of the environmental assessment process it advances, the procedures it sets out are currently insufficiently detailed to overcome the risk and uncertainty stakeholders face in trying to use them as methods for evaluating the sustainability of urban development. As Volume 1 made clear, this is because the legal instruments surrounding environmental assessment are themselves insufficiently developed, too generic and not sufficiently specific for the individual needs of stakeholders as diverse as planners,

property developers, designers and constructors in evaluating the sustainability of urban development.

In response to this, Volume 1 set out the 'soft' and 'hard' gates of environmental assessment and developed the five protocols (planning, property development, design, construction and operation and use) for evaluating the sustainability of urban development and went on to outline the directory of environmental assessment methods available for such evaluations, reporting upon how they are currently being used to evaluate the sustainability of urban development.

While Volume 1 drew attention to the legal instruments of environmental assessment and the tense relationship emerging between the 'hard' certainties of the biophysical sciences and the less certain and risky sphere of economic and social relations, it did not provide a detailed account of the environmental assessment methods, or examine how those listed in the directory are currently being used to evaluate the sustainability of urban development. This was the object of Volume 2 in this series: *Sustainable Urban Development: The Environmental Assessment Methods*.

VOLUME 2

Volume 2 (Deakin *et al*., 2007) took the BEQUEST framework and protocols as its point of departure and brought together a number of contributions from recognised experts in environmental assessment and leading authorities in the use of such methods. These contributions provide a unique insight into environmental assessment and methodological questions of critical importance to SUD. Volume 2 offered twenty-three chapters from leading authorities on the methodology of environmental assessment presented under the following headings:

- environmental assessment instruments;
- systems thinking-based approaches to assessment and the role of evaluation;
- environmental assessment methods;
- methods for environmental, economic and social assessments; and
- evaluations of the ecological integrity, equity of resource distribution, and participation of the public in matters concerning the futurity of urban development and sustainability of cities.

Volume 2, Part 1 set out the statutory instruments put in place by the European Commission (EC) to assess the environmental impact of urban development proposals. Focusing on the EU's 97/11/CE and 2001/42/CE directives, it examined the development and use of strategic environmental assessment and environmental

impact assessment to evaluate the sustainability of the development programme for the 2006 Winter Games. Part 2 used these statutory instruments of environmental assessment as a platform to examine the systems thinking behind the methods, their approach to SUD, and the role evaluation plays in this. Using this examination as a stage to account for further developments in environmental assessment, Part 3 set out the methods that can be used to evaluate the sustainability of urban development. This section accounted for recent developments in the use of cost–benefit analysis (CBA) and multi-criteria analysis (MCA), contingent valuation method (CVM), and the hedonic price method as environmental assessments. Part 4 examined the assessment methods that have recently emerged to meet the particular economic and social challenge SUD poses. Here, attention was drawn to the environmental, economic and social assessments that have recently developed to support very advanced evaluations of SUD.

Parts 3 and 4 of Volume 2 were taken from BEQUEST's survey of the environmental assessment methods currently available for evaluating SUD. So far the survey has identified that sixty methods are available to assess the environmental impact of urban development and sustainability of cities that have been applied to the planning, property development, construction, design, operational and use activities of the urban development process, and which are variously used by cities to evaluate the sustainability issues this raises at the range of scales of assessment. The survey can be accessed via the website of the BEQUEST project: http://www.surveying.salford.ac.uk/bq/extra. This provides a list of the methods surveyed and, in a number of cases, offers hyper-text links to the case studies from which they have been drawn. It provides an opportunity for readers to explore the implications of applying the method in further detail and satisfying themselves as to whether the technique is appropriate for the matter under consideration.

The list of methods is drawn from a survey of the scientific literature: textbooks, scientific journals and unpublished technical reports on the methodology of environmental assessment written by professional members of the community. The master list provides a survey of the assessment methods which cities in Europe and North America should have the capacity to use, and provides case-study reviews of how they have been applied to evaluate the sustainability of urban development. In certain cases they represent assessment methods that the partner and extranet members of BEQUEST have been engaged in developing, or of which they have a detailed knowledge (see Deakin *et al*., 2001, 2002a and b, Deakin and Curwell, 2003, Deakin and Lombardi, 2005a and b for further details of the survey).

Part 5 took the evaluation of SUD full circle, by assessing how well the environmental assessment methods evaluate the ecological integrity of urban development and equity of the resulting resource distribution. Furthermore, it explored whether this

distribution of resources in turn makes it possible for the public to participate in decisions taken about the futurity of urban development and the sustainability of cities.

The assessment methodology Volume 2 adopted was based upon an understanding that the growing international and increasingly global relationship between the environment and economy of civil society is uncertain, resulting in, as yet, incalculable degrees of risk; which means that standard, 'tried-and-tested' methods of assessment are of limited help in evaluating SUD. Volume 2 argued the limitations of such standard measures can only be overcome by adopting a 'co-evolutionary approach' to environmental assessment and by turning attention towards methods able to evaluate the ecology of resource consumption. This methodology managed to overcome the limitations of the past, and focus attention on the so-called 'hard' certainties of biophysical science underlying the less certain, risky and 'softer' social relations of SUD. Set within the BEQUEST framework and protocols, Volume 2 provided a detailed account of the environmental assessment methods key to this transformation through what is referred to as BEQUEST's 'post-Brundtland' directory of environmental assessment methods that are currently being used to evaluate the sustainability of urban development. In this way it has provided an account of the environmental assessment methods key in building the environmental capacity needed to qualify the ecological integrity of urban development, and provide the techniques of analysis required to evaluate whether this brings about an equitable distribution of resources. Whether ensuring the ecological integrity of urban development will bring about an equitable distribution of resources remains to be seen.

The highly integrative and multi-scalar nature of these assessments is seen to be of particular value because they highlight the significance of the BEQUEST framework in capturing the sustainability issues, representing them as matters of particular concern to the quality of life. They also expose the value of the protocols in dealing with the hard and soft issues of SUD. For, while in Volume 1 the hard gates of the protocols were represented in statutory terms, and therefore as rules of law (for example, the requirement of SEA and EIAs), Volume 2 provided the opportunity to develop a harder edge to the biophysical, economic and social science underlying urban land use planning, property development, design and the construction of buildings. These buildings make up the estates, neighbourhoods and districts of cities whose current forms of planning and developmental control have been brought into question because of the way they have tended to threaten ecological integrity and produce an inequitable distribution of resources. This has been met with a call for the development and application of environmental assessment methods able to restore the balance, based on socially inclusive decision-making, which gives the public the

power, entitlement, statutory right and opportunity under the rule of law to participate in matters concerning the future of urban development and the environmental, economic and social sustainability of cities.

The highly integrative and multi-scalar nature of these evaluations is significant because they not only link sustainability issues to the quality of life but are systematic, principled and disciplined about how these connections are made, related back to the statutory instruments of environmental assessment and the stakeholders (planners, property developers, designers and constructors) responsible for such evaluations. This is useful not just for assessing how the environment impacts upon the quality of life, but for qualifying SUD in terms of the environmental, economic and social value this in turn institutes. In this respect it becomes possible to capture the complexity of the situation under examination, along with the critical nature of the sustainability issues being considered.

Volume 2 argued that the value of this position lies in the opportunity to transcend the limitations of existing assessment techniques and to transform them into forms capable of evaluating SUD in all its aspects. As such, it offered a detailed account of those assessment methods that are key in BEQUEST: **B**uilding the **E**nvironmental capacity which is needed to **QU**alify the ecological integrity of urban development and **E**valuate the equity of the public's participation in decisions affecting the future economic and social **S**us**T**ainability of cities.

The objective of BEQUEST's directory of assessment methods is fourfold:

- first, to direct decision-makers towards the master list of environmental assessment methods that are currently in existence, and which stakeholders may use to evaluate the sustainability of urban development;
- second, to provide a standardised description of each assessment method;
- third, to illustrate the classes of assessment method; and
- fourth, to classify the assessment methods based on the complexity of the evaluations they advance.

Here, the stakeholders are represented as urban planners, property developers, designers (architects and engineers), constructors, operators and users. As each group offers expertise at various stages and differing scales of action of the urban development process, it is recognised that each decision-maker requires to be directed towards a method of assessment which provides a detailed description of what each evaluation contributes to the sustainability of cities. The standard description of the assessment methods provides this; it allows stakeholders to source the information of interest to them and to direct decision-makers towards the nature of the evaluation which the techniques of analysis offer. Given the number of

stakeholders in the urban development process and the interests they represent, it is important to provide such a description because it is not always clear which sector of the community the assessment method is directed towards, and to which stage of the urban development process it relates. The standard description aims to clarify these matters and avoid confusion over the use of the assessment methods.

The reason for this approach to the assessment needs of stakeholders is fourfold:

- it focuses attention on the agents of change (developers, urban planners, architects, engineers, surveyors, constructors, etc.);
- the attention paid to the agents of change and activities they undertake means the analysis is not limited to statutory urban planning instruments, but is more systematic;
- it becomes possible to take the property development, design, construction and operational interests into account in greater detail;
- it allows the analysis to concentrate on the built environment and the relationship this has to the economic and social sustainability of cities.

This might be seen as an Agenda 21 'grass-roots' activists' approach but making it more responsible for making urban development sustainable through greater support from the growing body of professional knowledge and deepening academic understanding of this as a city-wide process. The benefits of this are seen to lie in the capacity the assessment has to unify, rather than to fragment further, our knowledge and understanding of SUD. For, rather than dividing the subject into sectional interests, professional fields and academic disciplines, the assessment makes it possible to circumvent such divisions, something which it achieves by recognising the interdisciplinary, cross-sectional and inter-professional nature of what are trans-disciplinary issues.

The BEQUEST framework, protocols and assessment methods, set out in Volumes 1 and 2, have gone a long way to enrich our understanding of SUD. Together, they have deepened and broadened our understanding of the subject. For, while they take the statutory instruments of environmental assessment as the starting point, the framework and protocols have provided the opportunity to outline the systems thinking underpinning this assessment methodology and draw particular attention to the multi-modal, human and cosmologic complexity of the models underlying the evaluation of SUD. These contributions have served to underpin the principles set out in Volume 1, the four-dimensional model of SUD mentioned above, particularly the ecological integrity and equity of resource distribution dimensions, which represent the outcome of public participation in inclusive decisions taken about an economic and social future

of cities explored more deeply in Volume 2. The value of these principles rests with the standards of assessment they provide: that is to say, the typology, classification, scale and time-frames of assessment which these evaluations of urban development need to provide as an index of the sustainability of cities.

VOLUME 3

BEQUEST also offers through its 'vision' and 'methodology' of SUD a collaborative platform where the protocols and assessment methods provide a more comprehensive decision support system for evaluating the sustainability of urban development. The outcomes of this collaboration and consensus-building have been grouped together to form a prototype electronic decision support aid, referred to in this volume as the *Toolkit for Assessment* (Deakin *et al*. 2001, 2002a and b; Deakin and Curwell, 2003; Hamilton *et al*., 2002). This toolkit links the framework, protocols and assessment methods of SUD as an information system which provides the technology to operationalise the integrated methodology that is required to support the consensual visions of SUD and begins to demonstrate how the protocol(s) and assessment methods can be used together to support more complete evaluations of SUD.

This volume takes this forward and serves to bring the examination of SUD full circle towards handling the complex economic, environmental, social and institutional issues that complete evaluations of SUD require. Having begun by examining the framework and protocols for environmental assessment (Volume 1) and then gone on to study the environmental assessment methods (Volume 2), here the focus moves to the links and connections necessary to provide the more integrated evaluations mentioned above. In this regard, the investigation begins by exploring the links between the tools and connections they in turn have with the set of assessment methods for SUD. This is done by:

- setting out the links and connection in question;
- demonstrating how they combine to form a decision support system;
- showing how this prototype provides the information system and technology of an integrated methodology and vision of SUD; and
- identifying what the evaluations undertaken communicate about the sustainability of urban development.

This resulting toolkit (framework, protocols and methods) for assessment sets out the grid references which provide the BEQUEST network and its representative community of stakeholders with an information system to support decisions taken

about the evaluation of SUD. Taking the toolkit as its point of departure, Volume 3 sets out the collaborative platform and consensus-building methodology adopted by BEQUEST to 'bring together the diversity of stakeholder interests': planners, property developers, designers, constructors, operators and users, each with vested interests in decisions taken about the sustainability of urban development. It shows how the interdisciplinary language adopted for this exchange has provided a fruitful dialogue between the stakeholders, enabling them to devise, agree and adopt a set of standards for assessing the sustainability of urban development. To do this, Volume 3 presents the outputs of the research that BEQUEST and other close collaborators have developed as the gateways that the network has used to identify the 'hard and soft' junctions and open the crossing points for stakeholders to identify when working in the complex terrain that SUD represents.

To progress the findings of BEQUEST's research into SUD, this volume brings together twelve contributions on the use of the framework, protocols(s) and assessment methods as a system for supporting decisions taken about the sustainability of urban development. Part I sets out the decision support system and provides an updated view and reflections on it based on its further use and development from that originally presented in a paper published in a special issue of *Building Research and Information* on 'Sustainable Urban Development and BEQUEST' (Hamilton *et al*., 2002). Part II turns attention to the assessment methods selected to evaluate the sustainability of urban development. Adopting the BEQUEST framework for analysis, these chapters focus on diagnosing the challenges that land use planning faces, and how it is possible to meet them by using the advanced and very advanced SUD assessment methods now available and emerging from research. This part then goes on to provide examples of how the framework, protocol(s) and assessment methods are being used to support urban (re-)development in terms of the protocols for development of property, construction of buildings, estates, neighbourhoods and districts of cities. Part III returns to the underlying question of how to carry out evaluations which address the full complexity of SUD. Through a critical examination of two attempts being made by cities to develop sustainable communities, both chapters in this section turn attention to the very advanced, highly integrated and multi-scalar methods capable of meeting the growing expectations that both policy-makers and the public have for these to be participatory and 'future-proofed' – that is, offer reliable assessments of their impacts. In this sense they explore evaluations that support the development of sustainable communities and good urban governance.

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Part I

The Toolkit

2

Decision Support for Sustainable Urban Development

The Origins and Potential of the BEQUEST Toolkit

Andy Hamilton, Stephen Curwell, Gordon Mitchell and Philip James

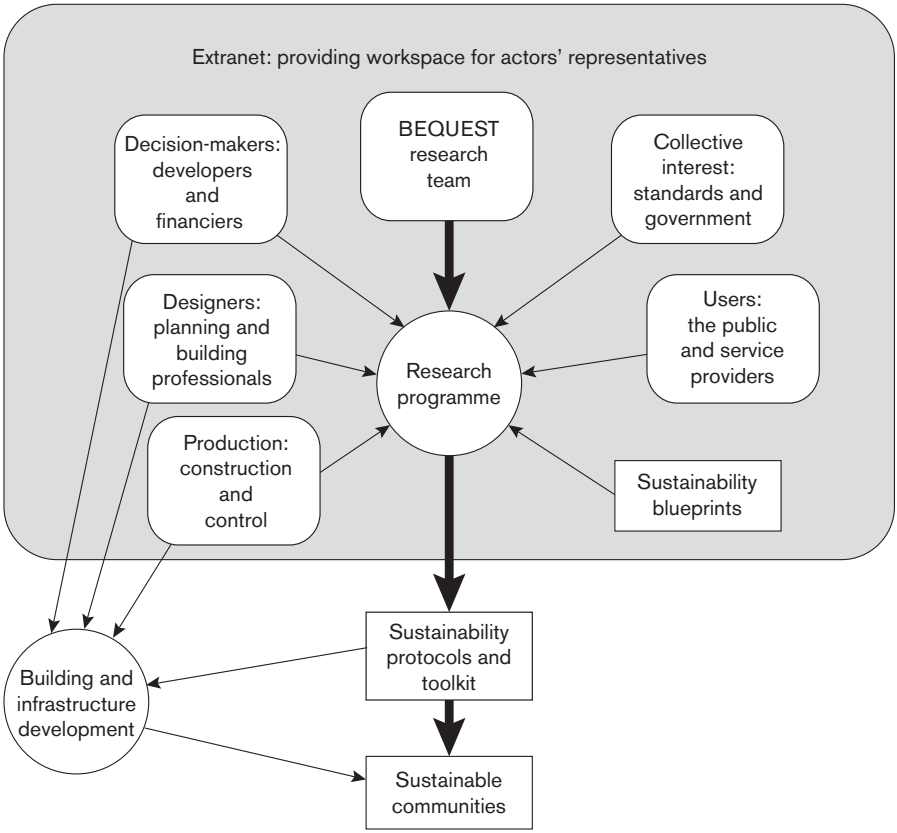
INTRODUCTION

The BEQUEST 'concerted action' derives from an acceptance that sustainable development (SD) was and remains a contested concept (Curwell *et al*., 2005; Bentivegna *et al*., 2002). Thus BEQUEST was posited on the need for consultation and negotiation in order to develop consensus across a wide range of actors from both the demand and supply sides of the urban property and infrastructure sectors on what SUD constitutes and how interventions in cities might support more sustainable living and working (Curwell *et al*., 1998) . To this end, a wide consultative network was established, described as the 'BEQUEST Extranet', to include representatives of all actors from across the EU. At the outset a collaborative research project was proposed in which the researchers took part in dynamic interaction between all the actors[1] as shown in Figure 2.1, which illustrates the context of research and indicates how the views of the various actors were to be combined within the research programme. The diagram also shows how the work was to make use of existing sustainability blueprints to produce new sustainability protocols that can be applied locally to enhance sustainability in building and infrastructure development. It was envisaged that these protocols would be supported by an internet-based decision support system or aid, to be known as the 'BEQUEST Toolkit', to assist planners and others in their interpretation and application of the concept. The Toolkit (BEQUEST, 2001) was planned to address the needs of all stakeholders working in, or affected by, urban development (Davoudi, 2005).

OVERVIEW OF THE TOOLKIT

Intended users

A key task that the BEQUEST team addressed at an early stage of the project was the identification of the Toolkit end-user groups. Because of the holistic nature of urban sustainability, initial designs attempted to address each of the twenty different groups in the ATEQUE classification (ATEQUE, 1994) of urban actors (planner,



2.1 Research context

property developer, financier, etc.). However, this classification was considered too detailed for the prototype Toolkit, greatly increasing its complexity. To overcome this problem, the Toolkit was designed to appeal to three broad end-user groups:

- Professional users (architects, planners, engineers, etc.), whose primary need is to access the best available information on appropriate assessment methods and protocols providing structured guidance on 'how to develop sustainably'.
- Mediators – those who interpret the information on behalf of non-experts, including politicians and the general public. Mediators should be interested in the protocol checklists and case studies of previous urban interventions. They may be drawn from NGOs, pressure and community groups, or from the professional and research communities.

- Researchers, whose principal interest is in exploiting the richness of available sustainability information (assessment methods, case studies, protocols, relationships between elements of the sustainable urban system), to gain new insights into sustainability problems and solutions.

These groups are not catered for specifically in the Toolkit as they are not mutually exclusive; an individual may belong to all three groups. Rather, the Toolkit was designed so that the information needs of these user groups could be satisfied generally.

BEQUEST's objectives

The objectives of the concerted action, as agreed in 1998, can be summarised as a mission to develop:

1 A multi-disciplinary, cross-cultural approach and plan of action for the implementation of sustainability in the context of urban development and regeneration.
2 A directory of environmental assessment methods and a decision matrix to provide guidance to practitioners.
3 A common procurement protocol for the built environment which encompasses the scale of action from individual buildings to the city/urban district.
4 The embryonic BEQUEST network, supported by the BEQUEST website, as a means for international and inter-professional communication and collaboration, and eventually, once the project was completed, to function as a self-funding international information exchange in the field of built environment quality evaluation for sustainability.

Each of the first three objectives became a component of the Toolkit (the Glossary, Assessment Methods, Protocol), whilst the Toolkit itself was designed to underpin the fourth objective. The BEQUEST Toolkit helps decision-makers consider the urban system in a more holistic manner, better addressing problems by integrating the BEQUEST objectives described above within a single, structured information system. However, it is important to note that the decision support system is not intended to be comprehensive, as this would necessarily have to address all elements and linkages in a system. Comprehensiveness implies that, with sufficient study, the urban system could be more properly understood and more effective management actions taken. However, in reality such complex systems are never fully understood, and in attempting to understand the system, so much time is spent that events supersede analyses, and a resultant 'plan' is no longer useful as a strategic document.

The Toolkit therefore guides the user in developing and applying approaches/techniques in sketching the urban reality and associated SUD issues. Based on the outcomes of these endeavours, SUD policy design and assessment can be conducted.

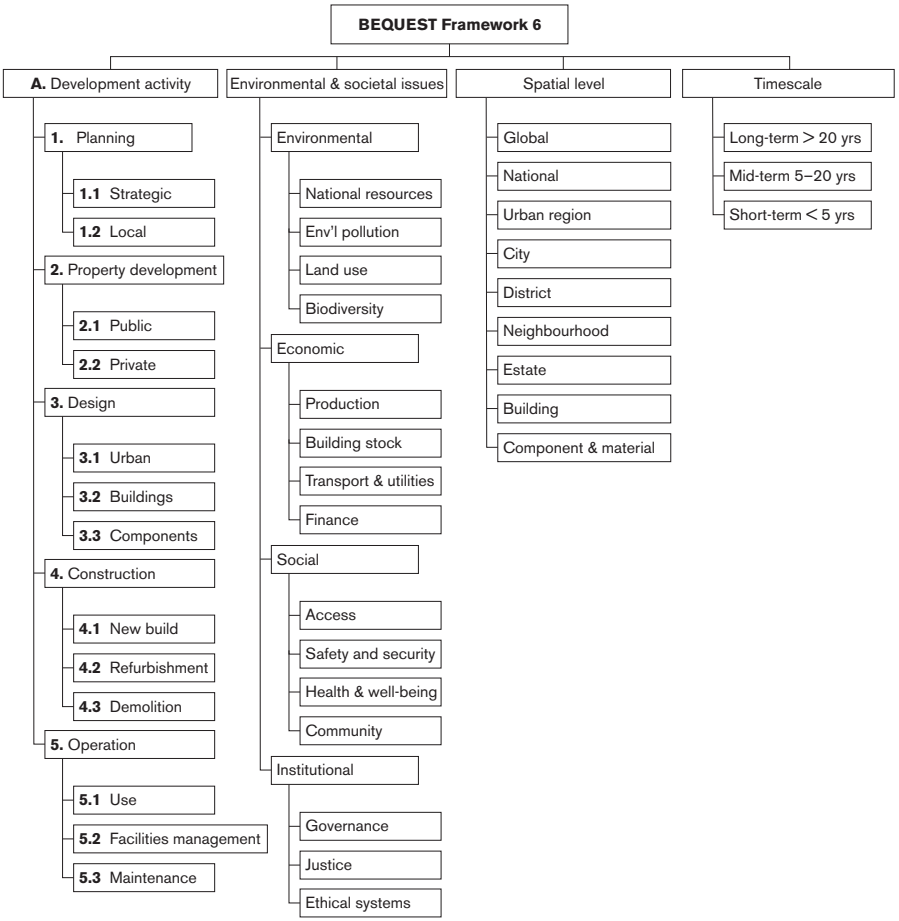
Toolkit structure

As the BEQUEST concerted action progressed it became clear that finding a common language, and a conceptual map or 'framework' for the understanding of urban sustainability, was much more difficult than originally envisaged. How the widely interdisciplinary nature of BEQUEST and the wide differences in various actors' perceptions of SD contributed to this difficulty is explained in Cooper (2002). The development of the conceptual framework was identified not just as a crucial element in the progress of BEQUEST but as a valuable aid to promoting collaboration between the various actors in the field of SUD in general (Deakin *et al*., 2002). As the value of a conceptual map of SUD that was both holistic and inclusive became more widely appreciated within the BEQUEST network, the Framework emerged as a substantive element of the Toolkit.

The conceptual map that emerged is known as the BEQUEST Framework and represents a consensus view amongst the BEQUEST network members on the key domains (activities, sustainability issues, scales) relevant to SUD, and how they relate to each other – its development is explained in more detail in Curwell *et al*. (2005) (Volume 1, Chapter 2 of this series) and Deakin *et al*. (2001). The Framework, shown in Figure 2.2, has four axes:

- Urban development activities: planning, property development, design, construction and operation. These aim to address all the activities that shape the urban environment, buildings, (green/public) spaces between buildings and the transport and utility infrastructure that connects them.
- Environmental and societal issues that influence or are influenced by development. The principal subdivisions, environmental, societal, economic and institutional, are used by the UN Committee on Sustainable Development to classify sustainable development indicators (UN, 1996) and were considered by the consortium to be a widely acceptable basis for classifying urban issues.
- The spatial scale of development activity or impact, from building components to global.
- The time period over which impacts might be experienced and/or assessed.

The Toolkit allows the user direct access, via either a menu or a search engine, to the principal components of the system, namely the Protocol, the Assessment Methods Directory, the Advisors Directory and the Glossary, which are described further



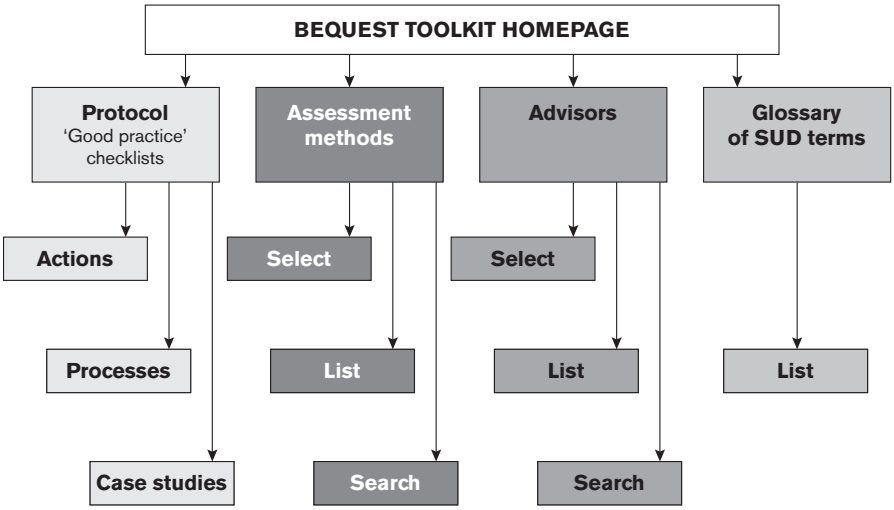
2.2 The BEQUEST Framework (version 6)

below. The Framework underpins this process by providing a common basis which links suggested actions, assessment methods and advisors with respect to the activity–issues–scales domains represented in the Framework. The practical advantage of addressing holism via an integrated rather than a comprehensive system is now apparent. The Framework has 13 activities, 15 issues, 9 spatial and 3 temporal scales (the minimum considered acceptable by the project partners for each axis), giving 5,265 separate domains for which information on protocol actions, associated assessment methods and advisors could be presented. Some domains will require little or no information, whilst others – the planning of city-scale transport utilities, for example – will require in-depth consideration.

Toolkit content

The Toolkit consists of the following components:

- **The Protocol**. The BEQUEST Protocol (see Deakin *et al*., 2002 for a full description) describes steps that urban actors can consider to make their development more sustainable, collectively addressing economic, social and environmental objectives. Because of geographical, cultural and legal differences throughout the European Union, the protocol cannot be highly prescriptive. Instead, it aims to indicate by way of checklists, actions that urban actors in particular fields undertaking particular activities should consider. Ideally the actions proposed should be based on strong evidence from research. However, due to the embryonic nature of the understanding of SUD and as a concerted action, BEQUEST took a different approach. It drew on the knowledge and experience of its diverse membership and the protocol emerged from an iterative consultative process similar to that used in action research. For suggested actions in the protocol, routes to further information are presented as references to cases studies, assessment methods and published guidance. Where possible, links are made to information mounted on web pages.
- **The Assessment Methods Directory**. This is a compilation of assessment methods, ranging from the well established to the experimental, that have been or could be applied in the sustainability assessment of urban development. BEQUEST identified sixty-four available methods, either in use or in research in the period 1999–2000; twenty-five that are broadly representative of the full list have been included in the prototype Toolkit. Each method in the Toolkit is described according to a common format: name, description, data requirements to use the method, status (i.e., 'well used', 'in research', etc.), applicability to the various SUD issues represented in the BEQUEST Framework and sources of further information, including references and case studies. An overview and evaluation of these methods with respect to assessing SUD is provided by Deakin *et al*. (2002) and in Volume 2 of this series (Deakin *et al*., 2007).
- **The Advisors Directory**. This module of the Toolkit contains details of advisors and consultants with experience in assessment methods and expert knowledge on individual steps identified in the protocol. Originally the advisors were drawn from the BEQUEST network. It was anticipated that this resource would expand over time but this has not been the case.
- **The Glossary**. This component explains terms used in the Toolkit, as well as some other SUD-related concepts, as understood by the BEQUEST network members.



2.3 The components of the BEQUEST Toolkit

These components are combined in the Toolkit as shown in Figure 2.3.

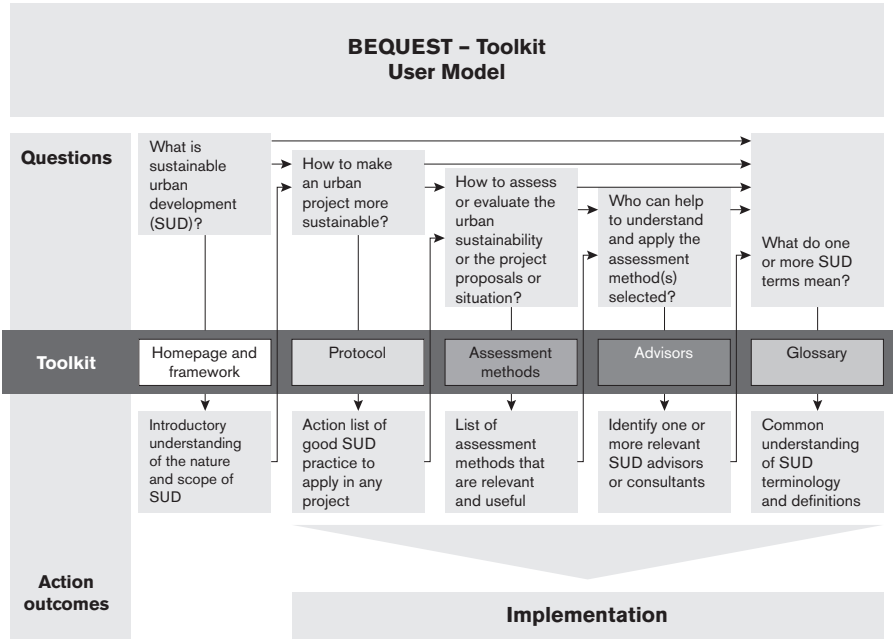
USING THE TOOLKIT FOR DECISION-MAKING

The 'user model' on the homepage of the Toolkit is shown in Figure 2.4. This supposes that a Toolkit user will be seeking to answer questions, from the basic 'What is sustainable urban development?' to the more complex 'How to assess the sustainability of a proposed project?' This can vary from a complex city plan, through an urban design to the design and construction of an individual building.

The Toolkit assists in answering such questions posed by users who differ in the experience they possess with regard to various aspects of SUD.

The key characteristics of the BEQUEST Toolkit are that it helps:

- Identify the most significant urban issues to be addressed and provides methods to assess the suitability of any proposed course of action. This is achieved for each development activity by considering the actions suggested by the protocol, and evaluating these actions using the most appropriate assessment method. Suggested actions and assessment results are then used to revise the original development plan to identify more sustainable development paths. This process may require several iterations. Draft plans and evaluations could be made available to stakeholders to facilitate stakeholder engagement in the establishment of the assessment criteria.



2.4 Toolkit User Model

- Recognise the uncertainties in urban decision-making. It is not highly mechanistic in the sense of some other expert or decision support systems. There are no 'right answers' for Toolkit users to find in the system, as one would expect, for example, when diagnosing faults with computer systems. Rather, the Toolkit aims to provide information about urban sustainability assessment and decision-making that users can apply within their own local context. Thus the Toolkit aims to provide generic advice that users must interpret within the context of their particular geographical location, sphere of activity and stakeholder groups.
- Decision-makers consider the 'big picture' by addressing the entire urban system, its component parts and the relationship between those parts. This perspective is important as it reminds us that a solution to one problem may create other often unexpected problems. Recent experience from the UK, for example, has graphically demonstrated that residential developments on flood plains increases flood risk for previously unaffected properties, and that building roads to relieve congestion often fails as demand merely increases to match the newly available road capacity (SACTRA, 1994). In these two examples, significant external factors, physical and socio-economic, respectively, have

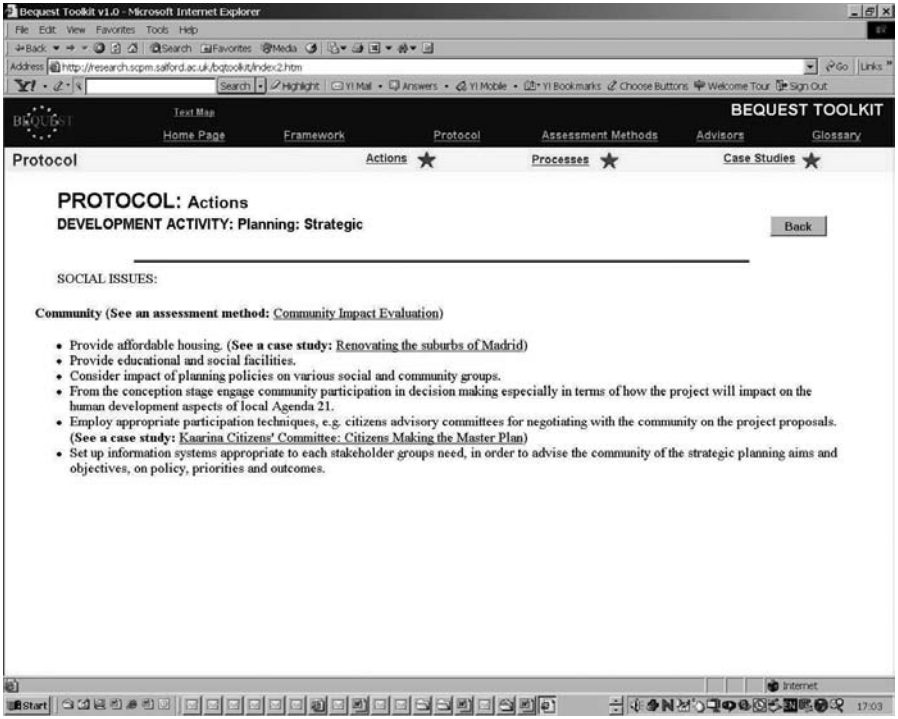
been neglected, with consequent problems. Hence it is recognised that more sustainable developments can result from greater recognition of external driving forces and externality effects, operating across a broader range of spatial and temporal scales than has conventionally been considered.

Let us clarify the above-mentioned issues by means of an example. Imagine that a mediator or spokesperson for a city residents' group is concerned about a large proposed retail park (shopping centre) on the outskirts of their city. The mediator would have some knowledge of urban planning, but this may not cover all the issues of sustainability, or may have had little experience of considering sustainability issues in urban decision-making and so would need more detailed guidance. At the other end of the spectrum is the professional planner, urban designer and/or constructor who needs advice about how to make the retail development more sustainable and wishes to understand how to demonstrate how his or her proposals will achieve a community's SD objectives. The Toolkit is designed to help in all these circumstances.

Selecting the appropriate protocol

On entering the system, the mediator user can spend some time on the home page, learning how to use the Toolkit effectively. With the retail park problem in mind they can enter the protocol module and select 'Actions', looking for action checklists for strategic planning. You notice that the protocol is organised according to the 'Development Activity' in the BEQUEST Framework (you can select 'Framework' in the menu bar to review it), and select 'Planning – Strategic'. You are given links to the action checklists on this topic, which are organised according to the 'Environmental and Social Issues' axis of the Framework (see Figure 2.5). The mediator user is most interested in community issues and selects 'Social Issues – Community'. The protocol checklist addresses issues such as housing, education, Agenda 21, planning and participation, with short statements describing the issues to consider and possible solutions. To aid further understanding, links can be followed to the Glossary, or to case studies within the Toolkit and on other websites. These might include good-practice examples, such as case studies of community actions in Madrid (e.g., renovation of suburbs) and citizen involvement in the master plan for Kaarinna, Finland.

The checklists presented are not simple sets of instructions to follow. If only becoming sustainable were that easy! Rather, they identify a number of issues that ought to be considered in planning the development. Importantly, we have tried to make the checklists inclusive; so that by addressing all the points given, no major factor affecting sustainability should be overlooked. It is intended that the information

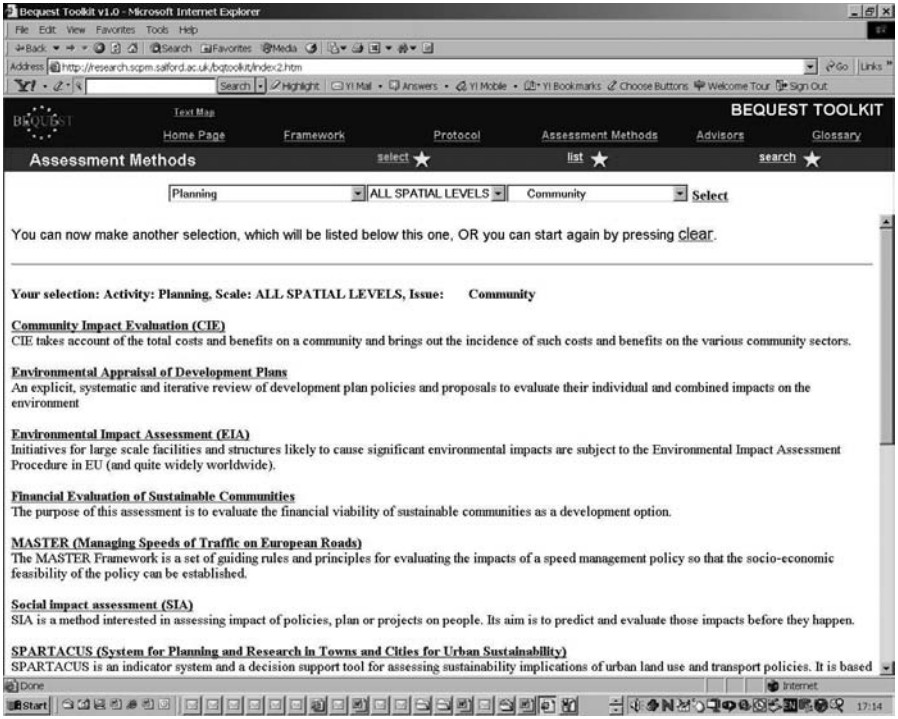


2.5 Selecting a protocol

collected from the checklist and associated links will help form a plan that can assist in procuring a more sustainable retail development (or a range of alternatives). This may include, for example, setting up a system for community participation in the planning of the shopping centre. A draft plan should then be evaluated, using the assessment methods in the Toolkit.

Selecting assessment methods

To select methods appropriate to this example enter the Assessment Methods module and select 'Planning', 'All Spatial Levels' and 'Community'. The user is then presented with twelve relevant methods (see Figure 2.6). The task then is to decide which methods to use. In an ideal world one method could be used, but at the time of the Toolkit development most methods had been developed to address specific issues, as the list in Figure 2.6 indicates. Therefore, it is necessary to consider several methods. To assist in this users can click on each method and be taken to a detailed description of each, which provides further information as well as onward links to further reading on the particular methods. This will help them select which methods



2.6 Selecting an assessment method

to use in their own decision-making situation. In the example the user would most likely concentrate on which of the seven methods are most useful in the specific community issues at stake with respect to the retail development. From this, the mediator is able to inform the stakeholders on the type of assessments that are possible and feasible; and ought to be undertaken to evaluate the community action plan properly from a sustainable development perspective. This will enable the mediator and community to make a more informed contribution in discussions between local residents, property developers and planners over development options identified from the action plan that remain open. Usually it is uncertain which of these is optimal from a SUD perspective, particularly with respect to the impact on local services and the community. Thus a collective decision is taken for a more formal assessment of the development alternatives. From this, the professional actors (planner, urban designer or constructor) can consider the methods identified earlier, select a method – for example, 'Community Impact Evaluation' – and apply it; or, if they are unfamiliar with this method, they can seek advice on its application from an advisor.

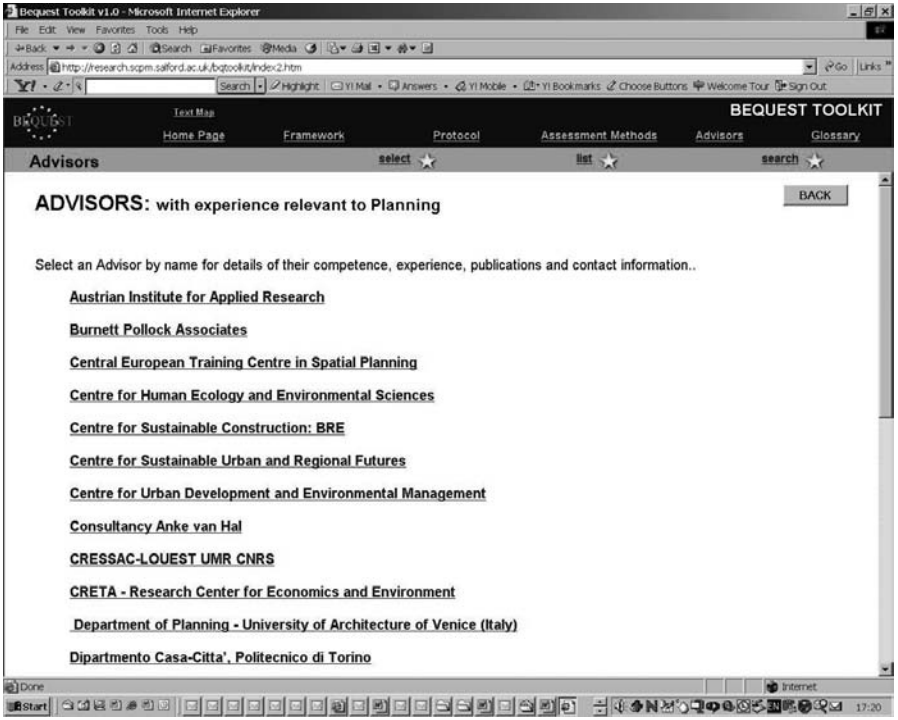
Selecting an advisor

A number of the methods demand specialist knowledge or expertise to apply effectively. Therefore, assistance may be required in the selection or application of an assessment method. Appropriate expert advisors can be searched for using the linked 'Advisors Module'. Advisors are subdivided into four categories, including 'Planning', as shown in Figure 2.7. Live links connect to the homepages of the advisor organisations.

In summary, the outcome of the use of the Toolkit is threefold:

- A wide range of recommended actions to be included in an action plan identified from the protocol checklists and supporting case studies.
- Identification of a number of suitable and appropriate assessment method(s) with guidance on their scope and application.
- Experts who can help with the application of evaluation tools and methods.

These outcomes provide a clear framework and range of supporting information that stakeholders need in order to collaborate on making decisions about SUD.



2.7 Selecting an advisor

EVALUATION

In the above scenario we have asked the reader to use their imagination rather than their analytical powers as we are describing a complete system that does not yet exist, for the Toolkit is a 'demonstrator' rather than a finished product. The example given is based on the strategic planning section of the protocol which has been enriched with information and web links. However, the system requires 'populating' with additional data and links for all the Toolkit modules.

Evaluation exercises carried out on the Toolkit (Hamilton *et al*., 2002) show that it scores highly for ease of use and on the potential of the Toolkit when fully developed (approximately 4 out of 5 on the Likert scale). However, in its present form it does not score so highly on usefulness in real world situations (between 3 and 4 on the Likert scale for several related criteria). In particular, during the feedback sessions reviewers said they would like more detailed advice on how to carry out actions identified in the protocol checklists, with one reviewer saying that they felt they often got to a 'dead end' in that information in the Toolkit was given at too high a level of generality to be easily applied to real-world situations. This is not surprising, as it is clear that the production of a fully developed Toolkit taking a holistic approach to SUD, and intended for use across the whole of Europe, addressing local planning legislation in each country, and taking into account cultural differences, would be difficult within a fully funded research programme let alone within the BEQUEST concerted action, which was primarily designed to support networking.

At the time of its development the BEQUEST Toolkit was unique in its wide scope and ambition in that it attempted to address all the activities, environmental, social, economic and institutional SD issues, spatial scales and timescales as represented in the BEQUEST Framework. This is confirmed by a review of the state of the art undertaken at the time by Kersten *et al*. (1999), which shows that most available methods addressed only some of the issues included in the Agenda 21 plan at the Earth Summit (WCED, 1987). One of the main criticisms is that the Toolkit does not embrace sustainability indicators, which were specifically left out of the BEQUEST concerted action because at the time of its conception there was much controversy about the use of indicators in SD and it was felt that developing consensus on the main SUD issues was sufficiently ambitious in itself without dealing with the metrics as well.

Subsequently the BEQUEST approach and thinking have informed the EU-funded FP5 project Construction and City Related Sustainable Indicators (CRISP, 2004). An expert system, eXpert21, that facilitates decisions on the selection of indicators for sustainable development at the local and regional levels has been developed in Germany. It aims at structuring participative decision-making processes in a way that maximises user influence on the decision while providing up-to-date

information on the single indicators. An operational prototype with seventy-two indicators has been implemented, and can be accessed via the internet (http://www.umwelt.schleswig-holstein.de/?eXpert21; in German). Such systems can be used alongside the BEQUEST Toolkit but ultimately they need to be integrated as is attempted in Multi-Criteria Analysis (MCA) (see also Munda *et al.*, 1995; Munda, 2004; and Roy, 1996).

In his review of 'The Relevance of BEQUEST', Kohler (2002: 132) states:

> BEQUEST has raised the necessity of integrated decision making and the required tools and has answered this with a prototype structure and prototype Toolkit for decision makers . . . The principal merit of BEQUEST is to have imagined such a Toolkit and created a first prototype. This allows one to judge if and how this type of tool and above all this type of planning heuristics can address the needs of different actors in different situations. It further addresses which tools are needed, how they can be combined and how such tools [protocols, assessment methods] can be integrated in a larger participatory process at many different scales within the urban process.

Where does this place the BEQUEST Toolkit? As the lower scores for usefulness outlined above indicate, it is not a prototype for a new generation of holistic and informative assessment tools that assist in a completely integrated analysis of SUD and enhance informed participation. It does not contain indicators and users cannot make assessments directly online using the system. However, it is a means by which users can identify the wide range of actions they should consider in SUD and a range of appropriate assessment methods and tools so that by the application of several methods in tandem more integrated sustainability assessments of intended urban changes can be approached. For this reason the Toolkit is found to be valuable and continues to be maintained by popular request. On the rare occasions when the server is down at the University of Salford the lead authors of this chapter receive complaints from around the world and requests for the Toolkit to be restored!

RELEVANCE OF THE BEQUEST TOOLKIT TO CURRENT URBAN DECISION-MAKING

New European Union laws on enabling rights provide further impetus for the development of measures, such as the BEQUEST Toolkit, which support decision-making for sustainability. These laws are being driven by the 1998 Aarhus Convention (UNECE, 1999), a pan-European treaty that aims to give substantive rights to all EU citizens on three principal environmental matters: public access to environmental information, public participation in environmental decision-making and access to

justice in environmental matters. Measures such as the BEQUEST Toolkit, designed to aid more inclusive, participatory decision-making for SUD, would clearly support implementation of such legislation.

As the concepts of participatory planning are becoming more firmly embedded within the planning system, the BEQUEST Toolkit becomes even more relevant. In the scenario detailed above we set out how someone working as a mediator might use the Toolkit. It is sufficiently accessible to informed citizens and so within the context of participatory planning all actors involved in proposed new developments could derive assistance from using it. For this reason the Toolkit has also been found to offer educational benefits for those entering regeneration, planning, sustainable communities and the building professions. It can be, and has been, used in many ways with students either as part of class-based activities or to support student-centred activities at both undergraduate and master's levels. It is currently being used to support teaching in a number of European universities, including Florence, Turin, Salford, Napier (Edinburgh) and Lusofona (Lisbon), and in the USA.

The Toolkit has also been used as a key input to a series of other SUD projects, including:

- CRISP (Construction and City Related Sustainability Indicators) – EU FP5
- INTELCITY (Intelligent Sustainable Cities) – EU FP5
- LUDA (Quality of Life in Large Urban Distressed Areas) – EU FP5
- VEPS (Virtual Environmental Planning) – EU Interreg.
- ND modelling (of buildings and urban areas) – UK EPSRC

Overall, these activities indicate that the Toolkit offers potential for supporting decision-making for SUD and considerable potential for further development in research. Onward development of the Toolkit as an operational system remains an issue of particular concern for the BEQUEST network. The development team think it more appropriate to consider producing systems that address the needs of particular professions, or which are specific to a location or sector, for example regeneration (as in the LUDA project), or for a company (interest has been expressed by a major steel producer). The present Toolkit has to work for all European climates, cultures, regulations and legal systems and, as a demonstrator borne of a European consortium, is necessarily broad in approach. A country- or city-specific Toolkit would be much easier to operationalise, yet can still retain the breadth of experience and cross-fertilisation of ideas and approaches evident in the international prototype. If the Toolkit were developed and targeted at a particular profession, such as planners or property developers, the narrower focus could allow the detailed content to deal with their particular needs and concerns and use their vocabulary. Work in other

research and technical development projects to do this is ongoing, for example in the LUDA and VEPS projects mentioned above. The LUDA development of the Toolkit is a good example of the application to urban regeneration sectors, as described below.

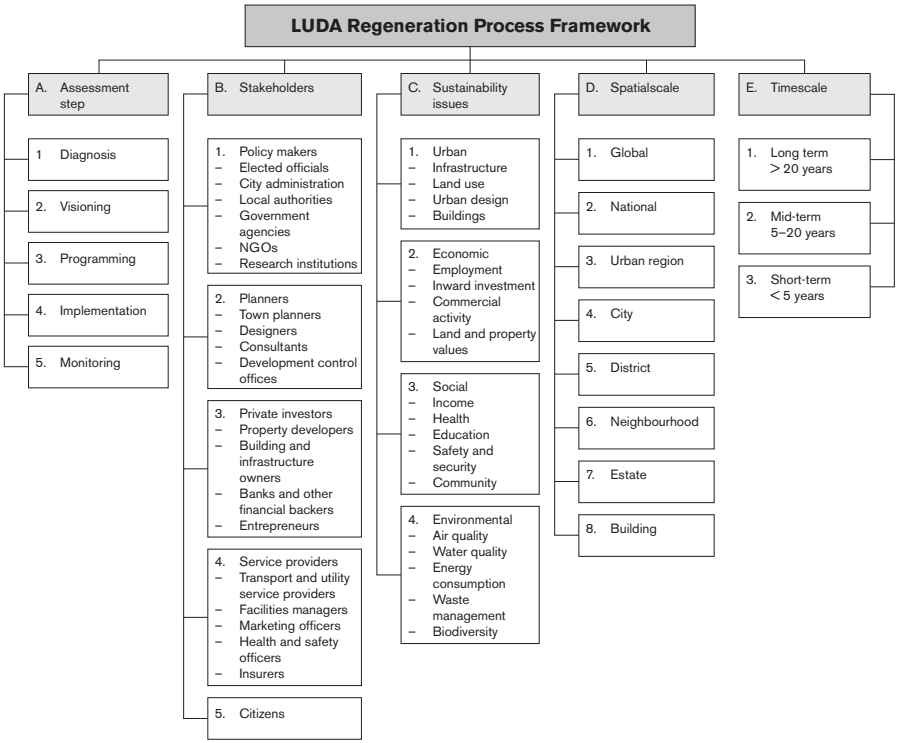
LUDA ASSESSMENT DECISION SUPPORT SYSTEM

In the LUDA decision support aid for assessing the quality of life improvements in LUDAs (Large Urban Distressed Areas) relies heavily on the experience in BEQUEST. LUDAs thus far have proved very difficult to treat in a sustainable manner due to the complexity of analysis and the difficulties in reversing the economic, social and physical decline. One of the reasons for this failure identified in the LUDA project is the limited or inappropriate use of assessment in the regeneration decision-making process. The aim of the LUDA decision support system is to provide a toolkit of assessment methods that can be used by urban practitioners to support decision-making throughout the regeneration of LUDAs. The toolkit contains a database of assessment methods in a similar way to the BEQUEST Toolkit but with a menu and framework that are more appropriate to the problems in this area. An expert group drawn from research and city practitioners was used to select appropriate methods and current good practice which were mapped against the components in the LUDA regeneration framework: that is, steps of the regeneration process, types of stake-holder, sustainability issues and different time and spatial scales.

The LUDA decision support system is available online via the 'Select method' function in the LUDA Compendium (LUDA Team, 2006). Similar to the BEQUEST Toolkit, it is a navigational interface designed to enable an expert user to select appropriate methods based on the criteria in the LUDA regeneration process framework (Figure 2.8), which is also adapted from the BEQUEST Framework. The user can choose any combination of the criteria from the drop-down menus to obtain a list of applicable assessment methods and techniques (Figure 2.9).

For example, if the following criterion is chosen: Step: Implementation; Stakeholders: Private Investors; Sustainability issues: Any; Spatial scale: Building; and Timescale: Short-term, this will bring up the list of methods as shown in Table 2.1. The user is also able to use the 'Any' option in one or more of the drop-down menus. For instance, if the user wants to be provided with methods that relate only to social issues and nothing else, then this is possible. Alternatively, if the user would like to view the full list of methods then they would select the 'Any' option for all five drop-down menus.

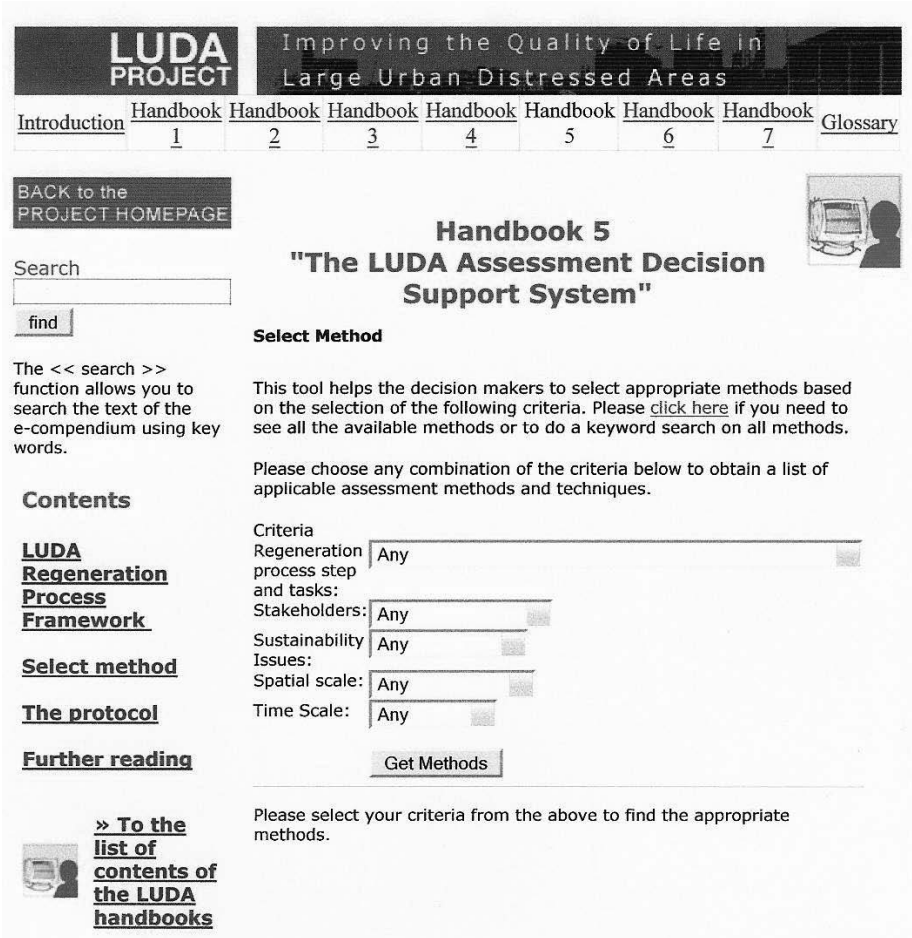
Table 2.1 shows the list of methods applicable to the chosen criteria as well as the status of the selected methods – that is, experimental, commonly used or well established – and purpose of the method (e.g., assessment and evaluation of



2.8 LUDA regeneration process framework

Table 2.1 List of methods from the example search described in the text

Method	*Method status*	*Main use of the method*	*Method description*
Analysis of Inter-connected Decision Areas (AIDA)	Well established	Aiding informed choices	View (in PDF format)
Community Impact Evaluation	Well established	Assessment and evaluation of impacts	View (in PDF format)
Multi-Criteria Analysis (MCA)	Commonly used	Aiding informed choices based on a set of criteria	View (in PDF format)
Survey Questionnaires	Commonly used	Collecting and initial analysis of data	View (in PDF format)



2.9 LUDA assessment decision support system interface

impacts). Moreover, links guide the user to a detailed description of each method, as already discussed. This allows the decision-maker to get to know the method in greater depth so that the user has the opportunity to apply the method in the given situation. The LUDA toolkit is available at: http://www.luda-europe.net/hb5/select.php.

The resultant online decision support aid develops the BEQUEST Toolkit but has similar characteristics in that it enables users to search the database of assessment methods by appropriate criteria for urban regeneration sustainable problem-solving and find suitable means to make the regeneration process more participative, sustainable and effective.

CONCLUSION

At the start of the BEQUEST concerted ation the difficulties in developing a consensus across all the built environment actors over a holistic framework for SUD and on the design of a toolkit to realise that Framework were not anticipated. However, the fact that the project was able to encompass the viewpoints of the thirty core partners from different disciplines and cultures, and incorporate feedback from a much larger group in the BEQUEST Extranet, gives strength to the outcomes. The design of the Toolkit evolved during the progress of the project to produce a system that had a strong internal structure and yet is flexible and adaptable. However, the Toolkit in its present form does not supply a complete answer to the problem of SUD for practitioners. In hindsight this was a very ambitious aim, but it was correct to produce a prototype that demonstrated the possibilities of an integrated evaluation in a way that was not divorced from reality so that its potential could be recognised in practice. The full potential of the BEQUEST Toolkit is becoming apparent as it is used as a stimulant to more integrated and holistic approaches to SUD in research and teaching. The conceptual approach is robust and is used in practice; however, a full commercial system is not seen as commercially viable due to the need for specific applications for various sectors, as the LUDA regeneration version indicates.

In this way the BEQUEST Toolkit can be seen as a stepping stone. It provided the first insights into the potential of a fully integrated evaluation of SUD. Subsequently a number of multi-criteria methods have been developed which promise fully integrated evaluations (see Munda, 1995, 2004, and later chapters in this volume). However, these are still in the research phase and require specialist expert support for application. At the moment most urban professionals remain largely ignorant of the range of assessment methods and tools available to them, although the EU's Strategic Environmental Assessment (European Parliament and the Council of the European Union, 2001) regulations mean that more effective evaluations are now required on larger urban projects and so various assessment methods are beginning to emerge in more mainstream practice. The BEQUEST Toolkit and its development in LUDA help address this deficiency. It has the benefit of highlighting the complex interactions between the wide range factors across social, environmental and economic issues. However, MCA methods provide more effective means to operationalise this during evaluations using targets and indicators in a way that is not possible in other assessment tools. The BEQUEST Toolkit can help user groups understand how each perceives various SUD problems, whilst MCA helps them deal with making trade-offs between the often conflicting factors in the analysis of SUD.

ACKNOWLEDGEMENTS

The Toolkit is a product of the whole BEQUEST network. We gratefully acknowledge funding from the EU Fourth Framework that supported the BEQUEST network, and Salford University, VTT Building and Transport and LT Consultants Ltd (supported by the Ministry of the Environment of Finland and the Finnish National Road Administration), for additional funding to develop the prototype Toolkit. Our specific thanks to Bim Egan of Salford University who programmed much of the Toolkit and gave her expert advice on accessibility issues, and to Sami Yli-Karjanmaa of LT Consultants Ltd for programming work and his general advice.

NOTE

1 The definition of actors used in BEQUEST and in Figure 2.1 is derived from the work of the ATEQUE group in France (ATEQUE, 1994). It recognises that individuals have multiple roles in society.

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Part II

Assessment

Part II.i

Simple and Advanced Evaluations of Urban Land Use

3

Scenario Analysis in Spatial Impact Assessment

A Methodological Approach

Francesca Torrieri and Peter Nijkamp

INTRODUCTION

Urban sustainability calls for a long-range perspective on an uncertain future. Policy analysis is a field fraught with many uncertainties. In the past decades scenario analysis has been developed as a scientific tool for coping with and managing long-run uncertainties in the policy-making process. A scenario may be defined as a possible, often hypothetical, sequence of events constructed in an internally consistent way for the purpose of focusing attention on casual processes and decision points (Kahn and Wiener, 1967). Consequently, a scenario consists normally of three parts: a description of the present situation; a description of future situations; a description of a number of events that may connect the present situation with future ones (the path) (see Nijkamp *et al*., 1997). The advantages of scenario methods over long-run forecasting tools are shown in Table 3.1.

In reality, there is a wide variety of scenario methods, such as: descriptive vs. normative scenarios; projective vs. prospective scenarios; commonsense-oriented vs. expert-based scenarios; or trend-based vs. open-ended scenarios. Scenario studies are usually experimental in nature and have assumed a solid position in the field of planning and policy analysis (see Ringland, 1998).

Table 3.1 Progressive advantages of scenario approaches in policy analysis

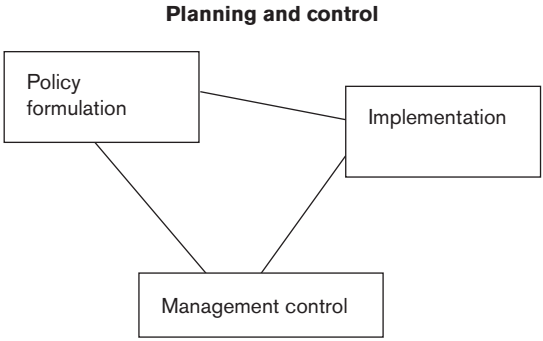
From:	*To:*
• Focus on quantified variables	• Focus on qualitative pictures
• More emphasis on details	• More emphasis on trends
• Results determined by status quo	• Results based on future images
• Deterministic analysis	• Creative thinking
• Closed future	• Open future
• Statistical-econometric tests	• Plausible reasoning
• From quantitative to qualitative	• From qualitative to quantitative
• Single-track thinking	• Multi-track thinking
• Reactive problem driven	• Proactive vision driven
• Multiple implicit assumptions	• Transparent simple assumptions
• Limited set of options	• Open range of options
• Model-determined mind	• Alertness to signals of uncertainty

Source: Nijkamp *et al*. (1997)

The present chapter proposes a cognitive methodological approach for future scenario development belonging to the field of Future Studies that is by its very nature a useful tool in the context of a spatial impact evaluation process. In the first part of the chapter, we describe the spatial or Territorial Impact Assessment process which proposes an integrated methodological approach that draws on the theory of 'planning and control' (Bardach, 1977) (Figure 3.1). We begin with an analysis of a real-world spatial (territorial, land-use) phenomenon for supporting the elaboration of alternative future scenarios related to a set of strategic objectives. Such an approach is based on the assumption that the future is not predetermined, but rather the product of a causal chain of events determined over time from exogenous and endogenous elements of the spatial system. Planning actions aim to guide such events towards achieving political objectives. According to the theory of 'planning and control', the implementation of planning action becomes an important task, so that scenario development must include an ongoing system of control and evaluation that can measure whether the development of the real world is proceeding in the direction that was envisaged. In this sense, scenarios are not an abstract and unchangeable path. They are in themselves an instrument which can help monitor and assess future development in order ultimately to propose new and creative actions.

The 'control' is very important to guarantee the satisfactory implementation of actions, moving away from a mere control of the extent to which the implementation conforms to the original plan to concrete prescriptions.

In the second part of the chapter, a cognitive methodology for future scenario development will be introduced (scenario planning), belonging to the field of Future Studies, that is inherently consistent with the processing logic proposed.



3.1 Relationship between policy and implementation
Source: Bardach (1977)

TERRITORIAL IMPACT ASSESSMENT: A NEW APPROACH FOR SUSTAINABLE REGIONAL DEVELOPMENT

Spatial impact evaluation refers to the territorial and land-use impact assessment of policy intervention. It aims to offer a systematic framework for consistent future-oriented policy action. The concept of Territorial Impact Assessment (TIA) was officially introduced for the first time in the 'ESDP Action Programme' by the Council of Ministers responsible for spatial planning in the Member States of the European Union and the Members of the European Commission Responsible for Regional Planning in the context of the European Space Development Scheme (Committee of Spatial Development, 1999). In this document, 'Territorial Impact Evaluation' was presented as an *ex ante* intersectorial evaluation tool or procedure to support a spatial development policy, plan or project for assessing the impact of territorial development in relation to the objectives and perspectives of territorial strategies. It includes all the aspects typical of territorial planning with reference to the social, cultural, environmental and economic dimensions (Committee of Spatial Development, 1999).

The main features that distinguish TIA from the existing evaluation tools (Environmental Impact Assessment and Strategic Environmental Impact Assessment) are the following:

- it is a new approach to *ex ante* evaluation in addition to classical cost–benefit analysis, environmental analysis, multi-criteria analysis, etc.;
- it is a large-scale approach consistent with the predictable effects of the overall territorial plans and projects of regional development;
- it includes a broad range of impacts (social, cultural, environmental and economic) that a plan produces in a specific territory, thus offering an intersectorial and multidimensional perspective.

Due attention is given to the future dimension in sustainable regional planning: here, controlling the impacts produced by future spatial developments plays a key role. The main problem of large-scale planning is, in fact, closely related to long-term planning. This activity is, in turn, strictly related to forward-looking thinking, because planners define and influence certain aspects of the future, often with long-term effects. Accordingly, looking forward and exploring possible different futures, and preparing to face them, become important activities.

Territorial Impact Assessment attempts to be an *ex ante* evaluation operating within an ongoing process of constructing of hypothetical future scenarios of territorial development related to a well-defined system of objectives. It sets the fundamental objectives for public action in order to attain the common good through

strategic actions to be assessed over time in relation to different dimensions, all of equal importance.

Starting from an integrated approach to the control system (Figure 3.1), it is possible to identify five steps:

1 identifying the issues through the observation of real-world phenomena;
2 setting the strategic objectives that have to be reached;
3 formulating alternative hypotheses of possible future scenarios in relation to the strategic objectives;
4 assessing the scenarios by means of a system of social, economic, cultural and environmental indicators;
5 applying a continuous monitoring system (strategy of control) on the territory in order to assess whether the actions undertaken in connection with the envisaged scenarios are meeting the strategic objectives set.

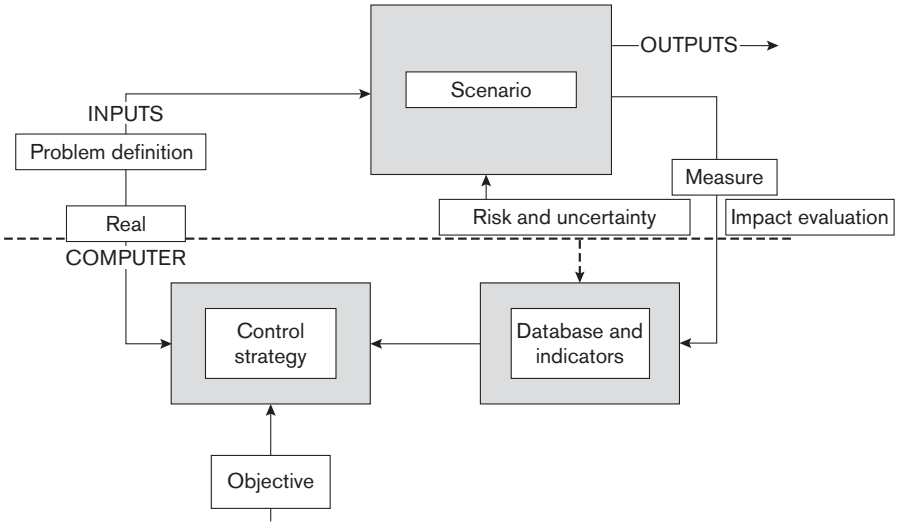
Within the evaluation process, questions arise as to the techniques to be adopted in each step together with the need for a way of measurement that enables the initial scenario (*ex ante* evaluation) to be compared with those consequent to the progressive realization of plans, programmes or projects that are decided to be activated (i.e., the ongoing evaluation). It seems important to emphasize that the evaluation process is not only a supporting instrument to the final choice, but should be accompanied by a process of observation on the territory to monitor and assess actions undertaken over time, with the aim of correcting the course of events if this is not in line with the strategic objectives.

This chapter addresses the issue of future scenario building. In particular, scenario analysis will be proposed as a technique for building scenarios for territorial development. It is a flexible, transparent, communicative decision support tool that can favour the participation of the social action in the territorial strategic planning. In fact, to evaluate means above all 'to enhance the transparency of the public action, to feed the democratic debate at different levels, to facilitate the understanding of the complexity of politics, to help to obtain a consent of the politics themselves' (Camagni and Musolino, 2002).

In the following sections, scenario analysis will be introduced with the purpose of understanding how it can support the Territorial Impact Assessment process, as outlined in Figure 3.2.

THE FUTURE DIMENSION IN A SPATIAL PLANNING PROCESS

The traditional approach to the planning of an unknown future attempts to foresee all its aspects: that is, to foresee the future by extrapolating it from existing trends.



3.2 Territorial Impact Assessment process

However, in the territorial planning field, forecasting is extremely complex since it is characterized by complex situations, whereby various groups of actors with conflicting objectives have the power to make decisions. The decision process is characterized by a high degree of uncertainty related to the future, especially in a dynamic and risky world (Beck, 1999). Uncertainty is, in fact, linked to the behaviour of the actors involved and to the unexpected or undesired impacts of the decisions. Moreover, uncertainty is due to exogenous risk factors.

The above considerations present a number of interesting challenges, from both procedural and substantive points of view. In that respect, the literature (Bell, 1997; May, 1996; Schwartz, 1991; Khakee, 1999) has proposed approaches and methodologies typical of Future Studies. Furthermore, within complex systems (such as the spatial system), the indeterminacy of the information and the impossibility of always being able to express the different and conflicting components through quantitative indicators make the exclusive use of classical methodologies ineffective in future forecasting. Actually, in physical and socio-economic planning qualitative information is accompanied by the uncertainty contained in some or most of the information. Information, in ideal terms, should be precise, certain, exhaustive and unequivocal, but in the real world it is very often necessary to use information that is compatible with the stochastic or fuzzy uncertainty of the data.

In approaches to Future Studies, normally an attempt is made to uncover the features and anticipate the characteristics of the future situation. This approach is based on the belief that the future is something already determined, unchangeable

and with clearly defined paths. The approach more often used to handle the uncertainty that intrinsically characterizes the future is to attempt to forecast with the purpose of defining a framework against which to set out objectives and programmes.

Within spatial planning, this approach based on the analysis of past trends has not always produced satisfactory results. Often, there is a complete reversal of past trends, due to exogenous factors that have overturned the normal forecasts (introduction of new technologies, changes in the macroeconomic context, climate change, environmental risk, etc.) and therefore it is possible, on this assumption, to develop a strategy that is not in conformity with the real future scenario.

Forecasts can be useful and accurate for measurable and comprehensible technical and physical systems (the movement of the planets, the load limit of a structure, etc.) that have a constant and informal character in everyday life, even if they also have a certain degree of space for indeterminacy. However, the territorial systems, strongly tied up with human dynamics and their values, beliefs or ideologies, are too complex and more difficult to forecast (Slaughter, 1995). Here, forecasting deals with systems for which complexity and uncertainty are strongly dependent on the influence of the external environment, at all levels, and on the unpredictable changes that characterize them. In this perspective, the study of the future does not have the objective to try to investigate the unknown to determine its characteristics, but to understand the different possible alternatives that can be developed with the purpose of furnishing a decisional context characterized by a multiplicity of options and choices.

Future Studies includes an ample range of methods and techniques that can be used in many fields of investigation. The current literature offers classifications and different indications of the principal methods and models of the art of future study.[1] In reality, it generally concerns methods imported by other disciplines, but always modified and suited for the particular environment being investigated and the objective for which the study is undertaken. Also important are the time of the research, the people involved, the decision methods and the scale of reference.

In the methods of future investigation an important distinction can be made between qualitative and quantitative, although this differentiation is intended more as a continuum than as a clean separation; most of the methods allow a certain quantification at least (Bell, 1997). Another important distinction is between normative studies and exploratory studies. Exploratory studies look at the future beginning from the present, while normative studies consider what needs to happen, so that a specific envisaged future state can come true. Normative forecasts establish objectives and introduce a series of alternative actions to reach them; they define the desirable future and then study the formalities with which to achieve those objectives that remain in the sphere of the possible future. Exploratory forecasts look instead at

the driving forces to see where this can lead us; they study the reasonable future. Starting from this distinction, May (1996) suggests an accurate classification of methods, by organizing them on a continuous scale that goes from forecast methods to those methods that aspire actively to shape the future. The principal methodologies of Future Studies include both models of problem-setting and models of problem-solving. In particular, we will make reference to them as tools to support decisions in the spatial planning process.

In the next section, a methodological approach to scenario analysis is introduced and its principal characteristics are highlighted.

SCENARIO PLANNING

Origin and development

The concept of scenarios is an old one. Since earliest recorded time, people have been interested in the future and have used scenarios as a tool for indirectly exploring the future of society and its institutions. In this context, scenarios have usually taken the form of treatises on utopias and dystopias and, as such, have a long history which can be traced back to the writings of the early philosophers, such as Plato, who described his ideal republic (Reibnitz, 1988; Wilson, 1978), and visionaries from Thomas More to George Orwell. However, as a strategic planning tool, scenario techniques are firmly rooted in the military and have been employed by military strategists throughout history, generally in the form of war-game simulations. Despite their long history in the military, the first documented outlines of what today might be regarded as scenarios do not appear until the nineteenth century in the writings of von Clausewitz and von Moltke, two Prussian military strategists who are credited with formulating the first principles of strategic planning (Reibnitz, 1988). Modern-day scenario techniques, however, developed only in the post-war period, and the 1960s saw the growth of two geographical centres in the development of scenario techniques: the USA and France.

In the USA the most meaningful studies were those of Kahn and Wiener (1967) who within the RAND[2] Corporation undertook numerous military commissions for the US armed forces. Founders of the Hudston Institute developed their use in the 1960s, coining the phrase 'to think the unthinkable' in relation to a forecast of the threat of thermo-nuclear war. Other important studies were conducted by Royal Dutch/Shell in the 1970s; the main exponents were Wack (1985), De Geus (1988) and Van der Heijden (1996).

During the 1970s the Research Institute of Stanford proposed an innovative structured approach for scenario building under the guidance of the illustrious luminaries Willis Barman, Harnold Mitchell, Oliver Markley and Marie Spengler.

Particularly important was the contribution made by the consultancy organizations that operated in this field: the Batelle Institute, the Global Business Network (Schwartz, 1991), Northeast Consulting and the Future Group.

Within the French school, the Centre d'Études Prospectives conducted fundamental studies in scenario approaches to long-term planning called 'prospective thinking' or 'You Prospective' (Berger, 1967). This approach reportedly emerged as a consequence of the repeated failure of 'classical' forecasting approaches. In this context, an extremely important contribution is that of Godet (1986), whose interest was mainly in morphological analysis and in existing relationships among different actors in the process of scenario building.

The main difference between the US and the French centres of scenario development is that, whereas the early scenario work in the US tended to be of a global nature, scenario development in France was more narrowly focused on the partner-political foundations of the future of France itself (Vught, 1987). There has since been a diffusion of scenarios into the business community, but scenario work in France still continues to play an important role in public sector planning.

Some definitions

Nowadays, the scientific literature on scenario analysis embraces a wide array of scientific disciplines, and the technique of scenario development is used above all in the choice processes to face the uncertainty that characterizes future areas of action. Despite all the discussion on scenarios, no clear definition or model has as yet been developed. It has proved to be a very broad and complex concept which defies attempts to capture it in a universally applicable definition.

Scenarios essentially represent coherent and feasible 'maps' of the future. So scenario analysis can be seen as the study of the strategic behaviour of actors in relation to true actions or events. Scenarios have been defined in several ways:

- a hypothetical sequence of events that focuses attention on casual knots and key decisions in the decision-making process (Kahn and Wiener, 1967);
- a story that describes the present situation and explains the changes and the developments that are envisioned for the future, including the steps and series of events that will enable society to move from its present condition to the more auspicious future state (Vleugel, 2000);
- a process proposing several informed, plausible and imagined alternative future environments where a number of possible options may be explored for the purpose of challenging current thinking, improving decision-making, as well as supporting human and organization learning about the planning situation (Chermack and Lynham, 2002).

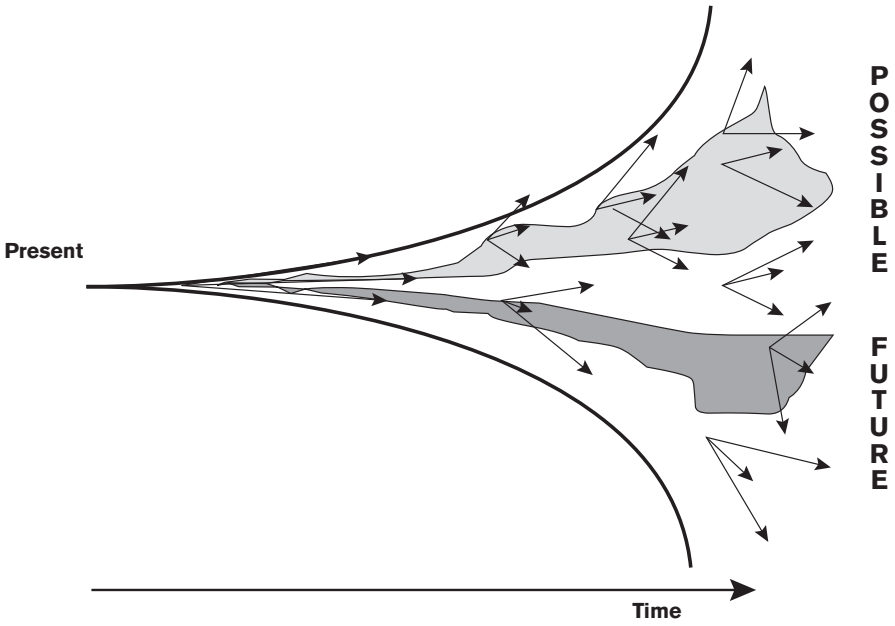
J. Warfield of the Batelle Institute furnishes the following interpretation of the term 'scenario':

> A scenario is a narrative description of a possible state of affairs or development over time. It can be very useful to communicate speculative thoughts about future developments to elicit discussion and feedback, and to stimulate the imagination. Scenarios generally are based on quantitative expert information, but may include qualitative information as well.

Therefore, a scenario does not represent a forecast or a preferred development of an actual situation; it is instead a set of coherent and believable descriptions that represent different visions of alternative futures, described according to a chain of events (Figure 3.3). In other words, scenario development can be seen as a tool to explore the future rather than to foresee it, to build contexts to support the decision, thus lowering the level of uncertainty and raising the level of knowledge. A scenario provides a context to think and reason about factors, relationships among actors and situations that answer the question 'What would happen if . . .?' Scenario elaboration is the task of an interdisciplinary team and helps to understand the points of strength and weakness of a project.

According to the cyclical development process proposed by Kolb (1984), starting with concrete experience, we can build models of possible futures (see Figure 3.3) achieved via different chains of events that then have to be valued and verified against different contextual conditions. Systematic information helps us to ensure that the future vision is built on the basis of the knowledge acquired during the process, in relation to the expectations, values, needs and events that can take place over time. The process is a cyclical-learning process in which new information is continually being turned into knowledge and verified on the basis of the hypotheses formulated. Such an approach appears to be very much in line with the processes of Territorial Impact Assessment, as described above.

The indeterminacy of the events that shape the possible future causes the planners, the policy-makers and all the subjects involved in the process of scenario building to react in different ways in relation to an uncertain and not deterministically predictable situation. In fact, it is possible to identify different ways to face uncertainty: to ignore the uncertainty; to identify and to specify the degree of uncertainty; not to do anything and wait until the uncertainty naturally reduces; to accept the idea that a condition of uncertainty exists and to act in a conscious way to manage it; or to face the uncertainty not as a threat but as an opportunity to model the future in a creative way. This last attitude is sometimes cited in the literature as the 'no-regret strategy' (see Nijkamp, 1994), in the sense that defined strategies may also be effective, even if the conditions are substantially modified over time. Therefore, scenarios do not



3.3 Cognitive process of scenario building

claim to foresee the future, but are a toolkit for describing possible chains of events that can determine alternative spatial transformations. This appears to be very useful within a Territorial Impact Assessment process, because they can support the definition of the lines of action, thus reducing the degree of uncertainty set by future dimensions. Furthermore, the construction of chains of events can help to monitor the course of events (see also Figure 3.4).

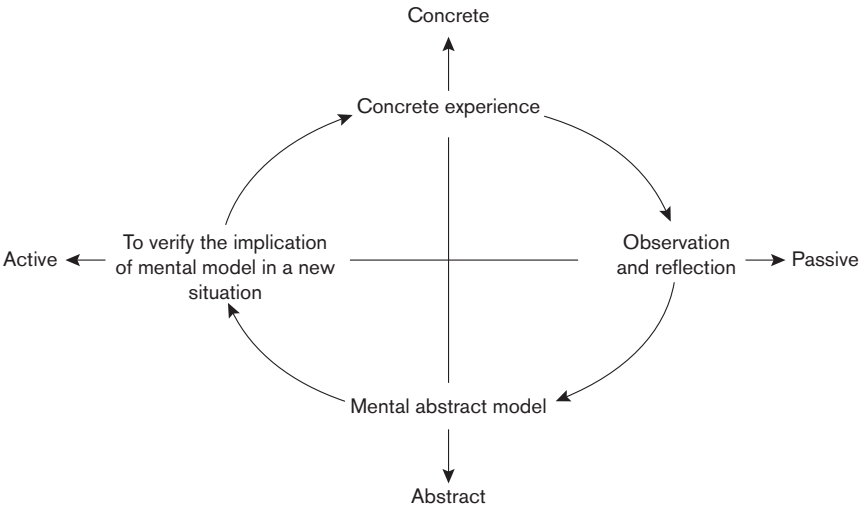
In the next section, our methodological approach of scenario building will be further described.

The methodological process of scenario development

Introduction

The design of a cognitive, interactive methodological approach for the construction and evaluation of scenarios draws on different fields of decision theory and particularly on descriptive theory (Descriptive Decision Theory) and prescriptive theory (Prescriptive Decision Theory).

Descriptive Decision Theory, directed to the study of psychological models in the decision process, even if not directly furnishing any formal support tool, guides the analysis of the various types of behaviour allowing suitable interventions during



3.4 The learning process
Source: Adapted from Kolb (1984)

this process. This field of decision theory, with reference to multi-actor decision processes, focuses on the individual or group mechanisms that can be activated, underlining that elements, both behavioural and psychological, that are able to influence, even strongly, the results. Within an interactive process we hardly make reference to information and knowledge acquired during the ongoing decision process, while more easily and frequently we look at information and knowledge assimilated in preceding times (Volkema, 1997).

This phenomenon seems to depend substantially on the necessary time for the processing of the acquired information. The information that every individual acquires during an interactive process is 'processed' to shape the concepts (descriptions of general categories): the use of concepts makes possible the reference to the information that, together with other contemporary or past information, produces these concepts (Wierzbicki, 1999). This means that the activated process must foresee the times of processing in order to allow an effective exchange of information.

Prescriptive Decision Theory foresees many methods to drive the decision-maker towards choices that, according to the approaches used, can be judged efficient, rational, excellent, satisfactory, etc. This field also uses descriptive analysis to drive the decision-maker in the evaluation of the decision process and its results.

In a concise and simple way, two approaches of Prescriptive Decision Theory can be distinguished:

- Problem Structuring (PS); and
- Decision Analysis (DA).

In the first case, strongly directed to problem structuring, alternatives/solutions are built within the decision process in a dynamic way; the process finishes when an alternative/solution is recognized as satisfactory, either unanimously or by the vast majority of stakeholders involved. In contrast, in the second approach, the alternatives/solutions are defined in advance and then ordered during the decision process in a ranking based on efficiency or optimality criteria, with the aim to support the final choice. The alternative can be both continuous and discrete.

Each of these two approaches has a different role in the decision process. The first is well suited to an interactive process with the purpose of collecting knowledge, facilitating interaction, creating a group spirit, deeply analysing the problem by making its characteristics formally explicit and therefore producing ideas and solutions. The second represents a strongly formalized support of the evaluation phases of an interactive decision process.

Methods and approaches

During the last decade different methods have been used for shaping scenario development, in terms of approach and vision of the planner; today we can speak of intuitive scenarios, idealistic scenarios, qualitative or quantitative scenarios and participative ones. In each of these cases, the scenarios are always considered as mental, analytical or visionary constructions, not necessarily valid, that aim to offer a context to think in a rational way to the future.

In order to schematize the problem, though running the risk of simplifying it, scenario development can be divided in two basic approaches:

- *future backward*: we depart from the individualization of possible alternative futures and investigate the models and the choices that could bring about such scenarios;
- *future forward*: we depart from the analysis of the existing conditions and, on the basis of the evolution of the present situation, possible futures are examined.

Departing from such generalizations, scenarios usually have four dimensions (Inayatullah, 1996):

- *status quo*: it is assumed that the future will be a continuation of the present;
- *collapse*: this appears when the system cannot keep on growing, or when existing conditions bring it to a state of irreversible breakdown;
- *steady state*: this is based on a return to a past condition, imagined or real;

- *transformation*: fundamental changes are hypothesized that can be in both values and technological innovation, or they may be political and economic changes.

In terms of a methodological approach, we can identify three fundamental approaches:

- *intuitive logic*: Global Business Network and Shell;
- *trend impact analysis*: Future Group;
- *cross-impact analysis*: Batelle Institute.

The recent developments towards interesting methodological approaches are those proposed by Schwartz (1991) and described as 'Strategic Conversations'; here the process of scenario development is seen as a 'building block' to plan strategic conversations that bring in the organizations to collect the knowledge on the key decisions and the priorities. The principal role of scenarios, in such a context, is that of 'laboratories' in which different models of the future can be tested.

Therefore, scenario development can be considered as a process that consists of a series of phases that are able, at least in theory, to be developed according to a circular sequence (Figure 3.5). It is possible to recognize four main steps. Some points of a general character can be underlined as well:

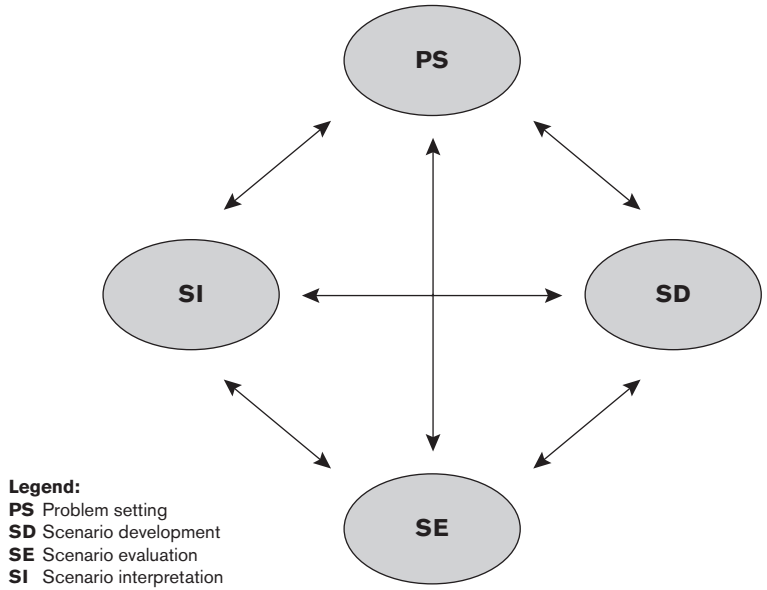
- the scenarios should focus on clear matters, decisions, strategies or plans;
- the scenarios should logically present themselves as structured and internally consistent;
- the process should be flexible and able to be easily adapted to the requirements of different contexts.

In practice, such a process appears to be an interactive activity that aims to direct political strategies towards the action through a series of phases that can vary according to the specific cases, although the main elements of the process stay unchanged.

The phase of *problem setting* has the objective of collecting and elaborating the information essential for the decision.

The construction of a framework for the collection of the information can be structured on three levels (Figure 3.6):

- the analysis and the collection of quantitative data and objective information with primary or secondary sources (official or unofficial) on the actual situation and the forecasts of variation in the variables and the elements of interest;

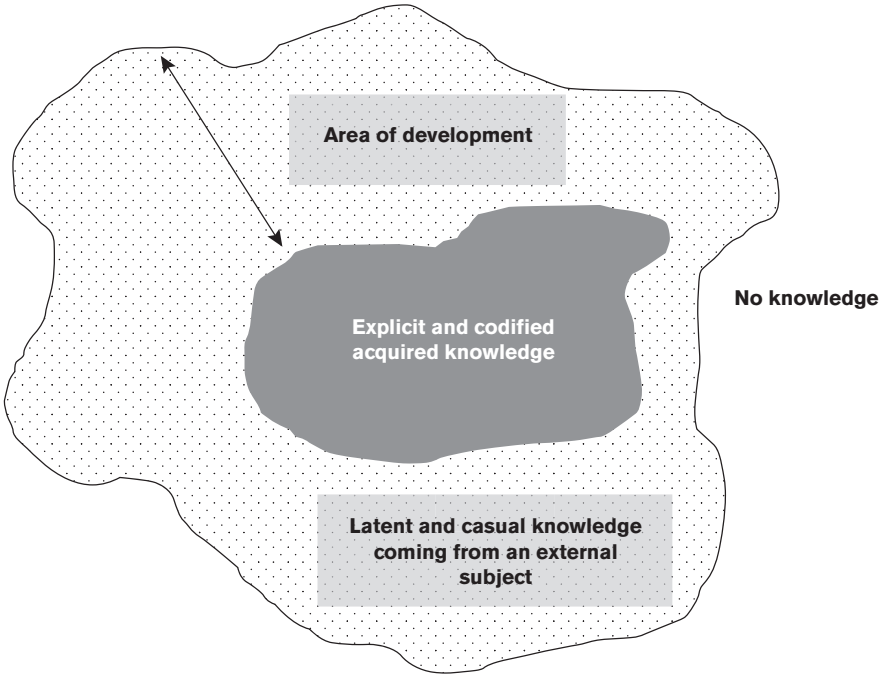


3.5 The cyclical process of scenario development and evaluation

- the collection of information and ideas of decision-makers with respect to the future development through specific meetings. They might provide different information from that described in the preceding point;
- the individualization of the possible dynamics of change, the discontinuities and the opportunities. The investigation of these aspects should happen through forum group and strategic conversations among the main actors involved in the decision process.

The acquisition of the core information has as a result the definition of an informative framework that involves:

- identifying driving forces, taking into consideration future spheres: the politi-sphere, econosphere, sociosphere, technosphere and biosphere;
- identifying predetermined factors – assessing what is inevitable about the future;
- identifying critical uncertainties – assessing those areas where the future is uncertain, which can be prioritized according to importance and the degree of uncertainty;
- developing scenario plots: that is, a series of plausible alternative futures;



3.6 Example of information structure
Source: Faggiani (2003)

- assessing the implications of different scenarios for the organization(s), community(ies), sector(s) of concern;
- identifying and monitoring indicators to enable continual reassessment and adaptation.

The whole available information must be put into a system in order to enable the critical elements to be managed; for example, by using Delphi studies. Some authors suggest matrixes to synthesize the cognitive learning process. Once the information is collected and the key factors are individualized, the next step is to order the acquired elements according to a scale of priority and level of uncertainty.

The results obtained through the exercise of ranking are the basis for the scenario development. At this level, the imaginative process, the creativity and the intuition play a key role. The importance and the objective of this phase have been underlined by Schwartz (1991), who highlights the importance of identifying a limited number of scenarios with clear differences that can be understood by the decision-makers in order to reduce the possible range of uncertainty.

The fundamental challenge in this phase is therefore to develop a limited number of logical scenarios that better capture the dynamics in action, no fewer than two, but no more than four. This has been defined as the rule (Wilson, 1978), and the following criteria have been suggested with the aim of making a choice:

- plausibility – the selected scenarios have to be feasible;
- differentiation – they must be structured in different ways, not with simple variations on the same theme;
- consistency – it is necessary that the internal logical process is consistent;
- utility of the decision-making – every scenario has to contribute to build the decision process;
- challenge – they have to propose innovative challenges in comparison with the existing conditions.

Once the preferred scenarios have been selected there follows the phase of scenario development, building the chains of events that characterize them.

In relation to such a process structured in different steps, the methodological base that can support every step is ample and diversified and embraces a vast range of techniques and approaches. In fact, one of the problems connected with scenario development is to choose the most appropriate method for the phase of the process under analysis and for the context under examination. The *Handbook of Futures Research* (Fowles, 1978) dedicates around thirty pages to the description of the existing methodologies: for example, Delphi techniques, game theory, brainstorming, checklists, morphological analysis, the cross-impact matrix, analyses and extrapolations of trends, regression analyses, etc. Moreover, since the publication of this book, many other connected techniques have been developed, above all in the field of strategic planning and management. One of the principal challenges in this field today is not so much to develop new technologies, but rather to test a process that can integrate in an efficient and effective way those already existing, so that we can apply the right tools in each situation (Ratcliffe, 2002).

CONCLUSION

In conclusion, the proposed approach may be of great interest for territorial planning processes, because it is structured as a decision support system that can help decision-makers to make sustainable choices for the future. Numerous questions arise concerning which techniques to adopt and on the control system to set that can support the monitoring of territorial transformations over time.

Assuming that it is difficult to prefigure *ex ante* a future scenario, planning practice becomes the governance and management of territorial transformations in a strategic optics of possible futures produced by a chain of events, monitored continuously. Such a management control system needs to be flexible and modifiable, foreseeing adjustments over time and clarifying what we can do tomorrow (Dente, 1989).

Further research efforts must be addressed in order to test the existing methodologies with the aim of guaranteeing a process that can be transparent, manageable and controllable in its development. The single phases of the process leave open issues with respect to the capability to evaluate actions that condition the chain of events and the relative impacts, to measure such impacts, to build a strategy of control (direct observation of real phenomena) that can guarantee the sustainability of the actions undertaken in relation to a system of strategic objectives. TIA in relation to scenario design and use may offer a new perspective that is appropriate for broadly supported planning actions in cities and regions.

NOTES

1 Trend Extrapolation, Dynamic Systems Analysis and Computer Modelling, Simulations and Games, Cross-Impact Analysis, Technological Forecasting, Technological Impact Assessment, Environmental Impact Assessment, Social Impact Assessment: Delphi Polls of Experts, Futures Wheels, Scenarios, Science Fiction, Intuition and Intuitive Forecasting, Experiments in Alternative Lifestyles, Social Action to Change the Future, Short-, Medium- and Long-Range Planning: Relevance Trees, CERT/CPM Analysis.

2 RAND is an acronym for 'Research and Development'.

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4

Multi-criteria Evaluation and Planning Support

Choosing Among Alternative Scenarios for an Urban Natural Park in Sardinia, Italy

Andrea De Montis and Sabrina Lai

INTRODUCTION

Planning environmental systems in an urban setting is a complex activity. This is due to the fact that many actors, stakeholders and concerns are involved in such planning processes. Planners, indeed, are often encouraged to acquire skills to master those particular situations where they are engaged in settling conflicts and solving intricate and multifaceted issues. Decision and planning support systems based on multi-criteria analysis have proved to be helpful in these turbulent settings. These methods help planners to clarify the issues at hand and help them gain strategic knowledge. They are also helpful in guiding communities to find common positions in order to reach a collective decision (De Montis and Nijkamp, 2006).

In this chapter the choice between two alternative proposals for the Master Plan of the Regional Natural Park of Molentargius-Saline Wetlands takes a central position. This area is rich in ecological systems and is located in the centre of the wide urban region of Cagliari in Sardinia, Italy. Although the area has been included since 1999 in a regional natural park, it is currently abandoned and claimed by economic activities that are incompatible with its protected area status, endowment of natural resources and future potential. The authors develop a planning support system based on the application of the Analytical Hierarchy Process (AHP) approach (Saaty, 1988), showing how it is possible to elicit not only a structured choice among alternative plan proposals but a better definition of land use patterns for the protected area.

The chapter is organized as follows. First the institutional context regarding the protection of the area is introduced and then the two alternative proposals for the Master Plan of the Park are presented. This is followed by an explanation of the functioning of the AHP approach to multiple criteria decision analysis, which leads on to a description of its application to support the choice between the two alternatives and a discussion of the outcomes of this assessment. Finally, conclusions are presented and an outlook is given with respect to further research directions.

THE REGIONAL NATURAL PARK OF MOLENTARGIUS-SALINE: INSTITUTIONAL CONTEXT

The area 'Molentargius-Saline' consists of very important wetlands of the Mediterranean basin. It hosts a wealth of ornithic species, both permanent and migratory, and a variety of botanic associations, generated by the existence of zones with a different level of salinity in a 1400-hectare area completely surrounded by the urban area of Cagliari, Italy.

Since the Roman period, the basin has been exploited for the production of salt. However, the morphology and hydraulic regime of the area have changed considerably due to technological progress in the production of salt. This production was interrupted in 1984, after a severe pollution event resulting from the overflow of the urban fringe sewer system. Despite its natural characteristics and its potential as a protected area (Provincia di Cagliari, 1988) this environmentally fragile system is now subject to degradation, abandonment and economic exploitation.

Regional law number 5/1999, the Park Constitutional Act, is the product of a long-standing and gradual procedure of acknowledgement of the natural relevance of the Ponds of Molentargius and Quartu. This process started in 1964, when a landscape order was imposed over the area, according to Italian national law number 1497/39; in 1977, the whole area was included in the zones protected by the Ramsar Convention (Wetlands International, 2005), while a zoological oasis and a nature reserve were instituted in 1978 and 1984, respectively. In spite of the juridical provision of a regional park, after nine years no plan has been drafted for the conservation, transformation and reuse of the area. This lack of effectiveness in the planning process for natural protected areas is frequently observed in Italy (Ferrara, 1996). The principles that should inspire decision-makers and planners in the construction of a plan for the Park of Molentargius-Saline can be drawn from national law number 394/1991, on the institution of national parks, and from Sardinian regional law number 31/1989, about the institution and management of regional parks, reserves, natural monuments and areas of relevant natural and environmental importance. According to the latter regulation, regional parks are defined as environmental systems 'organized in a unitary way with a special attention to conservation, restoration and enhancement of natural ecosystems and to the development of human economic activities, when compatible'. On the other hand, according to regional law number 5/1999, among the objectives of the Master Plan itself are the stimulation of scientific research and environmental education, and the development of a number of compatible activities, such as salt production, agriculture, zootechnic activities, manufacturing, tourism and ecological recovery. The draft of the Master Plan has been delegated to a Park Management Consortium, which consists of an

association (not yet constituted) of the Province of Cagliari and the municipalities involved: Cagliari, Quartu Sant'Elena, Quartucciu and Selargius.

TWO PROPOSALS FOR THE MASTER PLAN OF THE NATURAL PARK

According to regional law 5/1999, which specifies the level of natural quality and the management needs, the Master Plan of the Molentargius-Saline should articulate its prescriptions for three types of homogeneous territorial zone:

1 Relevant natural interest zones, which comprehend in particular the ecological niches of the avifauna that need urgent stewardship actions.
2 Social function zones, where activities and infrastructure are located in order to receive and host daily visitors to the Park.
3 Connection zones, where economic and productive activities, such as tourism, scientific research, etc., are allowed provided that they are compatible with conservation.

Against these guidelines, it is worthwhile to reflect on the type of general approach suitable for drafting a realistic master plan for this park. According to Caforio *et al*. (1998), a master plan for a natural park should contribute to saving the ecological integrity of the ecosystem by maintaining biological communities and ecological processes similar to those that may be expected in an ecosystem unaffected by human activity in that specific bio-geographical region. This interpretation, with respect to the regime to be established by the Master Plan of the Park, is excessively inspired by the principles of ecological economics (Costanza, 1991) and, therefore, hardly applicable to the system of Molentargius-Saline.

In this case, the relation between man and environment has affected the area and produced the (man-made) ecosystems which can be observed today. These are the results, among other things, of linked human settlement and actions, such as the inflow of seawater and its controlled circulation throughout the tanks, and the contribution of nutrients coming from sewers. The dismissal *tout court* of human activities could damage the delicate equilibrium of the water–soil–flora–fauna system and determine the loss of natural, environmental and landscape resources. In this particular case, nature cannot be conceived of as unaltered by human activities, and because of this the Master Plan for the Park has to be altered. A possible path may be followed by referring to a weak interpretation of the concept of sustainable planning (Munda, 1995). According to this paradigm, a compromise solution may be chosen where human activities insert themselves in harmony into the environmental

system. Below, two plan scenarios are proposed with reference to the principle outlined above.

Plan proposal A

The aim of this alternative is to seek ecological sustainability by monitoring the carrying capacity of the entire system, preserving ecological processes, such as biodiversity, stability, species evolution, using renewable resources in a sustainable way, and pursuing compatible activities with the objective of conservation. The main objective is the conservation of ecological processes, regardless of the level of natural quality or of the natural systems extant in the geographical area. This objective is articulated according to other aims, which are based on the basis of specialist studies about the hydro-geologic, floristic, zoological, archaeological, historic and economic conditions of the area. Specific objectives of conservation and stewardship have been articulated for each geographical subdivision. According to these general objectives, plan proposal A provides for a division of the area into three homogeneous zones: 'A' (relevant natural interest), 'B' (social function) and 'C' (connection), along the zoning elaboration presented in Figure 4.1 (see p. 66). For further details, refer to Lai (2001).

Plan proposal B

This proposal refers to a much wider geographical area, beyond but encompassing the area that is included in plan proposal A but also including the adjacent natural and tourist zones. The main aims of this proposal are: the sustainable development for future use, economic use, preservation of the historical identity, modification of the relationship between the conservation area and the town. Seven types of zone are defined within plan proposal B: wetlands for natural use, coastal zone for tourism and leisure, green areas, archaeological and industrial museums, tourist infrastructure, fringe of ponds for the conservation of current agricultural uses and human settlements. For further details, refer to Farci (2001). The zoning applied in plan proposal B is presented in Figure 4.2 (see p. 67).

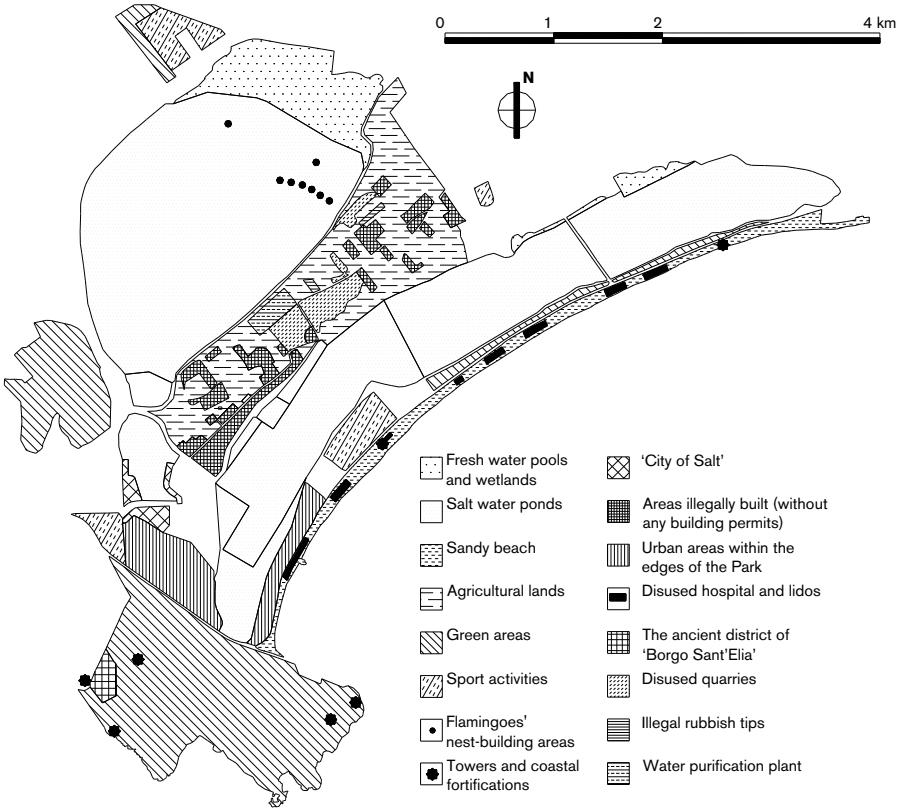
THE MULTI-CRITERIA METHOD CHOSEN: THE ANALYTIC HIERARCHY PROCESS (AHP)

In this research plan, proposals A and B for the Master Plan of the Park have been assessed by means of the analytic hierarchy process (AHP). This well-known approach to multi-criteria evaluation was developed by Saaty (1988), and applied by a variety of researchers (Vincke, 1992; Fusco Girard and Nijkamp, 1997; Scarelli, 1997). The AHP multi-criteria method allows analysts to apply two patterns typical of human reasoning: the deductive and the systemic approaches (Saaty, 1988). The first focuses

4.1 Plan proposal A: zoning

on the study of single components, without paying attention to relations with other components, while the second stresses the assessment of functional properties of the system as a whole, without delving into the characteristics of each part. According to Scarelli (1997), the foundations of the AHP approach to multi-criteria analysis are the following: it is always possible to detect and represent in a hierarchical scheme every relevant criterion and alternative for the process at hand; in the hierarchy, higher levels dominate the lower ones; decision-makers are always able to compare two peer (i.e., belonging to the same level) elements with respect to a higher-order parent element by means of a reciprocal fractional measure; in this comparison, the decision-maker is not allowed to judge an element infinitely better than the other one.

The AHP method consists of the following procedures: breaking down of complex problems into simple components structured according to a hierarchical tree; assessment of the priorities by means of a system of pairwise comparisons; sensitivity analysis of the results.



4.2 Plan proposal B: zoning

Construction of the hierarchies

According to Saaty (1988), any decisional problem may be structured by dividing it into simple components, by grouping these elements in homogeneous sets, and by placing them in different hierarchical levels. The hierarchical trees adopted in this way are built with reference to the function each part plays, with respect to the whole system. The definition of a decisional question starts from the identification of the general goal; then it proceeds with the specification of secondary objectives, which depend on the general goal, and of tertiary objectives, which in turn refer to the secondary ones, along a hierarchical tree spreading through a theoretically unlimited number of levels. Saaty (1988) does not state any rule for problem structuring, except for the need to compare the alternatives to be evaluated at the bottom of the tree. This depends on the claim that any decisional process is unique and therefore implies a dedicated hierarchical structure of concerns, objectives and goals.

Identification of the priorities

Within the hierarchical framework, analysts and decision-makers are always able to express a preference judgement on two peer elements (i.e., belonging to the same level) with respect to their higher-level parent. In this approach, a series of pairwise comparisons is developed, according to a semantic nine-point scale, which allows the decision-maker to express in qualitative terms a degree of preference. This scale, however, allows also for the quantification of the preference statements made by the decision-maker. Saaty (1988) favours the choice of this scale because: it yields more reliable results; it is easy to understand even for non-experts; and it adapts itself to group decision-making. The indexes of local and overall preference are extracted by calculating the priority vector, which is computed as the unity-reported principal eigenvector of the comparison matrix (A). This is a squared and symmetrical matrix whose degree is equal to the number of peer elements compared; the elements in the principal diagonal are equal to unity, while the rectangular ones are pairwise reciprocal. Each component x_i of the priority vector x represents the relative global priority of the peer element i over the other elements, with respect to the next higher-level parent element.

Consistency

Preference judgements are often drawn by interviewing stakeholders and decision-makers. These people are requested to complete a usually long series of pairwise comparisons and often reveal free-rider behaviour: their answers usually show a certain level of incoherence that is proved to increase with the number of elements and levels in the hierarchical tree. This phenomenon is due to bounded rationality, typical of human reasoning, with a special emphasis for the following aspects: incapacity to take into account many interrelations among the compared elements at the same time; loss of concentration; copying errors; loss of information; and inadequacy of the hierarchical structure to represent the real situation at hand (Fusco Girard and Nijkamp, 1997). According to the AHP approach, the intensity of this phenomenon is measured by using the consistency ratio (C.R.) and fixing a maximum acceptable value, equal to 0.10. The use of the C.R. allows monitoring the procedure of extraction of preference values: in case of a C.R. higher than 0.10, the analyst may rerun the comparisons until a lower value of C.R. is reached. Note that this evidence should not induce analysts to force particular sets of preference judgements; on the other hand, it is useful to start from a signature of incoherence and seek possible reasons for it.

A synthetic review of the analytical properties of the AHP approach to multi-criteria analysis is presented in the Appendix.

APPLYING THE AHP APPROACH TO THE CHOICE BETWEEN PLAN PROPOSALS

In this case study, the AHP method has been adopted to shape what Roy (1996) calls a 'choice problematic' assessment, according to the framework described below.

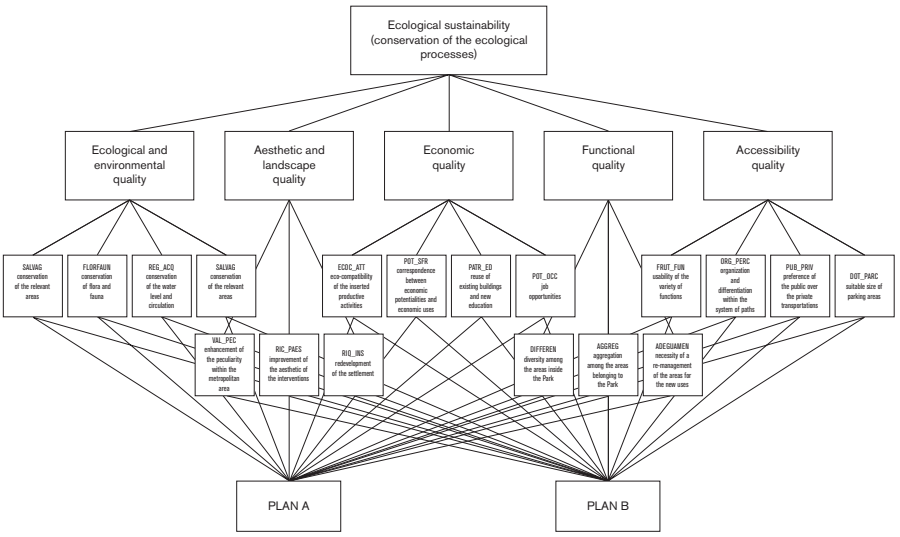
Constructing a hierarchical structure

A hierarchical tree containing the concerns to be examined in evaluating the two plan proposals has been constructed. Figure 4.3 shows how concerns have been conceived and structured within four levels: one overall obective, five specific objectives, eighteen criteria and two alternative plan proposals ('Plan A', 'Plan B').

Establishing priorities

In order to calculate priorities according to the AHP process, pairwise comparisons have been made over the set of concerns. In particular, alternatives have been compared with respect to the criteria; criteria with respect to the specific objectives; and specific objectives with respect to the overall objective.

Preference judgements have been expressed in two different ways. At the level of the alternatives, mainly quantitative evaluations have been carried out, adopting specific measures; qualitative judgements have been used only to face extremely difficult situations characterised by a lack of information, complexity of the indicator,



4.3 Hierarchical structure: overall objective, specific objectives, criteria, alternatives

impossibility to express immaterial qualities numerically. At the higher levels – criteria with respect to specific objectives and specific objectives with respect to the overall objective – qualitative judgements have been made by means of Saaty's nine-point scale.

We present here the tables showing the results of these assessments. Tables 4.1 and 4.2 refer to the outcomes of qualitative judgements, which result from pairwise comparisons of specific objectives with respect to the overall objective and of criteria with respect to specific objectives. Table 4.3 (see pp. 72–3) shows, for each criterion, the corresponding indicator and the results coming from the qualitative–quantitative assessments (pairwise comparison between alternatives against criteria).

Table 4.1 Synthesis of the priorities of the specific objectives with respect to the overall objective

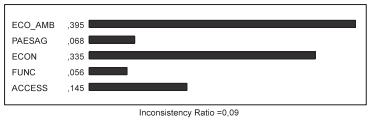
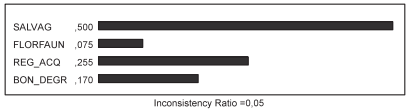
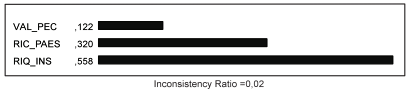
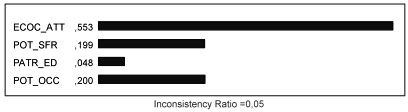
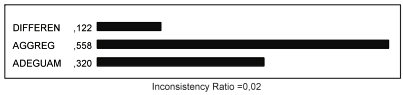
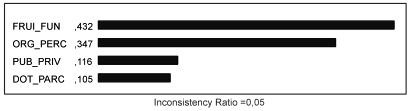
Overall objective	Ecological sustainability (Ecological process preservation)	

Table 4.2 Synthesis of the priorities of the criteria with respect to the specific objectives

Specific objective 1	Ecological and envionmental quality (ECO_AMB)	
Specific objective 2	Aesthetic and landscape quality (PAESAG)	
Specific objective 3	Economic quality (ECON)	
Specific objective 4	Functional quality (FUNC)	
Specific objective 5	Accessibility quality (ACCESS)	

OUTCOMES OF THE PROCESS: AN OVERVIEW

The assessment conducted by means of the AHP approach favours proposal A for constructing the Master Plan of the Molentargius-Saline Park. Table 4.4 shows that the alternative overall priority is equal to 0.505 for A, while it is equal to 0.495 for B.

Results of the evaluation process

In general terms, the judgements expressed are consistent, inasmuch as the index of global consistency is equal to 0.09.

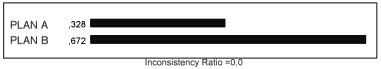
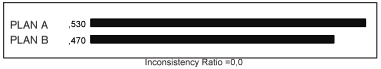
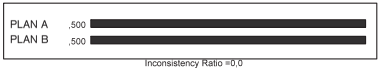
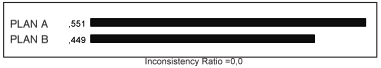
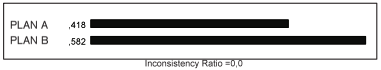
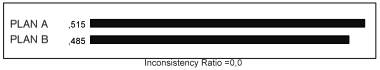
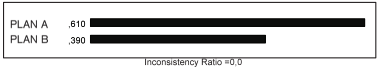
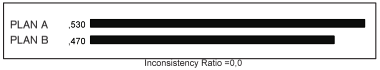
Some remarks can be made about the elicitation of the preference structure, which is:

1 dependent on proxy quantitative estimates, especially with regard to pairwise comparisons of the alternatives with respect to the criteria. The main difficulties are often linked to estimating areas, lengths, built volumes, number of expected new employees with an acceptable level of error;
2 dependent on subjectivity, when the indicator is expressed as a weighted average, since weights are assigned within a simulation;
3 very sensitive to the variation of the qualitative preference judgements in the pairwise comparisons of criteria with respect to specific objectives, and of specific objectives with respect to the overall objective;
4 not clearly directed to endorse an alternative with respect to the other: there is a very low relative difference (equal to 1 per cent) between the final results (0.505 versus 0.495).

Regarding the first point, it is possible to assess qualitative indicators better: this is why the measurement error is not considered within the inference of the results. With respect to the second issue, a viable solution could be group decision-making, seeking a compromise agreement among the actors. Referring to the third question, the volatility of the results may be analysed by means of sensitivity analysis. This test is designed to study under which circumstances the preference accorded to alternative A versus alternative B is robust, with respect to the variation of the weights of the criteria or of the specific objectives. It should be noted that a variation of the priorities of the specific objectives may result in a proportionate change of the global priorities of the Master Plan alternatives, so that B may become preferable to A.

Table 4.5 shows the overall priority of each alternative and criterion with respect to the specific objectives (central column), and the impact, on the overall priority of the alternatives, of the weights of each specific objective (right column). According to specific objectives 1 and 5, B is preferable to A; according to specific objectives 2, 3 and 4, this ranking is reversed. As a direct consequence, under certain

Table 4.3 Synthesis of the priorities of the alternatives with respect to the criteria

Specific objective	*Criterion*		*Indicator*	*Priority histogram*
Ecological and environmental quality (ECO_AMB)	SALVAG	Conservation of the relevant areas	Percentage share of protected areas over total Park areas	
	FLORFAUN	Conservation of flora and fauna	Percentage share of free areas over total Park areas	
	REG_ACQ	Conservation of the water level and circulation	Qualitative index about policies of water basins management	
	BON_DEGR	Quality of the reclamation of the areas	Weighted average of the restored areas with weight equal to a qualitative judgement	
Aesthetic and landscape quality (PAESAG)	VAL_PEC	Enhancement of the peculiarity within the metropolitan area	Qualitative evaluation of the cultural, environmental and historical emergencies	
	RIC_PAES	Improvement of the aesthetics of the interventions	Weighted average of the restored areas with weight equal to a qualitative judgement on the aesthetics of the interventions	
	RIQ_INS	Redevelopment of the settlement	Weighted average of the areas interested by redevelopment with weight equal to a qualitative judgement on the quality of the projects	
Economic quality (ECON)	ECOC_ATT	Eco-compatibility of the inserted productive activities	Weighted average of the areas interested by economic activities with weight equal to an impact factor of the specific activity	
	POT_SFR	Correspondence between economic potentialities and economic uses	Qualitative index	

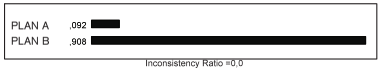
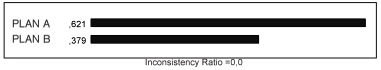
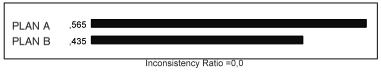
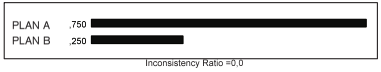
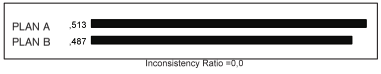
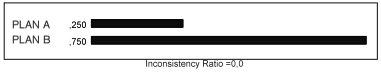
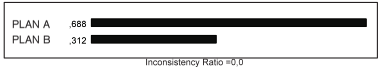
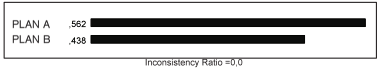
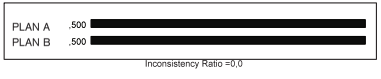
	PATR_ED	Reuse of the existing buildings and new edification	Superficial density of built volumes	
	POT_OCC	Job opportunities	Number of expected new employees within economic activities linked to the Park	
Functional quality (FUNC)	DIFFEREN	Diversity among the areas inside the Park	Qualitative judgement about the 'imageability' of each area of the Park	
	AGGREG	Aggregation among the areas belonging to the Park	Qualitative judgement about the recomposition of the uses and the level of connection among the zones	
	ADEGUAMEN	Necessity of a re-management of the areas for the new uses	Weighted average of the areas to be re-converted with respect to the whole area of the Park; the weight expresses the distance between the utilization condition planned and the current situation	
Accessibility quality (ACCESS)	FRUI_FUN	Usability of the variety of functions	Qualitative judgement of the connection among areas with different functions and the rest of the metropolitan area	
	ORG_PERC	Organization and differentiation within the system of paths	Ratio of the non-vehicular paths' length to the total path length	
	PUB_PRIV	Preference of public over private trans-portation	Ratio of the public or mixed paths to the whole number of them	
	DOT_PARC	Suitable size of parking areas	Qualitative judgement	

Table 4.4 Overall (O) and local (L) priorities calculated for the alternatives, the criteria and the specific objectives

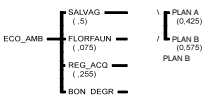
Overall objective	*Specific objectives*	*Criteria*	*Alternatives*		
			with respect to the criteria	*with respect to the specific objectives*	*with respect to the overall objective*
ECOLOGICAL SUSTAINABILITY – CONSERVATION OF THE ECOLOGICAL PROCESSES O = L = 1	Ecological and environmental quality (ECO_AMB) O = L = 0.395	SALVAG: L = 0.5; O = 0.198	A 0.328 B 0.672	A 0.425	A 0.505
		FLORFAUN: L = 0.075; O = 0.03	A 0.530 B 0.470		
		REG_ACQ: L = 0.255; O = 0.101	A 0.500 B 0.500	B 0.575	
		BON_DEGR: L = 0.170; O = 0.067	A 0.551 B 0.449		
	Aesthetic and landscape quality (PAESAG) O = L = 0.068	VAL_PEC: L = 0.122; O = 0.008	A 0.418 B 0.582	A 0.556	
		RIC_PAES: L = 0.320; O = 0.022	A 0.515 B 0.485	B 0.444	
		RIQ_INS: L = 0.558; O = 0.038	A 0.610 B 0.390		
	Economic quality (ECON) O = L = 0.335	ECOC_ATT: L = 0.553; O = 0.185	A 0.630 B 0.370	A 0.582	
		POT_SFR: L = 0.199; O = 0.067	A 0.530 B 0.470		
		PATR_ED: L = 0.048; O = 0.016	A 0.092 B 0.908	B 0.418	B 0.495
		POT_OCC: L = 0.2; O = 0.067	A 0.621 B 0.379		

Table 4.4 Continued

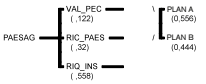
Functional quality (FUNC) O = L = 0.056	DIFFEREN: L = 0.122; O = 0.007	A 0.565 B 0.435	A 0.652
	AGGREG: L = 0.558; O = 0.031	A 0.750 B 0.250	B 0.348
	ADEGUAMEN: L = 0.320; O = 0.018	A 0.513 B 0.487	
Accessibility quality (ACCESS) O = L = 0.145	FRUI_FUN: L = 0.432; O = 0.063	A 0.250 B 0.750	A 0.464
	ORG_PERC: L = 0.347; O = 0.05	A 0.688 B 0.312	
	PUB_PRIV: L = 0.116; O = 0.017	A 0.562 B 0.438	B 0.536
	DOT_PARC: L = 0.105; O = 0.015	A 0.500 B 0.500	

Table 4.5 Overall priority of each alternative and criterion with respect to the specific objectives and impact of the specific objectives on the final outcome

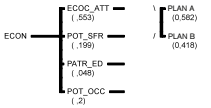
Specific objective 1
Ecological and environmental quality (ECO_AMB)



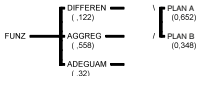
Specific objective 2
Aesthetic and landscape quality (PAESAG)



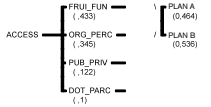
Specific objective 3
Economic quality (ECON)



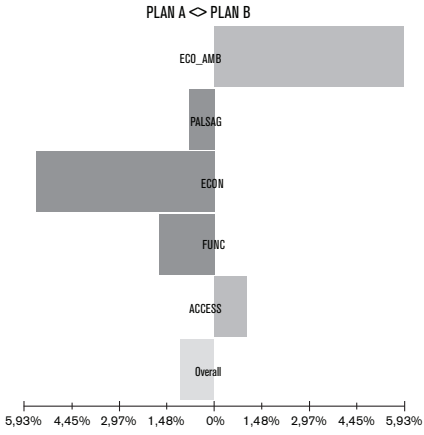
Specific objective 4
Functional quality (FUNC)



Specific objective 5
Accessibility quality (ACCESS)



Differences Sensitivity w.r.t. GOAL for nodes below GOAL



Weighted differences between PLAN A and PLAN B

circumstances, it is possible to have the overall priorities of the alternatives modified, simply by changing the weights of the specific objectives.

The sensitivity analysis allows the assessor to determine the thresholds of preference inversion. In this case, the authors, after Cerreta and De Toro (1999), choose the following strategies in order to visualise the results of sensitivity analysis (Table 4.6): displaying in a graph, on the horizontal axis, the priorities of the specific objective observed, and, on the vertical axis, the overall priorities of the alternatives; drawing the priority lines (for each alternative) which relate the variation of the overall priorities to the modification of the weight of the specific objective given; in the comparison of two alternatives, marking as inversion threshold values the point where the priorities lines cross each other.

CONCLUSIONS AND OUTLOOK

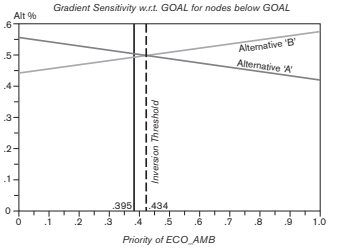
The experimentation of the activities within the AHP approach allows us to draw some reflections on the following three questions: the choice of multi-criteria methodology in the light of similar case studies; the comparison between strengths and weaknesses of that approach for environmental planning support in protected natural areas, and the broader issue of evaluation in planning.

With reference to the first issue, it is not possible to state that the AHP approach, like any other approach to multi-criteria analysis, is the best available tool to support a problem of choice between the alternative Master Plan proposals illustrated in this chapter. Under a comparative perspective, many scholars have discussed the issue of the appeal of the variety of approaches already available to multi-criteria decision analysis (Guitouni and Martel, 1998; De Montis, 2001; De Montis *et al*., 2005; Figueira *et al*., 2005). According to these studies, a common lesson may be drawn on the following suggestions.

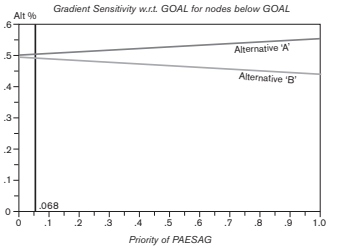
First, it is always imperative to understand the particular features of the decisional environment: stakeholders, political and institutional concerns, tendency to dialogue, ability of planners to encourage communicative processes and to stimulate learning during the process. In this chapter, the authors chose the AHP approach on the assumption that this method is suitable to decisional contexts characterized by the presence of conflicting interests, such as those arising in environmental planning processes. This methodology, correctly applied, makes the collaborative construction of the hierarchy of objectives and criteria possible, yields the complete ranking of the alternatives, and allows the evaluator to master sensitivity analysis of the results in a visual, interactive and intuitive way. This function proves to be decisive in order to increase the level of tool awareness of stakeholders and decision-makers, who might not be experts on, or acquainted with, multi-criteria

Table 4.6 Sensitivity analysis and thresholds: alternatives versus specific objectives

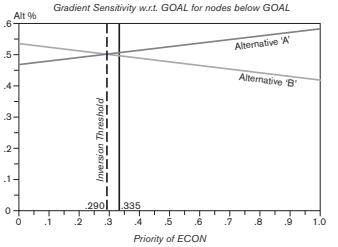
Specific objective 1 (ECO_AMB)
Inversion threshold value: 0.434



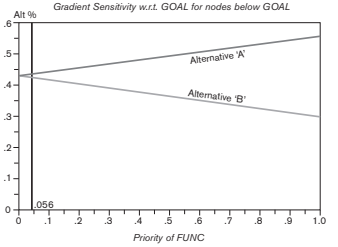
Specific objective 2 (PAESAG)
Threshold value does not exist:
the preference of alternative
A versus alternative B is robust



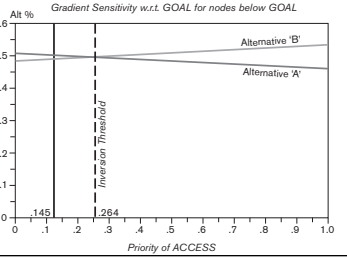
Specific objective 3 (ECON)
Inversion threshold value: 0.290



Specific objective 4 (FUNC)
Threshold value does not exist:
the preference of alternative
A versus alternative B is robust



Specific objective 5 (ACCESS)
Inversion threshold value: 0.264



analysis principles. In a comparative perspective, other authors have developed another multi-criteria approach, inspired by the outranking analysis based methodology Electre III (Roy, 1996), on the same decisional environments (De Montis and Farci, 2002). According to these studies, it is possible to infer weaknesses and strengths of each approach and to draw elements for a meta-analysis of multi-criteria decision support tools for Italian natural parks. The readers may compare the meta-analytical assessment developed for an analogous case by Carbone *et al.* (2000).

Second, it is useful to report the following summary about the balance between the pros and cons of the AHP method. On the positive side, this approach to multi-criteria analysis makes it possible to involve stakeholders that are always able to interfere in the decisional process at hand: during the preliminary stage, they may participate in the construction of the hierarchical tree by questioning the inter-dependencies among its elements; at the stage of pairwise comparisons, they have the opportunity to assign qualitative judgements for the determination of priorities. In the same stage, the AHP method facilitates communication between analyst and decision-maker, allowing the elicitation of judgements in terms of intuitive linguistic indicators: this is a clear advantage for decision-makers who may not be experts in mathematics, decision theory and informatics. It is also possible to smooth excessive particularity of individual judgements by mastering group decisional processes and building consensus among actors who support different stakes. Seeking a compromise solution may often prove to be useless, especially in turbulent decisional settings; in these cases, the AHP approach provides a powerful instrument: sensitivity analysis is able to measure how much the divergence in the system of revealed preferences influences the final outcome. It also permits ex post examination of the behaviour of the results obtained in a critical pattern: that is, with respect to each relevant concern.

On the negative side, the application of sensitivity analysis demonstrates that the AHP approach cannot be considered a tool able to suggest a definitive solution at a stroke. This is due to a number of reasons. First, the hierarchical tree of criteria and objectives, in the AHP approach a crucial element for the mathematical representation of the system of preferences of the decision-makers, should be as complete and precise as possible. In this case, as the sensitivity analysis points out clearly, the suggestion that proposal A for the Master Plan of the Park of Molentargius-Saline should be chosen might be biased by a hierarchical structure characterized by the presence of too many criteria linked to environmental protection. Other important concerns and factors, such as the economic feasibility and the time period of realization of the proposal, should be inserted as well. Furthermore, the same set of objectives and criteria may lead to a variety of preference structure representations, since they may be organized according to a variety of hierarchical

trees. In the case developed, the criterion 'Eco-compatibility of the inserted economic activities (ECO_ATT)' has been set under the specific objective 'Economic quality (ECON)', while it could have been inserted under another specific objective, for instance 'Ecological and environmental quality (ECO_AMB)'. Obviously, different hierarchizations even of the same elements lead to slightly different types of recommendation for the decision-makers. Likewise, the introduction of qualitative judgements (for the assessment of alternative plan proposals with respect to a criterion) and of the semantic scale (for the comparison of the elements at the higher levels of the hierarchy) increases the level of subjectivity. It should also be borne in mind that sometimes the evaluation of the level of preference among the alternatives in qualitative terms may lead to unacceptable inconsistencies.

Third, with respect to the functions of evaluation in planning indicated by Bentivegna (1995), in this case the assessment stage is situated at the end of the definition of plan proposals. As Bentivegna observes, multi-criteria evaluation has a symbolic function, as it contributes to the *ex post* legitimization of plan proposal A in terms of a structured judgement of preference. On the other hand, analysts, planners and decision-makers, while developing the multi-criteria procedure on two apparently defined alternatives, may uncover crucial aspects not sufficiently envisaged or underestimated during the phase of definition of the plan proposals. Hence, evaluation may be developed iteratively with respect to the planning process and, therefore, it may affect the (re-)definition of the alternatives in a continuous and cyclical pattern. In this case, no possibility of revision of the characteristics of the plan proposals is allowed, though. Further research should be orientated towards building evaluation processes where the alternatives are updated continuously, according to the acquisition of new formal and informal knowledge, new criteria are introduced and old criteria rephrased, the hierarchy is modified and adapted to the dynamics of decision-making and planning. In this pattern, multi-criteria decision analysis-based evaluation rationalizes master planning processes over each stage: both during the preliminary studies on available resources, on the objectives and the feasible plan alternatives, and during the definition of the most satisfying choice (Nijkamp and Voogd, 1989).

APPENDIX

Pairwise comparison matrix:

$$A = [a_{ij}] = \begin{vmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ . & . & \dots & . \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{vmatrix} \quad \text{where:} \begin{cases} a_{ij} = 1 & \text{i = j} \\ a_{ij} = \dfrac{1}{a_{ji}} & \text{i} \neq \text{j} \\ & (\text{where } a_{ij} > 0 \text{ and } a_{ij} \neq \infty) \end{cases}$$

Estimating the maximum (or principal) eigenvalue: an approximate method

In order to estimate λ_{max}, the pairwise comparison matrix A has to be multiplied by the priority vector x. The result is a new vector, $y = [y_i]$:

$$y = A \cdot x$$

$$\begin{vmatrix} y_1 \\ y_2 \\ . \\ y_n \end{vmatrix} = \begin{vmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ . & . & \dots & . \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{vmatrix} \cdot \begin{vmatrix} x_1 \\ x_2 \\ . \\ x_n \end{vmatrix} \quad \text{where:} \begin{cases} y_1 = a_{11} \cdot x_1 + a_{12} \cdot x_2 + \dots + a_{1n} \cdot x_n \\ y_2 = a_{21} \cdot x_1 + a_{22} \cdot x_2 + \dots + a_{2n} \cdot x_n \\ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \\ y_n = a_{n1} \cdot x_1 + a_{n2} \cdot x_2 + \dots + a_{nn} \cdot x_n \end{cases}$$

A third vector $z = [z_i]$ may be obtained by dividing each entry y_i by its homologous z_i:

$$\begin{cases} y_1 / x_1 = z_1 \\ y_2 / x_2 = z_2 \\ \dots\dots\dots\dots\dots \\ y_n / x_n = z_n \end{cases}$$

The maximum eigenvalue λ_{max} may now be calculated approximately (Fusco Girard and Nijkamp, 1997), by dividing the sum of the entries z_i by the rank n of the matrix A:

$$\lambda_{max} = (z_1 + z_2 + \dots + z_n) / n.$$

Evaluating consistency according to AHP

According to the AHP theory, a system of judgements is perfectly consistent if the equation $a_{ij} \cdot a_{ik} = a_{jk}$ is true for each i, j, k (where $i,j,k = 1,2,\dots,n$). If the previous statement is true, A is called "consistent matrix", and its maximum eigenvalue λ_{max} equals the rank n of the matrix A.

When dealing with real judgements, consistency is never perfect, so that assessments reveal a certain amount of inconsistency, which makes $\lambda_{max} > n$. Consistency Index (*C.I.*) measures how inconsistency affects the judgements:

$$C.I. = \frac{\lambda_{max} - n}{n - 1}$$

Another useful index is the so called Random Index (*R.I.*), which has been experimentally determined. Assuming that the numerical judgements are taken randomly from the sequence [1/9, 1/8,…, 1/2, 1, 2,…., 8, 9], the following table relates the value of the *R.I.* to the size of the matrix (Saaty, 1988; Fusco Girard and Nijkamp, 1997):

Size of matrix	1	2	3	4	5	6	7	8	9
Random Index	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45

Given the size of the matrix, the ratio of the Consistency Index to the Random Index equals the Consistency Ratio (*C.R.*) of the matrix. Inconsistency is unacceptable, according to Saaty, when $C.R. \geq 0.10$.

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Part II.ii

Advanced Evaluations of Urban Land Use

5

Sustainable Urban Development

The Case of Mixed and Compact Land Use

Ron Vreeker

INTRODUCTION

Over the twentieth century, growth of per capita income, increased automobile usage and spatial planning based on segregation of land use functions resulted in a low-density, dispersed land use development, which is often referred to as urban sprawl.

In the early twentieth century urban sprawl was seen by planners as an aesthetic problem. One of the early attacks on it was by Sharp (1932). Today, urban sprawl is not only an aesthetic problem but is seen as a major source of environmental degradation, fiscal instability and social problems. Several planning concepts, such as Smart Growth, New Urbanism, Growth Management and Multifunctional Land Use, have been proposed to reduce urban sprawl and to promote spatial and environmental quality (Hall, 1998). One of the solutions emphasised in these approaches is urban development based upon the concentration of different land uses. This type of urban development is labelled mixed and compact land use (see, for an overview, Coupland, 1997; Jenks *et al*., 1996; Jenks and Burgess, 2000; and Roo and Miller, 2000).

Various authors point to the importance of this concept in the light of sustainable urban development (SUD) (Capello and Nijkamp, 2002; Walker, 1997). It has been argued by Camagni *et al*. (1998) that urban sustainable development is more than environmental protection; the city is seen as the result of three intersecting forces – social, environmental and economic. Sustainable cities are therefore cities where socio-economic interests are brought together in harmony with environmental concerns (Capello *et al*., 1999).

According to Capello and Nijkamp (2002), various reasons exist why the urban level is important in attaining sustainable development. Since most production and consumption take place here, a clear focus on the urban level may enhance the effectiveness of environmental policies. Cities are also able, as a result of scale advantages, to create conditions for the efficient provision of public services or the implementation of measures to achieve the objectives of sustainable development. This urban focus is furthermore supported by the decentralisation of environmental and resource policy-making (Capello and Nijkamp, 2002). Other advantages are the

increased possibilities for direct local involvement in policy-making, creating support among the general public for changes in resource use and lifestyles. The observations above suggest that effects of mixed and compact land use in an urban context should be studied in a broader perspective than just as a remedy for urban sprawl.

This chapter is devoted to various planning principles aimed at the promotion of SUD by means of mixed and compact land use. First an overview is given of various trends in mixed and compact land use development, such as New Urbanism, Smart Growth, the Compact City concept and Multifunctional Land Use. Attention is then paid to the possible effects of mixed and compact land use. A distinction is made between the environmental, social and economic effects of mixed and compact land use, the three pillars of SUD.

MIXED AND COMPACT LAND USE IN PLANNING AND DESIGN

Since World War II, planners have had difficulties with the dilemmas concerning density and mixed land use. Efforts in urban densification in the decades after the war generally resulted in unsatisfying outcomes. Most of the public housing high-rises built after the war became so notorious for their (social) problems that they have been refurbished or demolished. Furthermore, the original reasoning for functional segregation was to protect residents against noise and pollution resulting from manufacturing activities. However, the trend in production processes is towards cleaner technologies and the shift from manufacturing to services.

As a result of these trends, several new planning movements are now beginning to reopen the discussion on design and density in a successful way. These movements include New Urbanism, the Smart Growth network and Multifunctional Land Use. In this section, I will describe the history of mixed and compact land use (MCLU). The most important period in the debate about urban form was from 1898 through to 1935. During this period the boundaries of the debate were drawn by Le Corbusier (centrist) and Frank Lloyd Wright (decentrist). Both had the benefit of reflection on the work of Ebenezer Howard (Breheny, 1996).

Howard pondered the large social and economic issues of the 1880s and 1890s resulting from the rapid industrialisation of cities. His solution was to join the best of town and country in his 'garden city'. Howard's garden cities would accommodate 32,000 people, at a density of approximately 25–30 people per acre, to form a polycentric social city (Hall, 1988). In Howard's garden city, residential areas would be separated from industrial areas. The town would occupy 1000 acres, surrounded by a 5000-acre belt of agricultural land, preventing the town from spilling into adjacent countryside. Howard's solution to the urban problems was one of contained decentralisation (Fishman, 1977).

Frank Lloyd Wright represents much more clearly the extreme case of decentralisation. In the 1920s, Wright saw that the motor car and electricity would loosen cities, enabling them to spread out into the countryside (Breheny, 1996). According to Wright, there was an opportunity to use new technologies to emancipate Americans from ties with the city, with each citizen having 'all forms of production, distribution, self-improvement, enjoyment within the radius of, ten to twenty miles of his home' (Wright, 1945, quoted in Hall, 1988, p. 288).

The Broadacres vision of Wright was not, however, meant to be a decentralised free-for-all. It was to be planned to be controlled aesthetically. Although Wright was correct in anticipating the popularity of his decentralised vision, he was wrong in assuming that it would be planned.

Le Corbusier's solution for the same urban problems as perceived by Howard and Wright was to increase urban densities. According to Le Corbusier, high tower blocks would increase open space and improve circulation. This was all to be done by total clearance. Le Corbusier's ideas were at their most advanced in La Ville Radieuse of 1935. This was a collectivist city, with all residents living in giant high-rise blocks. The legacy of Le Corbusier has had profound effects, most notably in the building of Chandigarh, and influencing the design of Brasilia, the new capitals of Punjab and Brazil.

Perhaps the fiercest advocate of the centrists is Jane Jacobs (1961). She wanted to retain the urban vitality and diversity found in her New York neighbourhood. She advocated high urban densities and mixed land use on the grounds that density creates diversity; and that diversity creates the richness of urban life that she enjoyed in New York.

One of the contemporary planning-design philosophies that addresses urban sprawl and mixed land use is New Urbanism. Deriving inspiration from the classic town planning practices of the early twentieth century, various architects (e.g., Duany and Calthorpe) formed the Congress for the New Urbanism in 1993. New Urbanist neighbourhoods are based on short walking distances and contain a diverse range of housing and jobs (Congress for the New Urbanism, 2000). New Urbanists support regional planning for open space, appropriate architecture and planning, and the balanced development of jobs and housing. They call their form of development Traditional Neighbourhood Development (TND) or Transit-Oriented Development (TOD).

In the 1990s, the Smart Growth movement emerged (American Planning Association, 1999). Smart Growth addresses three interrelated subjects: density of urban development; the spatial separation of land use functions; and the relation between land use and mobility patterns. Smart Growth principles include mixed land use, directing development towards existing communities, preserving farmland and

open space, creating pedestrian-friendly neighbourhoods, and providing a range of transportation choices.

The planning concepts described above all have their roots in the United States. However, the concept of mixed and compact land use development did not remain unnoticed in Europe. The publication of the *Green Paper on the Urban Environment* by the European Commission emphasised the Commission's commitment to achieve improvements in the quality of the urban environment within the Community (CEC, 1990). The document explicitly spelled out the relation between the quality of urban life, urban planning and sustainable development. Furthermore, it was stated that a mix of land uses at high densities and good environmental conditions would improve the economic performance and vitality of the cities. In addition to its support for a mixing of different land uses, the Green Paper also emphasised that further urban growth should be accommodated within the boundaries of existing urban areas. This type of development is labelled 'compact city'. A compact city is seen in EU policies as a city that has a high density and a concentration of socio-economic functions in order to reduce urban sprawl, energy use and environmental decay.

With respect to contemporary MCLU development, we have witnessed three periods, which differ in spatial focus and the inclusion of land use functions. In the 1970s, planners and designers, influenced by the work of Jane Jacobs (1961), pioneered MCLU development. Early applications of the concept were mainly based on the redevelopment of attractive but sub-optimally used historical buildings and districts. This was, however, limited to combining office and retail functions. In the 1980s, spurred by the gentrification process, the integration of housing with retail and office functions became more common. In the 1990s, the concept of 'urban entertainment centres' was introduced. This concept brings together theatres, sport facilities, and restaurants in large-scale developments like the Amsterdam Arena in Amsterdam. The Amsterdam Arena houses the football club Ajax and has car-parking, shopping facilities, movie theatres and even a highway underneath it. Besides this, the stadium is also used for dance events and concerts. The same multifunctional stadium concept has been applied in other cities across Europe (Gelredome in Arnhem, the Netherlands, and Arena auf Schalke in Gelsenkirchen, Germany).

The development of urban entertainment centres was nourished by a radical and rapid migration of manufacturing activities from cities from the 1970s. The decline of manufacturing employment and the fierce competition between cities to attract firms forced policy-makers to look at other sources of potential employment and regeneration. They therefore paid attention to consumer service industries such as tourism and leisure. It was assumed that tourism and entertainment (including arts and culture) contribute to mixed use development within an urban regeneration process by generating income and adding variety and vitality to areas.

In current design and planning practices more emphasis is placed on the relationship between mixed and compact land use, infrastructure and city redevelopment (e.g., railway station in Leipzig, Amsterdam South-Axis, Euralille, Seine Rive Gauche, King's Cross). This type of development is not only concerned with mixed and compact land use but focuses on the creation of synergy between the selected land use functions; this is often named 'key site development'. Key site development is currently popular in European planning circles (for example, in the UK and in the Netherlands) and encompasses high-density development of sites that are highly accessible, or could be made highly accessible, by (public) transport networks and nodes. This type of development includes the mixing of travel-generating uses. The planning concept of Multifunctional Land Use especially focuses on this type of mixed and compact development.

Several forms of criticism have been levelled against MCLU advocates. MCLU, for example, is criticised for claiming that good design of neighbourhoods and buildings can solve virtually any urban issue, including environmental pressures (see, for example, Steadman, 1997; and Sudjic, 1992). Arguments are also raised in discussions about the merits of MCLU in reducing transportation flows by altering transportation patterns (Gordon and Richardson, 1997). The most important one is that many residents show a strong preference for the use of cars as their main means of transportation. Combined with their preference for detached single-family homes, this has resulted in a land use pattern that cannot be changed easily (Breheny, 1992, 1997).

ASSUMED EFFECTS OF MIXED AND COMPACT LAND USE

Since the publication of the Brundtland Report in 1987, the concept of sustainable development has become central in research and policy. With regard to sustainable development, it became increasingly apparent that it should be addressed in close cooperation with local stakeholders. Furthermore, awareness has grown that many environmental problems have a local origin, while at the same time global environmental decay often manifests itself at a local level. This awareness has led to the formulation of Local Agenda 21 (1997), in which a plea is made for dedicated local actions needing to combine a reduction of environmental decay with an improvement of local socio-economic conditions. Local Agenda 21 placed cities at the centre of research and policies concerning sustainable development.

Finco and Nijkamp (2001) note that urban sustainability policies are often developed at the edge of various – sometimes conflicting – objectives and cover multiple fields, like urban rehabilitation, urban land use, urban transport systems, urban energy management, urban architecture and urban cultural policy. Mixing

different land uses is seen in planning as a mean to achieve various – often conflicting – planning objectives (Coupland, 1997). This section describes the assumed effects of multifunctional land use.

Spatial form and environmental issues

It is often argued that environmental problems become more severe with urban size. However, there is no clear evidence that urban size as such causes environmental decay. According to Orishimo (1982), it is not the sheer city size, but rather the implied land use, the transport system and the spatial layout of a city which are critical factors for urban environmental quality (see also Nijkamp, 1996). According to Givoni (1998), the effects of urban density on the total energy demand of a city are complex and often conflicting.

From the literature it becomes clear (see, for example, Hui, 2001) that the effects of urban density on city energy use are mainly related to building energy use and transport energy use. In this section, the focus will mainly be on transport energy use. Although building energy use is much greater than transport energy use, the latter often accounts for half of the total energy consumed in urban areas. There are a number of factors that have supported the focus on transport in environmental policies (Steemers, 2003):

- First, the very local pollution associated with mobility is more immediately perceptible than those associated with buildings.
- Second, the replacement rate of old vehicles is higher compared to buildings. With cars increasingly becoming more efficient, this means that transport policies have a much greater short-term benefit compared to building-related proposals.
- Third, cars are associated not only with environmental issues but with accidents and fatalities, bringing transport higher on the political agenda.
- Finally, there are limitations in adopting measures to reduce building energy usage in an urban context. The most important ones are noise and air pollution resulting from traffic. Environmental decay, related to urban mobility, therefore needs be addressed before a significant reduction in energy consumption of office buildings can be expected.

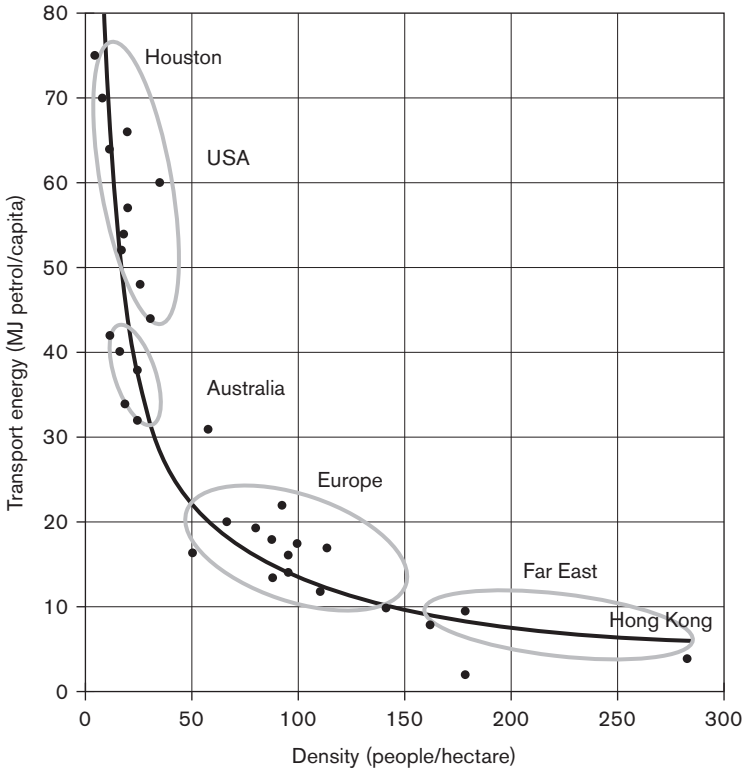
Spatial form, mobility and transport energy use

The first and most often stated reason for promoting mixed and compact land use is reducing the need to travel by providing a range of services in close proximity. It is expected that this will result in less car usage and therefore less fuel consumption and fewer emissions. Many authors refer often to the city of Portland, Oregon, where

a relatively dense layout encouraged investment in public transport and resulted in 43 per cent of the city's commuters using the bus and light rail network (Girardet, 1992).

Central to the debate on urban compaction and energy use has been the work of Newman and Kenworthy (1989a and b; Newman, 1992). For a number of large cities around the world, they have related petroleum consumption per capita to population density and found a consistent pattern with higher densities being associated with lower fuel consumption (see Figure 5.1). The conclusion from their research was that, if fuel consumption and emissions are to be reduced, there is a need for policies to promote urban compaction and public transport (Breheny, 1996). However, the Newman and Kenworthy message is still controversial in the academic world.

Various other studies exist that take a close look at the relationship between spatial form and mobility. Most of these investigate the relationship by means of



5.1 Transport energy use and urban density
Source: Newman and Kenworthy (1989b)

scenario studies based on simulation models (Clerx and Verroen, 1992; van Wee and van der Hoorn, 1997). The results of these studies indicate that the influence of spatial form on mobility is strong, and that elements of compact urbanisation have a high impact on mobility. However, the authors also state clearly that the models used might overestimate the influence of spatial form on mobility.

Handy (1996) concludes that the degree of empirical evidence supporting the relationship between urban form and mobility varied mainly with the research method used. The results of other studies give some mixed outcomes. Frank and Pivo (1994) found a relation between compact city variables and lower rates of car mobility. Cervero and Kockelman (1997) found that density, diversity and pedestrian-oriented forms generally reduce trip frequencies and cause a modal shift towards non-automobile transportation means. However, these authors conclude that the results should not be seen as a causal relationship between spatial form and mobility. Furthermore, other studies claim that the influences of spatial form on mobility are modest but supportive (see, for example, Kitamura *et al*., 1997; Banister *et al*., 1997; and Breheny, 1992).

Much of the criticism directed to Newman and Kenworthy has been related to the fact that they solely focus on the single variable of density, while other factors may also be considered important in explaining travel behaviour.

Gomez-Ibanez (1991), for example, argues that household income and petrol price are important determinants for travel behaviour, and points out that the relation between income and density may make it difficult clearly to identify the link between density and petrol consumption. Furthermore, Gomez-Ibanez claims that the costs of radical containment policies – in terms of economic losses, reduced quality of life, etc. – have not been weighted against the supposed environmental gains (see also Breheny, 1995).

There are various reasons why effects of spatial form on mobility are not as strong as expected. The compact city concept assumes that concentration and mixed land use will enable people to live, work and use services at the same location. However, there are several reasons why this is not the case in reality. For example, an increasing degree of specialisation of the workforce implies an extension of the spatial boundaries for job searches. Due to increased job mobility, people prefer to be reasonably accessible to all potential jobs rather than being very accessible to their existing job. This is especially important for 'double-income' households. Furthermore, due to housing market imbalances, especially in a qualitative sense, people generally place living in their preferred home above shorter travel distances. This often results in a desire to live in suburban residential areas with low-density housing (Maat, 2001).

Spatial form and social concerns

Mixed and compact land use provides a mix of services at short distances, accessible by public transport, and therefore provides equal access to those services to all citizens.

Furthermore, it is argued that mixed and compact land use also enhances social cohesion by ensuring a feeling of community, and making areas safer and nicer places to live. Measures to reduce fear of crime and enhance personal safety can be broadly categorised into two approaches. The first, often labelled 'situational crime prevention', targets the crime-prone situation and aims to make crime more difficult to commit. This is done by making the crime more risky and less rewarding through measures such as increased security and surveillance. The second approach, 'social crime prevention', aims to prevent criminal behaviour by addressing the underlying (social) causes of crime, and trying to influence the attitudes and behaviour of those most likely to commit criminal activities. It targets the potential offender rather than the crime (scene).

Theories regarding situational crime prevention assume that physical and environmental measures, including design and location, can effectively reduce opportunities for committing. It is assumed that there is a relationship between 'place and behaviour', and that behaviour can be influenced by 'place' (Walmsley, 1988). Newman (1972), in his research on spatial form and crime, identified three main factors which induce crime:

- the impersonal character of areas;
- the lack of natural surveillance, with poor design and visibility, preventing residents from overlooking public areas; and
- the presence of myriad escape routes.

Jane Jacobs (1961) was the first to discuss the relationship between mixed land use and safety. In her influential book *The Death and Life of Great American Cities*, Jacobs proposes that diversity in land use and an active street life could reduce opportunities for crime. She promotes small-scale development and diversity of uses as the keys to a lively and safe city, saying that such neighbourhoods not only provide natural surveillance but help to establish a stable social structure, where people know what is acceptable and unacceptable behaviour. Jacobs extended the influence of environmental diversity into social crime prevention. She emphasised that the relationship between children and their physical environment is significant for safe neighbourhoods and argued that children living in a lively, diverse neighbourhood will learn the kind of behaviour expected of them in public places.

Many theorists and practitioners today have built on the core principles advocated by Jacobs (see Fowler, 1992; Coleman, 1985; Sucher, 1995). They emphasise

that the presence of more people for more hours results in increased 'natural surveillance' which contributes to crime reduction. They also argue that fear of crime will be reduced as city centres are no longer deserted in the evening, and people will feel less vulnerable in those situations. Advocates of the power of natural surveillance assume that some personal intervention will take place: to question, to challenge or at least to report. Sucher (1995) does raise the issue, however, of whether people today are willing not only to observe but to act and intervene.

Most mixed use developments are located in city centres. Research on town and city centre crime shows that districts with a concentration of both entertainment and business activities often have the highest frequency of crime and disorder within urban areas. Although it may appear paradoxical, people's anxiety about using town and city centres is also fuelled by a vulnerability stemming from a lack of people and a sense of isolation (Clout and Burgess, 1986). The concentration of late night entertainment, in the absence of other kinds of activity with a wider appeal, contributes to fear of crime. According to planners, the key to safer and economically robust central districts would appear to rely on the success of these centres to attract and retain a diversity of people using their district throughout the day and evening, and into the night.

Housing within mixed use developments and city centres is seen by many as a matter of generating activity over day and night. This also holds for the development of the 'twenty-four-hour city', where the centre is primarily an attractive location during the day for the business economy and shopping and, during the evening, for leisure, entertainment, cultural activities, eating and drinking. Research conducted by Lovatt (1994) shows that the extension of opening hours results in a decrease in alcohol-related incidents (16 per cent) and arrests (43 per cent).

However, various authors have also identified a number of disadvantages related to MLU. Extra development in the form of MLU might increase existing environmental pressures in urban areas, resulting in a reduction in the quality of life of citizens. Furthermore, the lack of access to open space and green areas may further reduce the quality of life. In general, there is a perception of overcrowding in cities and MLU development might reinforce this (Breheny, 1992).

To conclude, mixed land use is assumed to increase urban vitality through diversity and increased activity throughout the day. Different but complementary uses during the day and in the evening reinforce each other, making town centres more attractive and safer to residents, businesses, shoppers and visitors.

Spatial form and productivity

The goal of the mixed and compact land use concept is to save scarce space. However, from an exploration of the spatial economic literature, it becomes clear that various economic effects are associated with it. This is mostly reflected in increased

productivity of actors due to the economies of synergy. In order to understand the productivity effects of mixed and compact land use, from the spatial economic literature it is well known that synergy effects related to increasing returns to scale or increasing returns to diversity are important reasons for spatial agglomeration. These synergy effects are labelled in economic literature as 'agglomeration economies' and various researchers have tried to measure them. However, agglomeration economies – for example, knowledge spillovers between workers – are difficult to observe, and empirical researchers therefore have to rely on indirect measures, such as wage differences, employment, output and economic growth to investigate them (see, for an overview of studies, Hanson, 2000; Rosenthal and Strange, 2004).

An important factor for a firm to concentrate its activities at one location is the existence of *internal scale economies* in production (Hoover, 1936, 1948). These arise for two reasons: factor specialisation; and indivisible inputs. Due to labour specialisation, for example, productivity will increase. Indivisibilities are faced when production factors cannot be utilised in small, spatially segregated units without incurring diseconomies of scale due to a sub-optimal size of operation.

Localisation economies occur when the production costs of firms in a particular industry decrease if the total output of the industry concerned increases. To benefit from localisation economies, a firm must be located close to other firms in the same industry. Location economies depend on the scale of the industry and originate from three principal sources (O'Sullivan, 2003): scale economies in the production of intermediate inputs; labour pooling; and knowledge spillovers.

Urbanisation economies originate from the same sources as localisation economies and are also external to the firm. However, urbanisation economies differ from localisation economies in that they result form the scale and diversity of the entire urban economy, and not from the scale of a particular industry or sector (Jacobs, 1969). Table 5.1 gives an overview of various studies measuring agglomeration economies and their findings. From this table it becomes clear that sources of agglomeration economies are various, ranging from knowledge spillovers between workers to the influence of diversity of economic activities at a location.

CONCLUSIONS

Over the twentieth century, spatial planning based on segregation of land use functions, together with rapid growth of automobile use, resulted in a low-density, dispersed land use development, which is often referred to as sprawl.

Several contemporary planning concepts, such as Smart Growth, New Urbanism, Growth Management and Multifunctional Land Use (MLU) have begun to investigate various possibilities to reduce urban sprawl and to promote spatial and

Table 5.1 Empirical studies regarding the scope of agglomeration economies

Scope	*Focus*	*Studies*	*Findings*
Industry; Urbanisation economies	Urban size and productivity	Shefer (1973) Sveikauskas (1975) Segal (1976) Moomaw (1981; 1983) Fogarty and Garofalo (1978) Nakamura (1985) Tabuchi (1986)	Doubling of city size results in a productivity gain between 2 to 8 per cent
	Labour specialisation and economic growth	Chinitz (1961) Glaeser *et al.* (1992) Henderson *et al.* (1995) Combes (2000) Rosenthal and Strange (2003)	Diversity does matter for economic growth (new, service or high-tech firms)
Industry; Localisation economies	Location decisions	Carlton (1983) Wheeler and Mody (1992) Florida and Gates (2001) Head *et al.* (1995) Aitken *et al.* (1997)	Firms (foreign) are attracted to own sector firms
	Labour specialisation and productivity	Nakamura (1985) Henderson (1986) Henderson *et al.* (1995) Henderson (2003) Wheaton and Lewis (2002) Dumais *et al.* (1997)	A doubling of industry scale leads to a 4.5 per cent increase in productivity; specialisation matters for mature firms
Geographical	Density, distance and productivity	Ciccone and Hall (1996) Ciccone (2002) Dekle and Eaton (1999) Rosenthal and Strange (2003) Ellison and Glaeser (1997) Duranton and Overmans (2002)	Doubling of employment density raises labour productivity by 5 per cent; agglomeration economies are subject to distance decay
Temporal	Temporal pattern of agglomeration economies	Glaeser *et al.* (1992) Henderson *et al.* (1995) Glaeser and Mare (1994)	Agglomeration economies have a dynamic component which differs per industry; a time lag exists in the transfer of agglomeration economies

Source: Adapted from Rosenthal and Strange (2004)

environmental quality. One of the solutions emphasised in these approaches is mixed and compact land use.

Various authors point to the importance of the concept in the light of (urban) sustainability. Mixing different land uses is seen in planning as a means to achieve various planning policies related to sustainable development. It is believed that mixed land use, and especially the inclusion of residential land use, will lead to more sustainable lifestyles.

Table 5.2 Possible advantages and disadvantages of mixed and compact land use

Advantages	*Disadvantages*
Protection of open space and farmland	Conflicts between activities (noise, congestion, etc.)
Attractiveness, vitality and diversity	Concentration of environmental problems in one location
Reduction in mobility (multi-purpose trips) resulting in reduced fuel consumption and emissions	Reinforces the perception of overcrowding
Reduction in crime	Lack of access to open and green spaces
Reduction in building energy consumption	
Increased productivity in the form of economies of scale, density and diversity	

In Table 5.2, the assumed effects of MCLU are summarised. Although the environmental and socio-economic effects of MLU are assumed to be considerable, adoption of the concept into mainstream development practice has been slow. This is due to constraints in cultural and economic values, the lack of coordinated national policies, the multiplicity of governmental jurisdictions and the resistance to change of land developers, builders and financial institutions (Laswick, 2002). One of the most important existing cultural values limiting MCLU is the fact that many residents show a strong preference for the use of cars as their means of transportation. Combined with their preference for detached single-family homes, this has resulted in a land use pattern that cannot be changed easily (Breheny, 1992).

Furthermore, developers are rather unwilling to proceed with mixed land use in building because they prefer safe, reliable investments, which yield solid returns over an extended period, instead of risky investment in mixed use developments. Also, in the public sector forces are present which restrict the application of mixed land use. The existence of rigid planning systems based on functional zoning is an enormous barrier to the implementation of MCLU.

Although many hurdles do exist, various mixed land use developments are present in Europe and the US. In most cases these applications are limited to the urban environment and mainly implemented as parts of urban regeneration projects. MCLU is not often applied in greenfield development.

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6

SMARTNET

A System for Multi-criteria Modelling and Appraisal of Road Transport Networks

Gordon Mitchell and Anil Namdeo

INTRODUCTION

Recent decades have seen a significant change in the nature of transport appraisal. These changes relate to the focus of appraisal, the appraisal context and the extent to which stakeholders are involved in appraisal and the wider decision-making process (Grant-Muller *et al*., 2001). The focus of appraisal has shifted from one in which a narrow range of concerns was addressed, albeit relatively thoroughly, to one in which a broad range of additional impacts is addressed. Thus, in addition to assessing time, cost and safety impacts, transport appraisal now seeks to address indirect impacts, including those on the environment and wider economic development.

The appraisal context has further changed, in that there is no longer a pre-occupation with single-mode project-level assessment. Rather, attention is now given to appraisal of transport plans for areas or corridors which, of necessity, entails an appraisal of impacts across a network, and consideration of multiple modes. There are also greater demands from the public, and the stakeholder groups that represent them, to be involved in decisions over transport plans. This generates a demand for transport appraisal systems that are transparent and accessible to a wider audience.

From their review of transport appraisal practice, Bristow and Nelthorp (2000) demonstrated that within the European Union there is a tradition of applying cost–benefit analysis (CBA) for the evaluation of public sector transport infrastructure projects. They found a high level of consensus on which direct impacts should be included in CBA, but not over values of impacts which have no market value, such as time or accidents. Similarly, a degree of consensus exists as to which environmental impacts should be included in appraisal, but not over how these impacts should be valued. Indirect socio-economic impacts (e.g., on economic development or employment) are widely felt to be important, but there is little agreement on how they should be included in appraisals (see Vreeker *et al*., 2007, for further detail on the role of CBA and MCA in sustainability appraisal).

Bristow and Nelthorp (2000) also observe that within the EU there is a move towards more comprehensive multi-modal appraisal methodologies. This is the case

in the UK, where road scheme appraisal under the cost–benefit analysis system (COBA) has been replaced by the new approach to appraisal (NATA). Under COBA, 85 per cent of an appraisal weighting was given to time savings and 15 per cent to safety and operating costs. Road investment proposals whose benefits outweighed the costs (i.e., a net positive return when discounted over a specified period) were supported in principle, subject to a separate environmental assessment where impacts were expressed in non-monetary terms. As environmental appraisals were conducted only for those schemes with a net positive COBA score, environmental impacts were felt by some to be secondary to economic benefits. Time savings for drivers seemed particularly important, and often appeared to drive the road-building programme through the 1980s and 1990s.

NATA was introduced in 1998 by the new Labour administration, which saw an overhaul of the appraisal system as an essential component of its move towards a sustainable transport strategy (Walton and Shaw, 2003). Under NATA, COBA, formerly restricted to evaluation of intra-modal investment, was extended to consider inter-modal evaluation as well (e.g., new road vs. public transport), and two new principal criteria (accessibility and integration) were added to the existing economic, safety and environmental criteria (Table 6.1). Accessibility addresses the ease with which opportunities (jobs, shops, etc.) can be reached and the ease of being reached (by workers, customers, etc.). Integration is intended to express the extent to which

Table 6.1 Evaluation criteria under the NATA

Criteria	*Sub-criteria*
Environment	Noise
	Air quality
	Landscape
	Townscape
	Heritage
	Water
	Physical fitness
	Journey ambience
Safety	Accidents
	Security
Economy	Journey time
	Vehicle operating costs
	Scheme cost
	Journey time reliability
	Regeneration
Accessibility	Access to public transport
	Severance
	Option value
Integration	Integration
	Transport interchange
	Land use policy
	Other government policies

a road proposal is consistent with other transport policies, and also with land use policies, such as the location of a commercial or housing development.

Three broad types of measurement are used in NATA. Where monetary values can be derived (using CBA principles), they are used; where these cannot be derived, impacts are to be expressed quantitatively. If this is not possible, impacts are assessed qualitatively on an interval scale, for which detailed guidance is available (DfT, 2007). For openness, clarity and consistency, NATA requires that all results are reported in an Appraisal Summary Table (AST). NATA was first applied in a government review of sixty-eight trunk road schemes proposed by the previous administration, and it remains the official framework for appraisal of road transport schemes in the UK. It has since been applied to multi-modal schemes, and larger geographical areas (studies typically addressed major UK regions, such as in SWYMMS, the South and West Yorkshire Multi-Modal Study), but no attempt to apply more integrative multi-criteria methods has been made, and decision-makers base their decisions on the information provided in the AST.

However, the utility of further integration in the NATA appraisal process is well recognised. For example, in developing guidance for government on multi-criteria appraisal (MCA), Dodgson *et al*. (2000, p. 75) advocate the application of MCA methods using scoring and weighting within the general NATA appraisal process. This was considered particularly valuable for more local, delegated decision-making (NATA appraisal to that point was the preserve of central government, as schemes were of national significance), where MCA was seen as a useful way of promoting consistency and transparency in decision-making. However, whilst city and regional authorities tend to have a well-developed transport network modelling capability for appraisal of transport plans, these are not applied in conjunction with MCA methods.

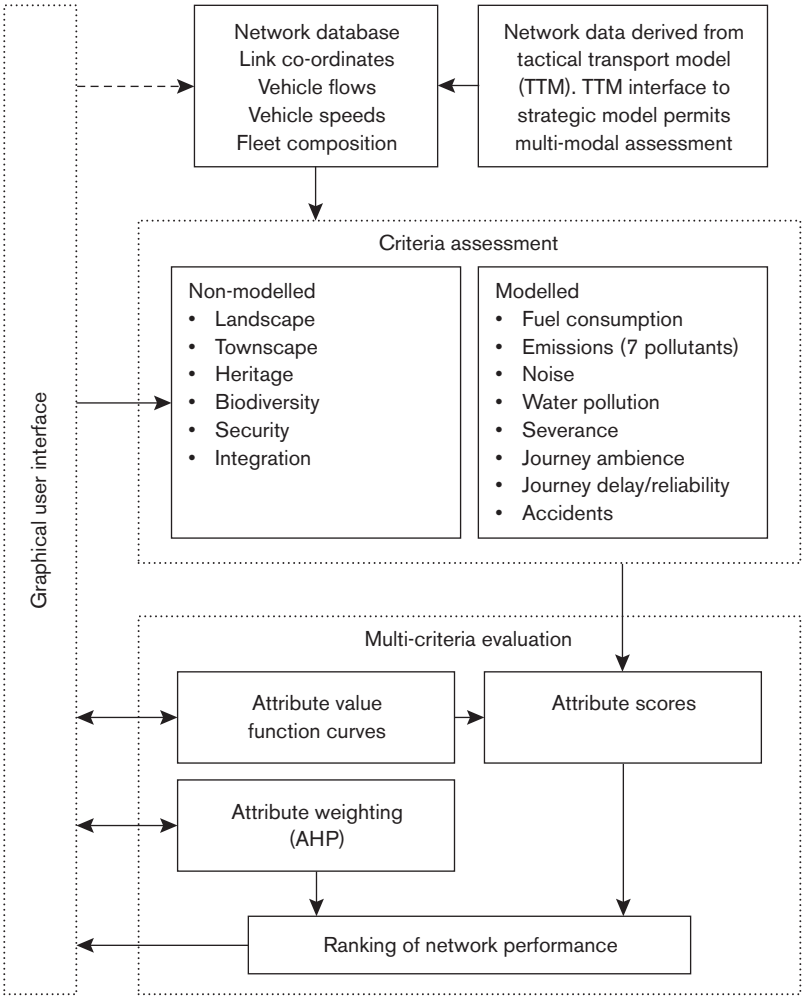
There is, though, a significant record of MCA method application within spatial decision-making. Malczewski (2006) reviews the integration of Geographic Information Systems (GIS) and multi-criteria decision analysis (MCDA) from 1990 to 2005 and finds that whilst ecological applications of spatial MCDA are most frequent (17 per cent of published papers), transport applications are also common, along with those in regional planning, waste management and water resources (each with about 10 per cent of published GIS–MCDA papers). Spatial MCA transport applications address the planning of new highways (Li *et al*., 1999; Sadek *et al*., 1999; Jha, 2001); site location for transit terminals and other transport infrastructure (Nyerges *et al*.,1997; Banai, 1998, 2000); land use development to address housing demand whilst minimising congestion (Balling *et al*., 1999; Horner and Murray, 2003; Conine *et al*., 2004); route selection for hazardous waste trucking (Frank *et al*., 2000; Fuller *et al*., 2003; Martinez-Alegria *et al*., 2003; Huang *et al*., 2004; Alumura and Kara, 2007); and school buses (Bowerman *et al*., 1995, Lourenço *et al*., 2001).

However, relatively few attempts have been made to integrate traffic network modelling with MCA techniques so as to address what might be characterised as network appraisal for sustainable development. Notable exceptions include Arampatzis *et al*. (2004), who developed a road network model-MCA tool designed to assist transport planners enhance the efficiency of the transportation network whilst reducing emissions and energy consumption, and Lautso *et al*. (2004), who applied MCA in conjunction with multi-modal traffic modelling in seven EU cities. Klungboonkrong and Taylor (1998, 1999) developed SIMESEPT, a tool that applies an MCA technique to road network data, to characterise the environmental sensitivity of individual links in the road network. This allows transport planners to identify those parts of the urban road network that present the greatest problems to local people (in terms of air quality, noise, severance, safety, etc.), and so prioritise remedial measures in terms of location and type of intervention.

In this chapter, we describe SMARTNET (System for the Multi-criteria modelling and Appraisal of Road Transport NETworks), a prototype transport network-MCA tool developed within the context of NATA. SMARTNET facilitates rapid appraisal of network-wide effects, and so provides a capability valuable to city and regional authorities conducting sustainability appraisals and strategic environmental assessments. We describe the basic structure of SMARTNET, the methods used within the tool to quantify NATA criteria across a road network, and the multi-criteria appraisal technique applied, including user-definable value function curves and weights. A pilot application of SMARTNET to a series of road user charging options for the city of Leeds, UK, is described. Finally, some limitations and future development opportunities are discussed.

THE STRUCTURE OF SMARTNET

SMARTNET is a Visual Basic application that integrates databases, models and a graphical user interface that prompts users for inputs and allows presentation of results. The basic structure of SMARTNET is illustrated in Figure 6.1. The system applies a series of modelled and non-modelled tools to quantify criteria within the NATA evaluation framework. For modelled criteria, link specific data is drawn from a tactical transport model, which in turn may be interfaced with a strategic transport model to permit the investigation of a wider set of policy options, including multi-modal appraisal. Results of the criteria modelling are output as a summary for the network, and can also be viewed on a link-by-link basis, via either database interrogation or network mapping within the MapInfo GIS. Non-modelled criteria are assessed using the NATA guidance (DfT, 2007), with the assessor scoring transport options on a three- or seven-point scale ranging from beneficial to adverse. The



6.1 The structure of SMARTNET

modelled and non-modelled data are then used to populate the appropriate elements of the NATA AST, allowing network-wide impacts of the transport option(s) to be summarised.

SMARTNET then offers the opportunity to rank transport options through application of a multi-criteria evaluation. We chose the Analytic Hierarchy Process (AHP) (Saaty, 1980), which uses a weighted linear additive model to derive a single value for the attractiveness of an option. AHP uses pairwise comparison of criteria to derive criteria weights, with the final option score calculated as the sum of the weight

and score for each criterion in the assessment. Criterion scores are drawn from the SMARTNET criteria calculator, normalised to a consistent interval scale through application of user-editable value function curves (see definition of value function curves below).

AHP has been criticised for a number of weaknesses, particularly those related to the inconsistency of weight derivation. However, as Dodgson *et al*. (2000) point out, no multi-criteria technique is without its critics. We chose the AHP method because it is well established, perhaps the most commonly used for prioritising alternatives. Also, in an evaluation of MCA techniques applied to transport project appraisal, Tsamboulas *et al*. (1999) indicated that AHP performs well overall, and outperforms other MCA techniques that it was compared with, including outranking methods, a multi-attribute utility theory approach, an ideal point approach and other weighted linear additive models (see Dodgson *et al*., 2000, for a useful summary of these and other MCA approaches). This evaluation was based on the performance of each method with respect to: robustness (data requirements, treatment of uncertainty, sensitivity, application to special interest groups); simplicity; accountability (ability to trace a decision, compensation between alternatives); and transparency (proximity to a human rational approach to decision analysis, ability to address real-world situations, well structured and easy to follow).

The main steps in SMARTNET are the generation of link and network data for each criterion under each option; definition of value function curves for each criterion; assignment of criteria weights using AHP; and the calculation of option attractiveness scores and ranks through application of the linear additive model. These steps are described further below.

QUANTIFICATION OF NATA CRITERIA

Network modelling

The first step in SMARTNET is the quantification of criteria included in the NATA appraisal framework. To do this, the user is first prompted to name the project, and the associated traffic network scenarios. A year must also be specified as this information is required in the assessment of atmospheric emissions. As each scenario is specified, the relevant network data are read by SMARTNET from the transport model network file.

To date, this file has been generated using the widely used SATURN tactical transport model (Van Vliet, 1982), although other tactical models can also interface with SMARTNET. With trip matrix and network descriptor inputs, SATURN runs assignment and simulation procedures iteratively until an equilibrium point is reached at which generalised (time and operating) costs are stable. These procedures

consider parameters of minimum gap acceptance, junction type, number of lanes, turn data, traffic signal stages and cycle length, which all impact upon time spent at junctions. The final result is information on traffic flows (as passenger car units), travel times and speed for each link of the network, which provides the basis for modelling of the criteria described further below. Appraisal of strategic actions, such as mode shift or land use change, is also possible through prior operation of a strategic model to provide a variable trip matrix as a SATURN input.

Environment criterion

The Environment criterion comprises a number of sub-criteria, which broadly reflect the structure of 'The design manual for roads and bridges' (DMRB) impact assessment methods for trunk road schemes (Highways Agency, 2007). For each link in the network, SMARTNET models the following sub-criteria: noise (L_{10-18h} level and annoyance), local air quality (emission of NO_x, CO, PM_{10}, SO_2, Benzene and 1,3-butadiene), global air quality (CO_2 emission), fuel consumption (diesel and petrol), accessibility (community severance), personal injury accidents, journey ambience (route stress) and journey time reliability. The need to carry out dissolved and aesthetic water pollutant abatement measures is also assessed for each link.

Noise and annoyance

NATA requires an assessment of the number of properties that would experience a significant change (3dB(A) or more) in noise from the baseline option. Such exposure assessment is only possible for a network by using spatially disaggregated data on households (e.g., Codepoint), but we are yet to develop this facility. Currently, a simplified assessment is used, in which the number of road links falling in various noise bands (< 57 dB to >= 75 dB in 5 dB intervals) is calculated, with this data used to assess likely changes in noise annoyance (links above certain noise or annoyance levels can be mapped to aid detailed investigation).

The CRTN noise method (Highways Agency, 2007, vol. 11, 3) is used to calculate, for each link, the noise level for an eighteen-hour period, ten metres from the road, using the equation:

$$L_{10}18h = L18hBase + VCF + GCF - SCF$$

The first independent term is the base noise level, and the remaining terms are correction factors for speed and the proportion of heavy goods vehicles (VCF), road gradient (GCF) and road surface (SCF). The base noise level equation, derived from field surveys, is calculated as:

$$L18hBase = 29.1 + 10 * Log10 (Q)$$

Where Q is the eighteen-hour flow. From traffic count surveys, this is estimated as 13.42 * hourly vehicle flow. VCF is calculated from:

$$VCF = 33 * (\text{Log10}\,(V + 40 + (500 / V))) + 10 * \text{Log10}\,(1 + (5 * p) / V) - 68.8$$

Where V is speed in km/h, and p is the proportion of heavy goods vehicles. GCF is 0.3g, where g is the road gradient. In SMARTNET, a default value of 2.0 is used for g, equivalent to a uniform 2 per cent gradient for all roads on the network. Gradients could be better represented across the network using a digital terrain model, a potential refinement to the system. The road surface correction factor SCF is set to 1 for impervious urban roads, and 3.5 for pervious roads (e.g., MacAdam surfaces). The percentage of people annoyed by the calculated noise levels is determined as:

$$\%\ \text{Annoyed} = \frac{100}{1 + e^{-\mu}} \qquad \text{Where, } \mu = 0.12 * (L_{10}18h) - 9.08$$

Results are presented as links per noise band, and as the 95 percentile of the link specific values, so as to give an aggregate indicative value for the network as a whole.

Air quality and emissions

Using the ROADFAC model, a component of TEMMS (Namdeo *et al*., 2002), link-based emissions of NO_x, CO, CO_2, SO_2, PM_{10}, benzene and 1,3-butadiene are calculated. ROADFAC uses link flow and speed data, plus data on fleet composition and speed-dependent emission factors from MEET (EC, 1999). The fleet composition is described according to vehicle type, gross weight, engine capacity and type, fuel and emission control technology used, giving seventy-two vehicle classes with characteristic emission rates. Data are based on vehicle sales, with projections for future years based on historical trends in fleet ageing, and scheduled emission control legislation. MEET speed-dependent emission factors for each vehicle class are derived from chassis dynamometer tests simulating observed drive cycles with different mean link speeds. Therefore, additional emissions from acceleration and queuing at junctions are included, but these are allocated evenly along the length of the link, and are not allocated specifically to junctions. ROADFAC uses CORINAIR methods to estimate the additional emissions resulting from cold start motoring (Eggleston *et al*., 1991).

For each link, a composite emission factor is determined from the fleet data, vehicle class emission factors and mean link speed. Total link emissions are the product of this composite factor and link flow. Modelled speed and flow typically relate only to the morning peak, hence emissions through twenty-four hours are

calculated by application of a time variant correction factor developed from observed hourly vehicle count and speed data (collected throughout the week for a range of road types). Total mass emission per link is calculated as the product of link length, emission rate (g/km/vehicle) and flow (vehicle/hour). Annual load is calculated using location-specific factors to convert hourly flow to annual flow. Pollutant concentrations must be determined by applying atmospheric dispersion models (see Mitchell *et al*., 2005, for an example application using the TEMMS component of the SMARTNET system). Fuel use by type (petrol and diesel) is also calculated using the modelling approach outlined above, using MEET fuel consumption factors for the seventy-two vehicle types in the model. Using fuel-specific CO_2 emission factors, this allows calculation of emission of the greenhouse gas CO_2, as tonnes per year for the network.

Water pollution

NATA assesses the risk to receiving waters from road surface wash-off using a qualitative scale. SMARTNET adopts a more quantitative approach, in which the 'CIRIA 142' method (Luker and Montague, 1994) is applied to determine the need for abatement of water pollution from highway discharge. The method considers dissolved pollutants (e.g., metals) and 'aesthetic' pollutants, including oil. The method considers vehicle flow, road width, rainfall and surface permeability in the calculation of pollutant concentrations in surface run-off, and determines the need for pollutant abatement by considering characteristics of the receiving water (discharge rate and environmental quality standard). In SMARTNET the receiving water factors are not considered, as relevant river network data are not yet included. SMARTNET thus reports the change in the number of road links from the baseline option that are likely to require works to mitigate surface water pollution.

Journey ambience

In SMARTNET, route stress is used as a proxy for journey ambience, and is calculated using methods (Highways Agency, 2007, vol. 11, 3.9) that consider driver frustration, fear of accidents and uncertainty over the route being followed. No evidence is available to support use of a continuous or fine-scale grading in route stress; hence, we use a three-point descriptive scale (low, moderate, high) that is based upon road type, peak flow per lane and average journey speed. Table 6.2 illustrates how these variables are used to assign route stress to network links (road types are defined in SMARTNET). Results are reported as change in number of links in each stress category for the network.

Table 6.2 Route stress on a dual carriageway road

Average peak hour flow per lane	*Average journey speed (kmp/h)*		
	< 60	*60–80*	*> 80*
Under 1200	High (moderate in urban areas)	Moderate	Low
1200–1600	High	Moderate	Moderate
Over 1600	High	High	High

Safety

NATA safety criteria comprise accidents and security. The latter is assessed using a seven-point qualitative scale, whilst accidents and their costs are calculated using the modelled network data. The number of accidents on a given length of road is expressed as an accident rate, defined as so many 'Personal Injury Accidents (PIA) per million vehicle kilometres'. Thus a doubling of link length or traffic flow will double the estimate of accidents. DMRB methods are used to calculate total PIAs by type (fatal, serious, slight, damage only) for the network, with accidents estimated for links and junctions combined, and with a consideration of road type. DMRB accident rates are for a base year (1997) and must be adjusted for future years, to account for generalised safety improvements, using the equation:

$$A_n = A_0 * B^n$$

Where: A_n = the accident rate n years after the base year
A_0 = accident rate in the base year
B^n = change coefficient raised to the power n

SMARTNET calculates PIAs by type per link and reports network-wide figures. Overall accident costs are calculated using accident cost values, which include personal injury cost and an element for insurance administration, damage to property and police costs.

Economy

SMARTNET calculates the NATA economic criteria of journey time, journey time reliability and vehicle operating costs. The regeneration sub-criteria is excluded, as this is a qualitative assessment that can only be made with local knowledge of the area. Scheme costs are also excluded from the MCA, but can be used in a comparison of the cost effectiveness of each option (see discussion under the pilot application below).

Journey time is not calculated directly in SMARTNET, but total peak time delay is used as a proxy, with longer delays reflecting longer travel times. Peak time delay in

minutes is derived from SATURN for each link and totalled across the network. Currently there is no agreed method for estimating journey time reliability. The DfT suggests that the journey time reliability is reduced as traffic flow on a road approaches its capacity, either through junctions or on links between them. In SMARTNET, journey time reliability ('route stress') is thus calculated as the ratio of link flow (as annual average daily traffic) to the link congestion reference flow, as defined by the DMRB (Highways Agency, 2007, vol. 5, 1.13).

Vehicle operating costs are calculated from link data, using a DfT (2007) method (WebTAG unit 3.5.6). Fuel costs are calculated from fuel consumption calculated by ROADFAC and the unit costs of petrol and diesel (resource cost plus tax). The non-fuel elements are calculated as:

$$C = a^1 + b^1 / V$$

Where: C = cost in pence per km travelled
V = average link speed in km/h
a^1 = a parameter for distance travelled costs for each vehicle category
b^1 = a parameter for vehicle capital saving for each vehicle category

Non-fuel cost parameters and prices are given in the DfT WebTAG guidance for 1998 and forecast for future years in accordance with the national ten-year transport strategy.

Accessibility and severance

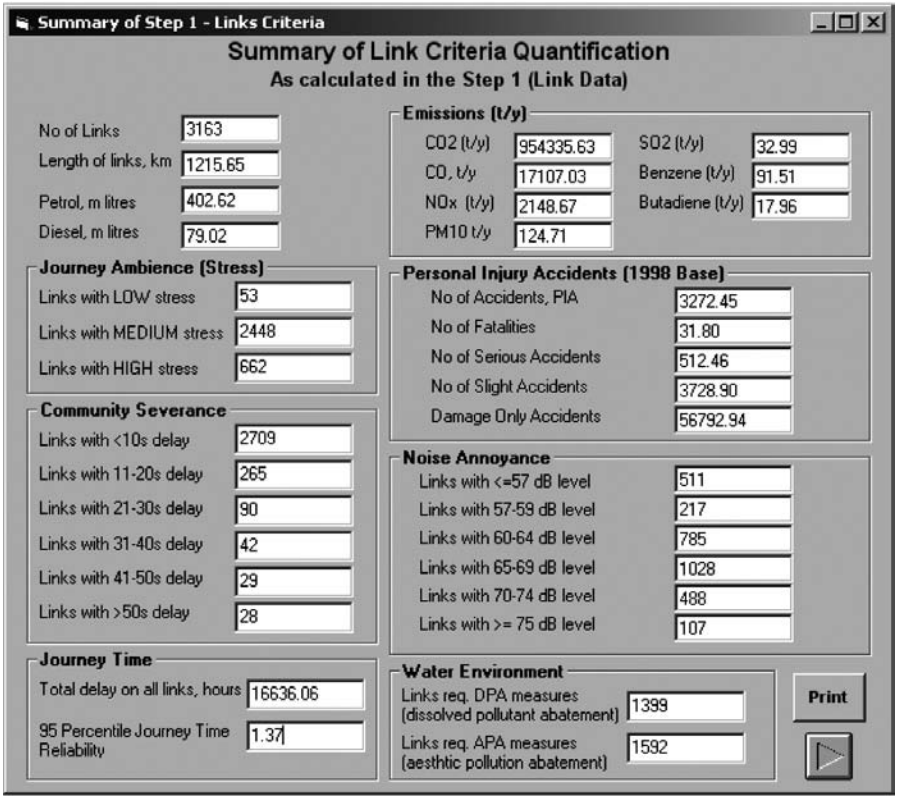
The NATA accessibility criteria address the impacts of road schemes on journeys which people make by public transport and 'slow modes' (walk, cycle). SMARTNET does not address access to public transport or impact on pedestrians and others, as these criteria cannot yet be determined on a network basis unless a multi-modal model is first used. The severance of communities (the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flow) is however assessed in SMARTNET, using a standard method (Highways Agency, 2007, vol. 11, 3.8). Severance is measured as the delay (in seconds) faced by pedestrians in crossing a road, calculated from:

$$\text{Delay} = 1.26 + 4.54 * (1 / 1\,000\,000) * \text{flow}^2$$

SMARTNET calculates link-specific delays and summarises the data for the network in six bands with ten-second intervals (<10 to >50s). The 95 percentile of the link-specific severance is also calculated to give a single indicative value for the network.

Integration and other non-modelled criteria

NATA integration criteria address the extent to which the scheme is consistent with land use and other transport policies and plans, for all modes of transport. The assessment is qualitative, using a three-point scale (positive, neutral, adverse) which DEFRA judge to be sufficient for this objective. Other non-modelled sub-criteria are landscape, townscape, security, biodiversity and heritage, which are qualitatively addressed in SMARTNET using a seven-point scale of large beneficial to large adverse, as recommended in NATA guidance (Highways Agency, 2007). Once the criteria assessments are complete, the resulting output is saved to a user-named CSV file, and a summary of the modelled assessment presented to the user (Figure 6.2), either as aggregate network statistics (e.g., total CO_2 emission) or as the number of links in each assessment class (e.g., links within specified noise emission bands).



6.2 Summary of link criteria quantification

MULTI-CRITERIA APPRAISAL

SMARTNET users may choose to use the natural (modelled, estimated) values directly for each criterion in the network appraisal; to complete a NATA appraisal summary table, for example. They also have the option of using these criteria values to conduct an MCA. To do this, SMARTNET applies a linear additive MCA model, in which options are scored as the product of criteria weights, derived using AHP and natural criteria values, normalised to a consistent scale using value functions (formally known as single-dimension or single-attribute value functions).

Definition of value functions

Value functions are important for two reasons. First, a consistent numerical scale allows the performance of alternatives against different criteria to be compared. Second, the value function allows the directional sense of a criterion to be properly represented, through a reversal of the natural units. This may be necessary for criteria where lower natural values indicate a more desirable situation (e.g., an accessibility measure based on distance to a facility).

The first step in defining the value function is to define the level of performance of the natural values with reference to two points on an interval scale. These are usually the extremes, or end points, of the scale, with 0 indicating worst performance, and 100 indicating best performance. These end points may be set to reflect the extreme range of natural values likely to be found in general (known as global scaling) or in the particular set of options being evaluated (local scaling). For example, global scaling may reflect the range of road transport emissions found throughout the country, while local scaling would reflect only the range of emission values found within the set of options being appraised. Global scaling allows new options to be readily accommodated at a later date, but requires additional judgement in defining end points, and also presents greater difficulties in establishing weights for criteria.

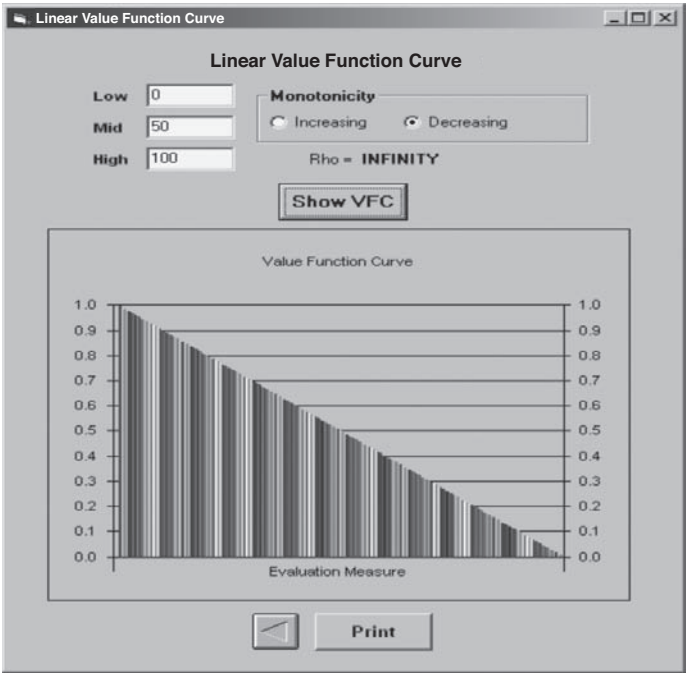
Once end points have been set, value functions to relate measured criteria values to scores can be constructed. There are several techniques for building these value functions (see Dodgson *et al*., 2000, for an overview). Direct rating (von Winterfeld and Edwards, 1986) uses the judgement of an expert to score the performance of each criterion on the 0–100 scale. This technique is often used where a commonly agreed measurement scale for the criterion does not exist, or where resources are not available to undertake the measurement, but suffers from problems of consistency and potential bias on the part of the expert. Where criteria are measured on an ordinal scale, the problems associated with direct rating can be addressed through application of the AHP technique, where decision-makers make pairwise assessments in which a judgement of the preference of one option relative

to the others is expressed. The AHP process, also used to derive criteria weights (see below), is used in MCA software such as MACBETH (Bana e Costa and Vansnick, 1997) that facilitates pairwise comparisons used to calculate a set of scores for options on the 0–100 scale, and which also checks for inconsistencies that prevent computation of compatible scores.

In SMARTNET, value functions are defined using a third technique, which uses simple graphs to relate natural unit values to scores. In many MCA applications, such functions are assumed to be linear, but some functions are clearly non-linear (e.g., human reaction to noise), or threshold levels occur, where the value of equal increments above and below the threshold are different. Several of the criteria relevant to NATA are of this type, and are best represented by non-linear value functions.

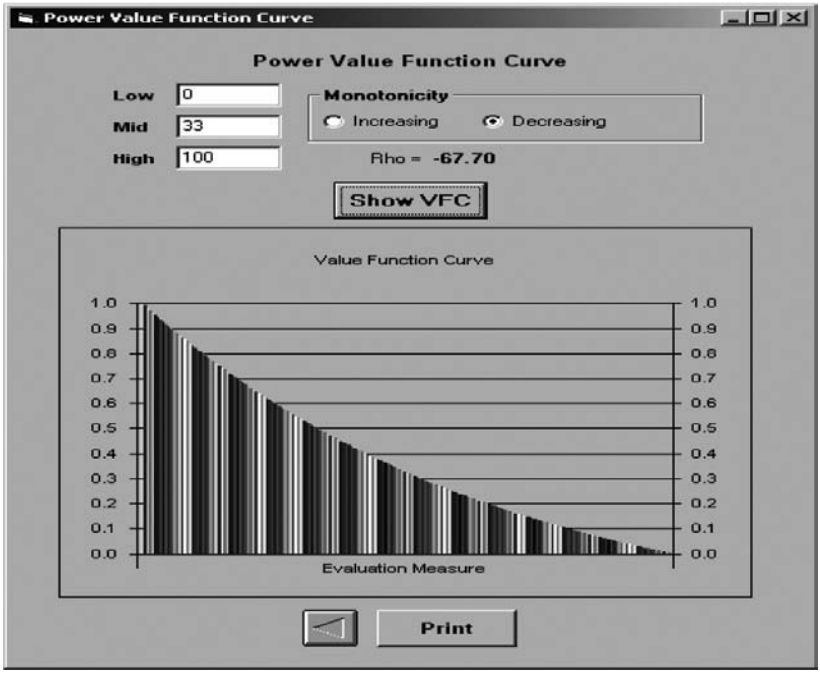
SMARTNET value functions are linear, power or step (Figure 6.3). Default curves are provided based on authors' judgement (and using global scaling) but users are also able to define their preferred function shape by editing the end and mid-points. Editing the end points allows users to define whether global or local scaling is used, and is relevant to all three forms. The mid-point is the point on the natural unit scale

(a)

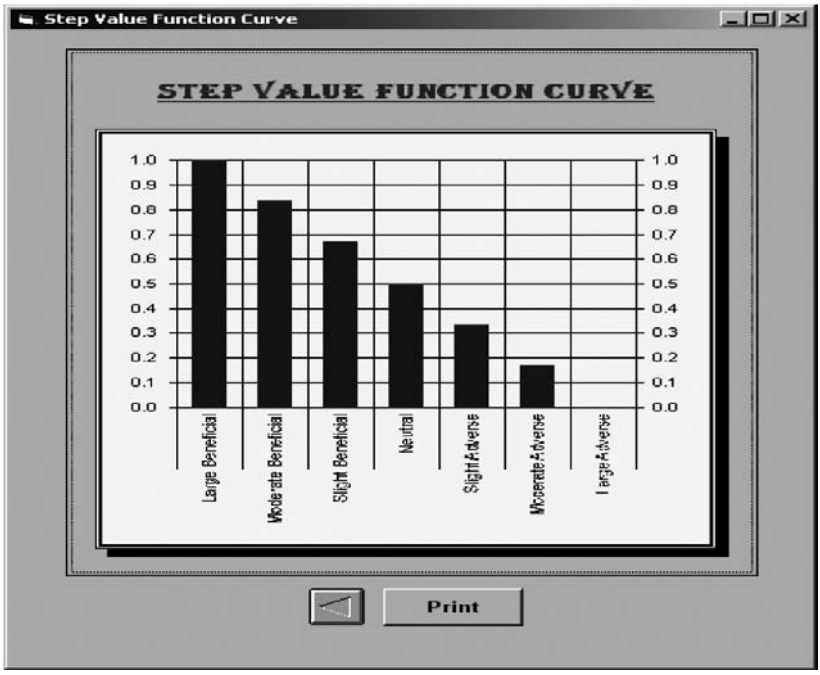


6.3 Example SMARTNET value function curves (a) Linear (e.g., journey ambience); (b) Power (e.g., noise); (c) Step (e.g., landscape)

(b)


Power Value Function Curve
Power Value Function Curve
Low
0
Mid
33
High
100
Monotonicity
Increasing
Decreasing
Rho = -67.70
Show VFC
Value Function Curve
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Evaluation Measure
Print

(c)


Step Value Function Curve
STEP VALUE FUNCTION CURVE
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Large Beneficial
Moderate Beneficial
Slight Beneficial
Neutral
Slight Adverse
Moderate Adverse
Large Adverse
Print

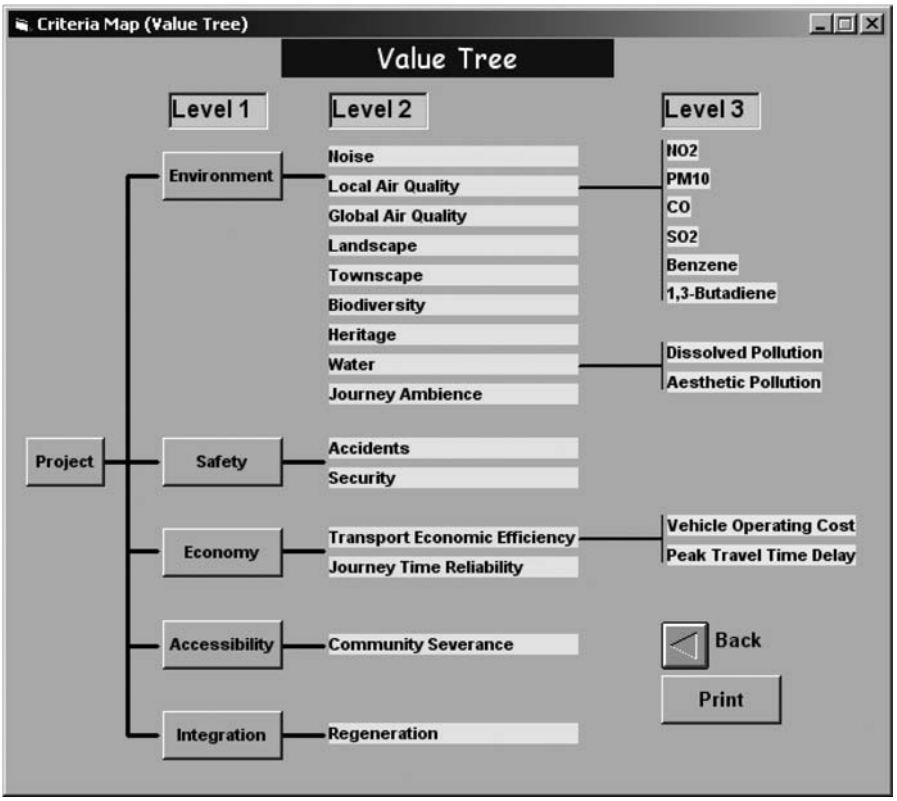
where the increment from the mid-point to each end point is valued equally. On a linear scale, the mid-point is always halfway along the scale of the natural unit, but for non-linear functions it is closer to one end point than the other. The power function (exponential single dimension value function) is defined using equations (Kirkwood, 1995) in which the mid-point of the curve, and hence its shape, is defined by manipulating the exponential constant [p]. As the value of [p] increases, the function becomes less curved; until, when [p] is very large, the value function is linear. The step VFC uses an equally spaced seven-point scale with end points set as large beneficial and large adverse. The step VFC can thus be described as a discontinuous linear VFC.

SMARTNET users can edit end and mid-points for all criteria VFCs, view the resulting functions and, when satisfied, save the VFC file for later use. The ability of users to specify their own value functions is an important aspect of SMARTNET as this allows users, whether individuals or groups, to express their preferences more accurately, and so should lead to a better ranking of alternatives, a requirement for better transport decision-making identified by Grant-Muller *et al.* (2001). In practice, definition of value functions by a group requires an off-line consensus-building approach, such as focus groups or Delphi analysis. Such an activity, conducted amongst appropriate stakeholders, would be a valuable means of improving the default functions within SMARTNET, an activity we intend to pursue in forthcoming work.

Criteria weighting

The second step in the MCA module of SMARTNET is the derivation of weights for each criterion. For reasons outlined above, we chose to apply the Analytic Hierarchy Process (AHP) of Saatay (1980), which derives criteria weights by asking decision-makers to rate the importance of one criterion relative to another for the decision being addressed. This pairwise comparison process asks how important criterion A is relative to criterion B, and codifies the decision-maker's response on a nine-point preference scale (1, 3, 5, 7, 9, where, with respect to B, A is considered to be, respectively, equally as important, moderately more important, strongly more important, very strongly more important and overwhelmingly more important). Intermediate values are used to express shades of judgement, and if B is considered more important than A, the relevant reciprocal value is assigned.

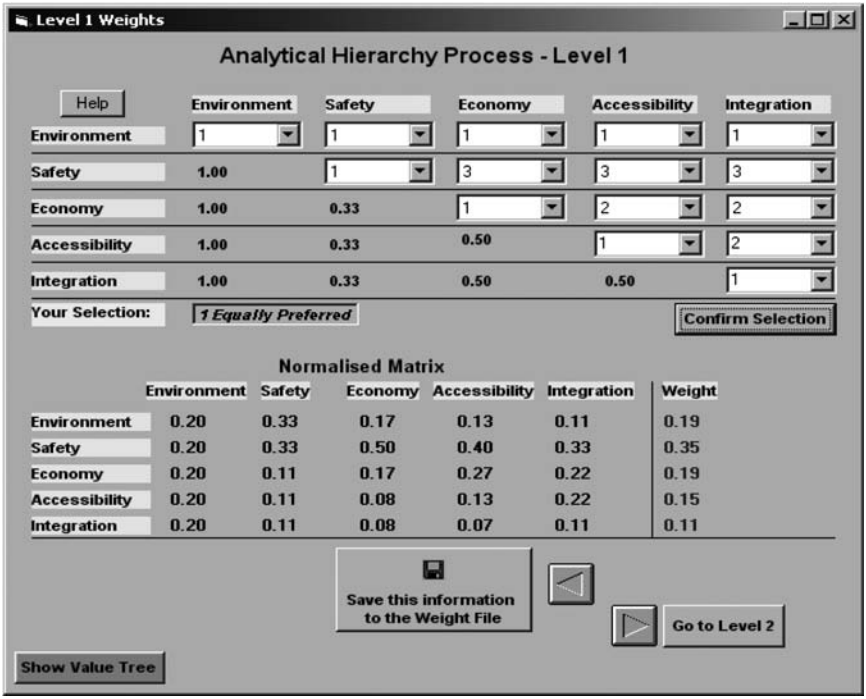
AHP organises criteria in a hierarchical manner (the value tree) that reflects higher- and lower-level objectives. Thus, at a high level, the trade-off may be between costs and benefits, whilst, at a lower level, costs may be split into monetary and non-monetary, with each of these further subdivided as appropriate. Figure 6.4 shows the SMARTNET value tree, whose structure reflects the hierarchical approach adopted by NATA. There are three levels, with the five main NATA criteria at level one, where the most important objective trade-offs are addressed. Criteria weights are derived



6.4 SMARTNET value tree

for each level of the hierarchy, and weights must sum to unity for all the criteria contributing to a higher-level objective. Thus, SMARTNET guides users to conduct pairwise comparisons of criteria at each of the three levels relevant to a NATA assessment, ensuring that the number of pairwise comparisons required does not become unwieldy. A weight tracking window allows users to review their progress through the value tree. Figure 6.5 illustrates a SMARTNET weight assignment screen.

Criteria rank equally when compared to themselves, and the decision-maker is assumed to be consistent when ranking A to B and vice versa; hence $0.5n\,(n-1)$ pairwise comparisons are required for n criteria. SMARTNET prompts users to conduct a pairwise comparison in which the preference values (on the 1–9-point scale) are entered to the matrix. Selecting a preference value returns a text description of the preference of one criterion over the other, and automatically enters the reciprocal value to the matrix. The matrix is then normalised (i.e., cell values proportionately adjusted so that column and rows total equal unity).



6.5 SMARTNET weight assessment screen

Using this normalised matrix, final criteria weights are determined. Saaty's method calculates weights using relatively advanced matrix algebra (using elements in the eigenvector associated with the maximum eigenvalue of the matrix), but a popular and more straightforward method (Dodgson *et al*., 2000), which we apply in SMARTNET, is to: (i) calculate the geometric mean of each row in the matrix; (ii) total the geometric means; and (iii) normalise each of the row geometric means against the total just calculated. As an example, assume we have four criteria CR1, CR2, etc. for which we wish to determine relative weights. We set up the n requirements in the rows and columns of an [$n \times n$] matrix. So we insert the n criteria into the rows and columns of a matrix of order n (in this case a [4 $\times$ 4] matrix), and then perform pairwise comparisons of all criteria using the nine-point scaling described earlier, thus:

	CR1	CR2	CR3	CR4
CR1	1	1/3	2	4
CR2	3	1	5	3
CR3	1/2	1/5	1	1/3
CR4	1/4	1/3	3	1

Next, we estimate the eigenvalues of the matrix using the simple method known as averaging over normalised columns. First, we calculate the sum of *n* columns in the comparison matrix, then we divide each element in the matrix by the sum of the columns the element is a member of, and calculate the sum of each row:

	CR1	CR2	CR3	CR4	SUM
CR1	0.21	0.18	0.18	0.48	1.05
CR2	0.63	0.54	0.45	0.36	1.98
CR3	0.11	0.11	0.09	0.04	0.34
CR4	0.05	0.18	0.27	0.12	0.62

We then normalise the sum of rows by dividing each row sum with the number of criteria. The result of this computation is referred to as the priority matrix and is an estimation of the eigenvalues of the matrix:

$$\frac{1}{4} \times \begin{pmatrix} 1.05 \\ 1.98 \\ 0.34 \\ 0.62 \end{pmatrix} = \begin{pmatrix} 0.26 \\ 0.50 \\ 0.09 \\ 0.16 \end{pmatrix}$$

Decision-makers must be consistent in expressing relative preferences (weights), but they are not always so, hence a consistency check is an important part of any MCA. The next step in the SMARTNET MCA is thus to the consistency index, a measure of the internal consistency and accuracy of the pairwise comparisons. If comparisons were fully consistent, the values for the weights in each row would be the same. Here, SMARTNET uses Saaty's eigenvector method, in which the maximum value of the principal eigenvector (Value λ_{max}) is determined to give a consistency index (CI), as:

$$CI = \frac{\lambda_{max} - n}{(n - 1)}$$

The closer the value of λ_{max} is to *n* (the number of criteria), the smaller the judgemental errors and thus the more consistent the user has been in expressing preferences. To estimate λ_{max}, we first multiply the comparison matrix by the priority matrix:

$$\begin{pmatrix} 1 & 1/3 & 2 & 4 \\ 3 & 1 & 5 & 3 \\ 1/2 & 1/5 & 1 & 1/3 \\ 1/4 & 1/3 & 3 & 1 \end{pmatrix} \times \begin{pmatrix} 0.26 \\ 0.50 \\ 0.09 \\ 0.16 \end{pmatrix} = \begin{pmatrix} 1.22 \\ 2.18 \\ 0.37 \\ 0.64 \end{pmatrix}$$

Next we divide the first element of the resulting matrix by the first element on the priority matrix, the second element of the resulting matrix by the second element in the priority matrix, and so on:

$$\begin{pmatrix} 1.22/0.26 \\ 2.18/0.50 \\ 0.37/0.09 \\ 0.64/0.16 \end{pmatrix} = \begin{pmatrix} 4.66 \\ 4.40 \\ 4.29 \\ 4.13 \end{pmatrix}$$

To calculate λ_{max} , we average over the elements in the resulting vector:

$$\lambda_{max} = (4.66 + 4.40 + 4.29 + 4.13) / 4 = 4.37$$

and calculate the consistency index (CI):

$$CI = \frac{4.37 - 4}{(4 - 1)} = 0.12$$

Reciprocal values are always internally consistent: that is, there is always consistency in weighting within a pair. However, a user may make preference selections in which there is inconsistency between pairs. Inconsistency may occur with respect to the direction of preferences (e.g., A is preferred to B; B is preferred to C; but C is preferred to A) or, more usually, in terms of preference scoring (e.g., A scores 2 relative to B; B scores 2 relative to C; but A does not score 4 relative to C). SMARTNET checks for these inconsistencies by conducting a final consistency check, using the consistency ratio (CR), which is calculated as follows. For each size *n* of a matrix, we can generate a random matrix with its own mean CI value referred to as the random inconsistency index (Golden *et al*., 1989). The CR is then defined as the ratio of CI and random inconsistency index (RI). The RI for matrices of order *n* are given below. The first row shows the order of the matrix and the second the corresponding RI value.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

In our example, RI for a matrix of order 4 is 0.90, thus the CR is:

$$CR = CI / RI = 0.12 / 0.90 = 0.14$$

Pairwise comparisons are considered acceptably consistent when values of CR are ≤ 0.1. Our example shows that the user has not been consistent in assigning weights and must repeat the weight assignment process. In SMARTNET, if the consistency test returns a ratio > 0.1, the user is given the option of repeating the pairwise comparisons until consistency is achieved. Once the user is satisfied with their weight assignment, they are prompted to save the normalised matrix to a weight file.

A criticism of AHP is that weights are often elicited before criterion measurement scales are set. Measurement scales are an important influence on weights due to the fact that the weight on a criterion reflects both the range of difference of the options, and how much the difference matters (Dodgson *et al*., 2000). For example, safety is often seen as very important, but if the range of safety values between options is small (or zero), then it may be given a smaller (or zero) weight compared to another criterion, say maintenance costs, where, for the same options, the range of values is large. This problem is addressed in SMARTNET by conducting the weight assignment procedure after the decision-maker has worked through the criterion quantification and value function steps. Conducting the steps in this order helps to ensure that the decision-maker is at least aware of the criteria values ranges.

Overall weighted score calculation

The final step in the MCA is the calculation of an overall score for each option. SMARTNET prompts users to select the relevant scheme option file (containing outputs of the criteria quantification step), the value functions and the criteria weights. The value function curves are applied to criteria natural values to give criteria scores, which are in turn combined with criteria weights in the linear additive model:

$$S_i = w_1 s_{i1} + w_2 s_{i2} + \ldots + w_n s_{in} = \sum_{J=1}^{n} w_j s_{ij}$$

Where: S_i = the overall score for option i
s_{ij} = the score for criterion j under option i
w_j = the weight for criterion j
n = the number of criteria for each option

and:

$$S = \sum_{k=1}^{5} \sum_{j=1}^{m} \sum_{i=1}^{n} S_{ijk} * W_{ijk}$$

Where: S_{ijk} = score for criterion ijk
W_{ijk} = weight for criterion ijk

k = number of criteria on Level 1 (k=1 to 5)
j = number of criteria on Level 2 (j=1 to m; for k=1 to 5)
i = number of criteria on Level 3 (i=1 to n; for j=1 to m and k=1 to 5)

The results of the MCA are displayed as a histogram from which scheme options can be visualised in rank preference order. Note that the overall option scores also provide a quantitative assessment of the relative performance of options.

Sensitivity analysis

Sensitivity analysis is strongly recommended for large schemes in which the public have a stake (a common occurrence in transport investment), as people tend to disagree to some extent over the nature and importance of criteria within an MCA. SMARTNET does not permit sensitivity testing with respect to which criteria are included in the analysis. In principle, this is a disadvantage as adding criteria to an MCA may lead to a better representation of key stakeholder concerns. However, we are developing SMARTNET within the context of NATA, a publicly debated appraisal framework, hence we make the assumption that the appropriate criteria are addressed. Stakeholders also differ in their views on the relative importance of criteria, and it is valuable to be able to assess the sensitivity of results to different scoring and weighting systems; particularly the latter, which are often contentious between different user groups. SMARTNET facilitates this process, allowing users quickly to redefine value functions and/or criteria weights, repeat option appraisals and compare results.

This sensitivity analysis may produce results in which options have different scores, but their ranks do not change, in which case the results are relatively insensitive to the different views of participants. The analysis may, however, lead to a change in the rank preference order. If this happens, option scores become more important, as they may indicate, for example, that whilst rank ordering changes under the sensitivity analysis, the differences in scores are minor, hence it can be demonstrated that accepting a second-best option leads to little loss in overall benefit. This is often overlooked when MCA is not applied, as people tend to focus on areas where they disagree, and ignore a (usually substantive) set of factors over which they agree.

Sensitivity analysis may result in a widely differing set of results from which no preferred option emerges. In this case, the sensitivity analysis can be used to identify those concerns over which the stakeholders differ most, and is thus valuable in identifying key issues for further debate. Note that in identifying which criteria are particularly important in the selection of scheme option, the sensitivity analysis is a useful means of investigating how scheme options might be improved.

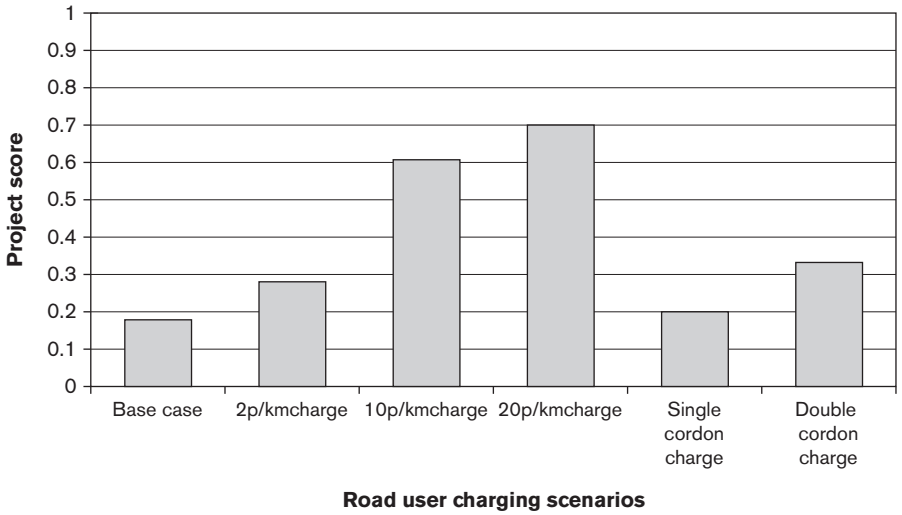
A PILOT APPLICATION: URBAN ROAD USE CHARGING IN LEEDS

Tackling traffic congestion and pollution are major objectives of UK transport pricing policy (DETR, 1998a), and following the publication of the Transport White Paper (DETR, 1998b), local government was given the power to levy charges for road use. Many city authorities in the UK have expressed interest in implementing road user charging, but London remains the only substantive scheme in operation (a new toll motorway has also since been constructed). The hesitancy of local authorities to implement road pricing is, in part, due to uncertainty over the benefits (or otherwise) that might accrue from charging, and the possible adverse public reaction that might occur.

One source of uncertainty arises as to the benefits that can be achieved from different charge options. To date, urban road pricing schemes (UK, Norway and Singapore) use a cordon charge where drivers pay a single fee to enter a charge zone. However, other studies suggest that benefits from road pricing might be higher if charges were levied continuously throughout the road network (i.e., a charge per unit distance travelled). The studies (Fridstrom *et al*., 2000; CfIT, 2002) drew these conclusions following appraisal of relatively few criteria (e.g., the CfIT study neglected environmental benefits), and they have not been conducted within a wider appraisal framework, such as that defined by NATA.

We applied SMARTNET in an investigation of the relative benefits of cordon and distance-based charging for Leeds, a UK city that is considering introducing road pricing. The network data was derived from the SATURN tactical transport model which for Leeds includes 10,250 links and 1314 intersections in an area extending to beyond the main strategic orbital routes, and a trip matrix covers 85,000 morning peak journeys between 370 spatial zones. Demand response was applied using an exponential function, calibrated by stated preference survey data, with elasticity values of 0 to −1.0 for most conceivable changes in generalised cost. Thus, the SATURN forecasts represented the combined driver responses of re-routing and changes in demand (e.g., trip suppression).

Road user charging was addressed through additions to travel costs in the assignment model, calculated using appropriate values of time, within the SATTAX sub-module. Variable travel demand was represented using the SATEASY sub-module, which employs an elastic user equilibrium assignment algorithm to modify the trip matrix in response to changes in network travel costs, based on a simple own-price elasticity relationship. Cordon pricing was modelled by adding a time penalty to each affected link, and distance pricing by adding appropriate time penalties, as a function of length, to all links within the charge area. Charges were calculated using a value of time of 7.63p/min, determined from previous studies (see Mitchell *et al*., 2005, for full details of the road user charge network modelling methods).



6.6 SMARTNET multi-criteria evaluation of Leeds road user charging schemes

Five charge scenarios were then investigated: an inner ring road cordon charge of £3; a double cordon with a £2 inner ring road; a £1 outer ring road charge; and distance charges of 2, 10 and 20p/km levied for travel within the outer cordon. The 20p/km charge was set by reference to the double cordon charge (revenue raised divided by PCU kms travelled in the charge zone). This gave a toll consistent with distance charges recommended elsewhere (e.g., CfIT, 2002), but a very high trip suppression, hence the lower distance charges tested. All charges were levied per PCU, with no attempt to differentiate by vehicle type. Detailed network responses to these charges are presented by Mitchell *et al.* (2005).

SATURN outputs addressing these charge options were assessed using SMARTNET. As this is a demonstration, value functions and criteria weights were derived by the authors; but, in practice, stakeholder consultation would be required to establish more widely accepted values. The results of the appraisal are presented in Figure 6.6, and illustrate that all of the charge options are preferable to the do-nothing base case. However, it is important to note that we have not included information on scheme costs, for which insufficient information was available; these would change the MCA scores and potentially the ranking of options. In our exemplar, there are two key elements to the scheme cost. The first is the cost of implementing and running each road user charge scheme. This will differ between the cordon and distance-based schemes, which use different technology for charging, and between the cordon types (a double cordon entails more entry points than a single cordon). For the distance-based charge schemes costs are the same, and Figure 6.6 suggests

that the 20p/km scheme is at least clearly better than the 2 and 10p/km schemes. However, if we also include the second scheme cost element, that of costs borne by drivers (which we can calculate using SATURN outputs), then it might well be evident that the extra cost levied in moving from a 10 to 20p/km charge is not justified for the marginal benefit evident in Figure 6.6.

With satisfactory information on scheme costs, a more credible MCA is clearly possible. Costs, however, need not be included in the MCA itself, but can be appraised separately, and, together with the MCA score, used to calculate the benefit per unit cost for each option of interest, as recommended by Dodgson *et al*. (2000). This would help stakeholders to decide if the extra benefits offered by an option were worth the additional cost. Given that NATA recommends the use of monetary evaluation where possible, it is logical also to include some of the SMARTNET sub-criteria in the cost appraisal. For example, vehicle operating costs, journey delays and traffic accidents can readily be evaluated in monetary terms in SMARTNET and could thus be added to the cost element of the benefit–cost ratio calculation, and removed from the MCA simply by setting their weights to zero.

ENHANCING DECISION SUPPORT FOR URBAN ROAD NETWORKS

SMARTNET is presently a prototype tool and a number of further developments to enhance its decision support capability can be identified; these address both the technical development and application of the system. First, as noted above, there are opportunities to improve the quantification of sub-criteria natural values. These might be improvements to reduce assumptions made (e.g., include digital terrain data better to characterise link gradient and so noise emissions) but substantial benefits are possible by addressing attributes of the area bounding each road link. For example, characterising population density along road links would permit better noise exposure estimates; inclusion of river network characteristics would allow improved estimates of road run-off risk to receiving waters; and spatially mapping of landscape, townscape and heritage features would present opportunities for spatially resolved assessment of these NATA criteria. Such developments are, for the most part, conceptually simple, but can often be technically demanding, so simplifying these tasks by developing the modelling capability in a software suite is clearly worthwhile.

Second, to date, we have limited SMARTNET to criteria that are defined in the NATA appraisal framework, but consideration of criteria not yet represented in SMARTNET is warranted. The relevance of some of these criteria becomes more obvious when a network model (e.g., SATURN) is interfaced with a strategic model to permit appraisal of, for example, multi-modal assessments. In this case, criteria

such as the quality of public transport services may be important, but these are currently not included.

Similarly, the distributional impacts of policies and plans are increasingly seen as an important aspect of sustainability appraisal in the UK (HM Treasury, 2003; Agyeman and Evans, 2004), and are clearly amenable to analysis via a network-based decision tool. SMARTNET developments could address distributional issues in both the criteria modelling and MCA aspects. It is already possible to produce criteria network maps (of noise, emissions, etc.) in SMARTNET, and this could be used to identify 'hot links' representing significant changes between options. This allows users to identify areas with particular problems: for instance, noise increases proximal to sensitive receptors, such as schools or hospitals (Klungboonkrong and Taylor, 1998, 1999, take this analysis a step further, by conducting link-specific MCA, further to aid identification of problem links).

By assigning area-based social deprivation data to links, it would also be possible to assess how the social distribution of impacts changed between options (see Mitchell, 2005, for an example analysis using air quality). The resulting equity assessments (e.g., represented by Gini values) could then be entered to the MCA stage of SMARTNET, where users would express, through weighting, the importance attached to ensuring impacts were 'fairly' distributed. A weighting capability is particularly important here, as stakeholders may have very different views on what is a fair social distribution, according to the social justice theory they subscribe to (see Lautso *et al*., 2004, for application of equity appraisal within a multi-criteria framework).

Numerous other enhancements are also possible with SMARTNET, including, for example, improving the ease with which sensitivity analyses can be conducted, and making the display of natural value data more prominent to users (important in effective weight elicitation). However, other developments relate more to how SMARTNET is used (e.g., facilitation of a group weight derivation process), rather than its technical characteristics.

CONCLUSION

In this chapter, we have described the development of SMARTNET, a software tool for conducting multi-criteria appraisal of actions that impact upon road transport networks. SMARTNET has been developed to address NATA, the current UK approach to transport appraisal developed by government to improve upon COBA, the previous approach based on cost–benefit analysis, which was criticised for its inability to address a number of key issues in transport appraisal. However, whilst developed within the NATA framework, the general approach taken, that of linking transport modelling with criteria appraisal routines and an MCA module, means that

further development is possible so as to address a wider range of policy and plan interventions (e.g., via prior application of strategic models) and assessment criteria (e.g., equity appraisal).

The role of modelling in urban sustainability appraisal has been critically reviewed elsewhere in this series (Mitchell, 2007). SMARTNET further illustrates the potential of integrated modelling (in this case of transport and NATA criteria) in appraisal of sustainable urban development. With respect to the BEQUEST sustainability appraisal framework (Bentivegna *et al*., 2002) it is evident that a range of activity areas can be addressed (planning, design and operation of transport services and infrastructure), and that the key sustainability dimensions (social, environmental, economic) relevant to NATA are addressed, with scope for further additions. The spatial and temporal scales addressed by SMARTNET are quite limited compared to the scope encompassed by BEQUEST, but are appropriate to the problems that are designed to be tackled. The integration of modelling with MCA provides further benefits, as the MCA provides a mechanism for including important criteria that are not readily modelled in the appraisal. This mixed approach is a valuable means of handling the complexity of assessment inherent in urban sustainability appraisal, and offers a mechanism for making more robust, consistent and transparent decisions with opportunity for significant stakeholder participation.

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Part II.iii

Advanced Evaluations of Urban Land Use, Buildings and Estates

7

The NAR Model of Land Use and Building Assessment[1]

Mark Deakin

INTRODUCTION

Focusing on the utility of property market valuation and investment appraisal, this chapter examines the critique of the discounting principle advanced by environmentalists. In particular, it examines the argument put forward regarding the link between the valuation and appraisal of investments, selection of a discount rate, existence of land use, building obsolescence and depreciation, connected with the inter-generational downloading of development costs; the link seen by some as having an adverse effect on the life-cycle of land and buildings and as working against attempts to implement experimental designs aimed at energy saving and low carbon-based emissions.

The chapter begins by examining the valuation and appraisal issue surrounding the discounting principle, reviewing the life-cycle and environmental impact assessment measures it is supposed to work against, even frustrate, as well as exposing some of the contradictions in the criticism. Having done this, it goes on to examine the sustainability requirement that the (re)development of land uses and building programmes need to meet if they are to be environmentally friendly and green in the manner they deal with obsolescence and depreciation. It will then show how the rejection of simple adjustments to the discount rate can be used to rehabilitate the mechanism into a co-evolutionary and multi-criteria approach to environmental economics. The examination will then demonstrate how this rehabilitation of the discounting mechanism offers a framework of analysis that has the potential to circumvent many of the criticisms which surround the utility of market-based valuation and appraisal models.

TIME HORIZONS, THE SPATIAL CONFIGURATION AND RATE OF REDEVELOPMENT

In reference to the discounting principle, Harvey (1989: 97) points out:

> In general terms (re)development takes place when the present value of the existing flow of future net returns from the existing use of land resources becomes less than the capital

> value of the cleared site. It must be emphasised that we are seeking to establish the *capital* net return expected to be earned in future years, such returns must first be estimated and discounted for the present value and then aggregated.

From this initial statement on the discounting principle, Harvey formulates a simple income model of property valuation. In this model it is the notion of net annual returns, or what he refers to as NARs, that takes a leading role in the appraisal of investments and rate of (re)development (see also, Balchin *et al*., 1995).

As a form of income, the NAR is defined as the difference between gross annual returns (such as rent received) and operating costs (including repairs, maintenance, insurance and other such outgoings). To operationalise the notion of net income as an annual return in terms of property valuation and investment appraisal, Harvey (1989) proposes that all gross annual returns and operating costs should be projected over the lifetime of the land use or building programme in question. Before subjecting the NARs to a rate of discount, he makes some comments on the nature of the relationship between the gross annual returns and operating costs. What he proposes is that over the life of the land use, the gross annual return (GAR) will fall and operating costs will rise. He represents this notion as an annual return given by:

$$P = \sum_{t=i}^{n} \frac{R_i - O_i}{(1 + r)^i} \quad \ldots\ldots (1)$$

Where:
- P = value of property in its current land use
- n = period when GARs can be earned in its current use
- R_i = GARs from i to year n
- O_i = operating costs, excluding obsolescence and depreciation, from i to year n
- r = rate of discount

Harvey's (1989) approach represents the valuation of property as a method of investment appraisal and procedure that should be followed in the discounting of returns and calculation of present value. In terms of cleared site value, it is proposed that the value of the cleared site is equal to the present value of the most profitable alternative use, less the cost of clearing the site and rebuilding for the new use. The residual method of property valuation and procedure to be followed in the appraisal of investments required for this calculation is represented in the formula:

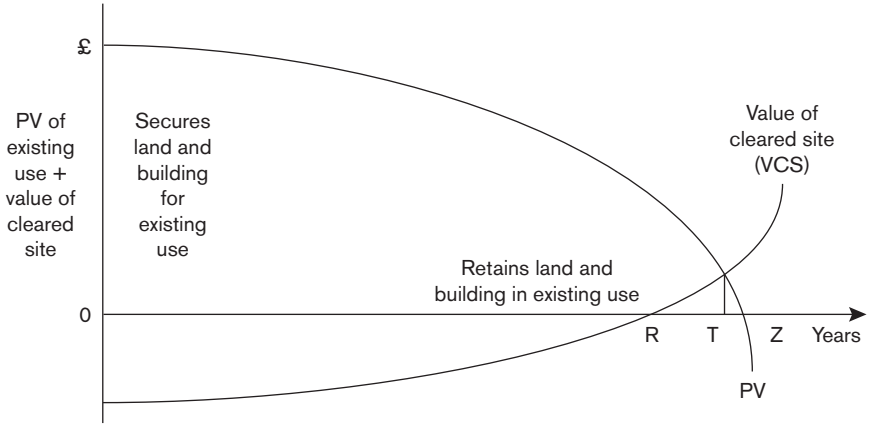
$$C = \sum_{t=i}^{n} \frac{R_i - O_i}{(1 + r)^i} - D - B \quad \ldots\ldots (2)$$

Where: C = the value of the cleared site
n = period when GARs can be earned until alternative use
R_i = GARs from i to year n
O_i = operating costs, excluding obsolescence and depreciation, from i to year n
r = rate of discount
D = the cost of demolition and clearing the site
B = the cost of rebuilding to the new, alternative land use

THE DYNAMICS OF THE NAR MODEL

Taking the NAR model to represent the dynamics of (re)development, it is possible to illustrate the process of change within the time horizon of land uses and spatial configuration of building programmes (see Figure 7.1). As Figure 7.1 illustrates, from year R the value of the cleared site is positive and increasing and eventually at T it is seen to exceed the present value of the land in its current use. As a result, redevelopment takes place in year T, where PV equals VCS.

As Harvey (1989) is keen to point out, at T the land use is still technically efficient, for it can receive an NAR until year Z. However, in year T it becomes inefficient in economic terms because resources can be redeployed or switched to an alternative, new land use having a higher present value. As he points out, under these circumstances, the present value of the current and cleared site brings about a situation where the time horizon of a land use is represented as OT, and a position whereby it is possible to calculate how many years the technical and economic life of a building programme is efficient.



7.1 The timing of (re)development

With regards to the rate of redevelopment, it is stressed this is far more difficult to predict, and it is contingent on a number of factors: first, the level of demand from occupiers and investors; second, operating costs; and third, the rate of interest. Ignoring the first two categories, he goes on to examine the effect a change in the rate of interest has on the present value of current land uses, cleared sites, time horizon and spatial configuration of building programmes.

LAND USE, BUILDING OBSOLESCENCE AND DEPRECIATION

Perhaps the most obvious and immediate significance of this examination is that two important variables have not yet been taken into account in the NAR model – obsolescence and depreciation. However, it should be recognised that the significance of obsolescence runs much deeper than the addition of further expenditures on the cost of outgoings associated with land use and building programmes. This is because it represents the outcome of a more far reaching enquiry into the adoption of discount rates: the so-called initial yield and the nature of uncertainty and risk surrounding their use in the valuation of property and appraisal of investments. As an approach to the valuation of property and appraisal of investment, the income thesis draws upon Fisher's (1965) representation of the discounting principle and interest payments which the investment of capital yields in terms of a 'rate of return'. Such payments are seen to represent a return for:

- the loss of liquidity;
- the payment for the forgoing of immediate consumption and switching of capital into investment. Often referred to as the 'risk free rate', because it represents a 'return' for the 'forgoing of consumption' – investment of capital in riskless operations unaffected by inflation;
- anticipated inflation and compensation for the loss of real value; and
- the premium which reflects the degree of risk associated with a particular investment opportunity.

Based on Fisher's (1965) theory of interest, the rate of return is represented as:

$$R = l + i + p$$

Where: l = loss of liquidity
i = anticipated inflation
p = the risk premium

Given the valuation of property and appraisal of investment does not allow for real rates of return, only notional, it is proposed there is no requirement for I, and R

can be represented as the sum of I + p. Responding to Gordon (1982), and adding rental growth to the equation, a risk, growth and depreciation explicit model of property valuation and investment appraisal is put forward (see Baum and Crosby, 1995: 95). This is represented as follows:

$$K = RFR + r^* - g + d$$

Where:
- K = the initial yield on capital investment
- RFR = the risk-free, inflation-prone opportunity cost rate of return
- r^* = risk premium
- g = expected annual rate of rental growth in new land uses and building programmes
- d = depreciation in the capital component of land use: that is, the building and not the land. This is because land is seen to represent the non-reproducible resource that commands a scarcity value and transfer earnings payment from (re)development potential. This can, of course, be severely restricted if the land in question is subject to contamination and becomes obsolete in the sense that it represents an environmental hazard.

Here, the risk-free, inflation-prone opportunity cost rate of return is taken to be the redemption yield on government securities and the premium is the additional return for investment of capital in property. The proposal for g to represent the expected annual rate of rental growth in new land uses and building programmes is made so as to allow the depreciation component to be measured in terms of the obsolescence a particular use or programme is subject to.

The formula is important for two reasons. First, K is equivalent to r in the NAR model previously referred to. Looked at in this way, r appears to be a far more complex figure than initially thought. It appears, however, to be one it is necessary to live with if the criticisms of the model's silence on such matters as uncertainty, risk, rental growth and depreciation are to be overcome. Second, in taking the form of a summation equation (one which takes the first three criticisms into account), it also works within the definitions of physical deterioration, technical, economic and environmental obsolescence, put forward by the RICS, ISVA and the Centre for Advanced Land Use Studies (CALUS) to explain the causes of depreciation. Determining factors, Baum (1991) suggests, are impossible to single out, but can be represented in terms of: (a) physical deterioration; (b) external appearance; (c) internal specification; and (d) configuration – factors which Baum in turn argues need to be weighted in order of significance so that the impact of low and high flexibility can be analysed in terms of the impact depreciation has on rental values, yields, expenditure and risk.

THE DEBATE OVER LIFE-CYCLE ANALYSIS AND ENVIRONMENTAL IMPACT ASSESSMENT

The previous discussion has sought to identify that a number of developments have taken place in property valuation and investment appraisal which circumvent many of the criticisms aimed at the NAR model. In particular, the fact that, by substituting the r of the NAR model in the valuation of property with the initial yield (shown by symbol K) which surfaces in the obsolescence and depreciation sensitive model of investment appraisal, it is possible to be not only risk and growth explicit but (obsolescence and) depreciation explicit. Balanced against this, however, is the fact that this reformulation of r in terms of the initial yield has little to say about the time horizons, spatial configuration of land uses or building programmes. What is also noticeable is the tendency for both approaches to say little, if anything, about whether they represent a net benefit or make a contribution to welfare. This question is, of course, looked at briefly under the issue surrounding rate of return over cost. But given neither of the approaches addresses spillover effects, or externalities in any way whatsoever, it has to be recognised any claims in this department have to be balanced against the fact that the discount rate (in whatever forms of surfaces: i.e., the r of the NAR models, the K of the initial yield, or the plain old rate of interest!) is private, and in that sense reflects private, as opposed to social time preferences regarding the marginal productivity of capital.

The same remarks hold for the cost and benefits considered. This is worth reiterating because it is the life-cycle analysis issue of time horizons, spatial configurations, spillover externalities and the social dimension of the discounting principle (and the way it ought to influence valuation and investment appraisal) that is of particular concern to those with an interest in environmental impact assessment (e.g., Rydin, 1992; Vale and Vale, 1993; Breheney and Rookwood, 1993). Working within these terms of reference, Rydin (1992: 230) has sought to examine the life-cycle and environmental impact assessment issues of valuation and investment appraisal in market economies. Quoting Pearce and Turner (1990), it is proposed that:

> the use of discounting downgrades costs to future generations at the expense of benefits to the current generation. Thus the expense of future maintenance will have a relatively smaller impact on the value of an investment compared with current capital expenditure. This form of valuation can inhibit many forms of refurbishment which would enhance energy conservation and undervalue buildings which minimise their environmental impact.

The contradiction Rydin seeks to expose is that the economics of discounting in valuation and investment appraisal tends to work against the possibility of introducing

experimental designs aimed at low-carbon and fossil fuel content, because the benefits they provide in the long term – repair, maintenance and running costs – do not translate into any additional rental income, or a favourable yield adjustment, but merely additional capital costs. This is seen as contradictory because: (a) the so-called tyranny of the discounting principle tends to militate against the introduction of such experimental designs; (b) inhibit improvements and refurbishments aimed at low-carbon, fossil fuel consumption; (c) lead to high repair, maintenance and overall running costs without any compensatory income; (d) negate the possibility of off-setting deterioration, obsolescence and depreciation in a manner that brings about long-term horizons and more compact spatial configurations; and (e) download private and social costs associated with land use and building programmes to future generations for the benefit of the current. As a critique of the discounting principle, the aforesaid draws upon the research of Pearce and Turner (1990). As it is a concern that leads Rydin (1992) to advocate a lower discount rate, initial yield or level of interest for environmentally friendly, green land use and building programmes, it is a critique which requires further attention.

Pearce and Turner's (1990) criticism of the discounting principle is fivefold: (a) private individuals can measure the pure time preference for present consumption as opposed to future investments; (b) the lack of consideration the marginal efficiency theory of capital gives to the possibility of social time preference; (c) the lack of any specific allowance given to uncertainty and risk in the choice of a discount rate; (d) the tendency discount rates have to ignore that any positive initial yield or rate of interest assumes growth; and (e) the tendency that interest rates have to place a high value on current income and a low weight on future capital and revenue costs.

Looked at independently, it is evident that the first four criticisms are economic in nature. What is also clear is that the last point has little to do with efficiency and in referring to such matters as the downloading of inter-generational costs is a social question to do with equity. Irrespective of this, however, Pearce and Turner (1990: 223) recognise that:

> The implication of the criticisms is that we should lower discount rates from whatever they are . . . If we accept this we have an immediate problem in that the criticisms do not tell us by how much we should lower discount rates. We are left with an indeterminate theory of discount rate selection.

In an attempt to circumvent this problem, Pearce and Turner propose that an alternative to the question of adjusting discount rates should be examined. Here, it is proposed that attention should focus not so much on the adjustment to the discount rate but on the sustainability requirement valuation and investment appraisal need to

meet in order for it to take into account the effect of land use, building obsolescence and depreciation on the environment.

THE CONTRADICTIONS

A number of contradictions exist in the environmentalist's critique of the discounting principle, which lies behind the valuation and appraisal of investments. The contradictions in question take a number of forms. First, the tendency to misrepresent the use of the discounting principle in property valuation and investment appraisal. Second, the tendency to abandon NAR-type models of valuation, investment appraisal and their use of efficiency as a measurement of environmental improvement, without any suitable replacement. Third, the tendency there is to ignore questions about the economic efficiency of environmental improvements in favour of matters concerning the social equity of inter-generational downloading.

Rydin's (1992) criticism of the discounting principle in the valuation of property and appraisal of investments represents it as being at odds with, or working against, the possibility of having time horizons and spatial configurations whose effect on the environment is ever going to be as capable of meeting the sustainability requirement. To support this line of reason, Rydin draws upon the critique of the discounting principle advanced by Pearce and Turner (1990): in particular, the criticisms regarding the lack of due consideration given to the marginal efficiency of capital, social time preference, uncertainty, risk and question of growth. What, however, is most noticeable is that Pearce and Turner do not agree with the arguments put forward to support a discount rate adjustment, but instead focus attention on what they refer to as the sustainability requirement of valuation and investment appraisal.

Based on this, there can be no simple assumption (as Rydin appears to make) that the possible benefits of life-cycle analysis and impact assessment for environmentally friendly, green land uses and building programmes call for downward adjustments to discount rates and increases in capital value to offset additional expenditure on longer time horizons and more compact spatial configurations. However, even putting this to one side, it is evident that Pearce and Turner's (1990) criticisms of discounting do not take into account the significant advances which have been made with regards to its recent use as a principle in the valuation of property and appraisal of investments. For, you only have to look at the Fisher inspired formula for the initial yield of Baum (1991) and Baum and MacGregor (1992) to see property valuation and investment appraisal does now take uncertainty and risk into consideration and also acknowledges that growth is another component which has to be taken into account (see also Baum and Crosby, 1995: 95). Indeed, if we follow through this line of reason, it soon becomes clear that any downward adjustment to the rate of

discount is based on the assumption that the valuation of property and appraisal of investments will give rise to land uses and building programmes which are not only more efficient in bringing about environmental improvement but in generating a level of growth sufficient (relative to obsolescence and depreciation) to yield as a rate of interest capable of sustaining the capital in question. It in fact *assumes a lower level of risk and higher rate of growth*; a situation that *tends to draw additional, not fewer, scarce, fixed and finite resources into the (re)development process*. It is perhaps for this reason that Pearce and Turner (1990) draw the conclusion that the criticism of the discounting principle indicates there is something 'amiss' with the rates of return selected, but such an insight does not add up to much. This may explain why they choose instead to focus attention on the pressing need for the discounting principle to meet the so-called sustainability requirement.

MEETING THE SUSTAINABILITY REQUIREMENT

As O'Brian *et al*.'s (1996) contribution to the debate points out, the 'meeting of the sustainability requirement' is what most of the discussions on the critical role of property valuation and investment appraisal have in common. They also suggest that these debates differ in the method each proposes should be adopted for such purposes and point out that the main reason for rejecting the methodology of valuation and investment appraisal rests in the belief that they suffer from the tyranny of the discounting principle, and are in that sense too abstract, over-generalised and unhelpful in the way they represent the technical analysis which is needed to measure the effect (re)developments have upon the environment. This understanding is – if a little less explicitly – also reflected in the rejection of market models as the basis of life-cycle analysis and environmental impact assessment. The difficulty with this rejection of market-based models is that it is founded upon an incomplete, somewhat questionable critique of the discounting principle and which, on reflection, adds up to little more than a suggestion that the abstract and over-generalised nature of valuation and investment appraisal means it is not possible for a detailed life-cycle analysis or environmental impact assessment to meet the sustainability requirement. If it can be accepted that there are a number of contradictions in the critique of the discounting principle which leave the question of a meaningful relationship between valuation, investment appraisal and the environment open, then it becomes worthwhile searching for a means to bridge the gap there is between the market basis of the former and the more bio-physical-cum-ecological representations of the latter (Deakin, 1996, 1997).

THE REJECTION OF SIMPLE ADJUSTMENTS

The rejection of any simple adjustments to the discount rate and plea to establish whether a development meets the sustainability requirement are also echoed in the work of Norgaard (1984) and Norgaard and Howarth (1991). Here, any notion of simple adjustments to discount rates is discouraged. This is because, in principle, such a course of action is seen as too mechanistic, unable in that sense to represent the uncertainty, risk, growth or knock-on obsolescence and depreciation which surfaces from decisions of this kind (see Norgaard and Howarth, 1991, in particular).

Pearce and Turner (1990) and Pearce and Warford (1993) tend to see such concern over the choice of discount rate as too reminiscent of the debates over the valuation and appraisal dimension of cost–benefit analysis (see Pearce, 1971, 1972). For Pearce and Turner (1990), an investigation of discounting in the context of valuation and appraisal appears to be of little interest (see also Pearce and Markadya, 1989). Pearce instead turns attention to the valuation and appraisal of what is referred to as natural capital. Built upon a green accounting mechanism, natural capital is put forward as an instrument that captures the fixed, finite nature of those resources critical to the environmental integrity of ecosystems and whose depletion needs to be regulated so that the income stream resulting from the economic development of such resources grows at a rate which is sustainable; grows, that is, at a rate whereby any factor substitution of natural for man-made capital, or replacement of such resources, does not result in a situation where the development in question brings about an inter-generational downloading of costs (Duborg and Pearce, 1997).

Given the complex nature of the relationship between the environment and economy, uncertainty and incalculable nature of the risk related to decisions about environmental conservation and economic growth, considerations about the choice of discount rate tend to be seen as of little help in the valuation and appraisal of investment. Instead, attention turns to the use of non-standard (hedonic and contingency-type) valuations (Powell *et al*., 1997), deployment of life cycle analysis and environmental impact assessment in the appraisal process and the effect such instruments can have upon the index of sustainable development (Faucheux *et al*., 1997).

In providing a critique of natural capital as a green accounting mechanism, Faucheux and O'Conner (1998), suggest Pearce's 'environmentally friendly, green' response to the problem of valuation and investment appraisal *merely reframes the question and does not provide a solution* (see also O'Conner, 1998). Faucheux and O'Conner stress the need for what they term non-monetary valuations. Instead of searching for a monetary valuation of natural capital and appraisal of the effect any such development has upon the index of sustainability, they put the environment before the economy in what they term a co-evolutionary approach. They suggest that

the development of both environmental and economic goods/services is complementary, not because of the way in which environmental conservation can sustain economic growth but in quality of life *per se*.

This focus on quality of life shifts attention to the environment in terms of ecosystem integrity, carrying capacity, degradation, waste, pollution, etc., and the scientific basis of any such valuation and appraisal. Here, attention turns to energy and the laws of thermodynamics in understanding the environment in such non-monetary terms. It is evident they seek to unite the bio-physical with the social sciences through a particular emphasis on the non-monetary (ecologically based), as opposed to the monetary (i.e., market, hedonic and contingency), tradition in the valuation and appraisal of such developments. In casting attention back on energy, eco-systems, life-cycle analysis and environmental impact assessment, the point of emphasis shifts from the economic development of income streams and conservation of resources to the inter-generational downloading of costs. The reason for this lies in Faucheux and O'Conner's belief that the two discourses (i.e., bio-physical and social) in environmental economics can be reconciled through a multi-criteria analysis which applies the so-called 'hard' certainties of bio-physical science to the more uncertain, risky social relations, which are 'softer' and by nature more difficult to predict. Rather than represent the monetary-isation of income streams in the face of uncertainty and risk as incalculable, due to the inter-generational downloading of costs associated with the hazards of growth, obsolescence and depreciation, they apply the certainties of the non-monetary (bio-physical and ecological-based) issues to assess the impact any (re)development of land use and building programmes (and economic growth in general) has upon the environment.

Faucheux and O'Conner (1998) rehabilitate concerns over money, energy, income, costs, uncertainty, risk, growth, obsolescence, depreciation, time and space into a form of environmental economics that allows (re)development to be assessed in terms of the impact any inter-generational downloading has on the index of sustainable development. This is done by placing emphasis upon the bio-physical and social in the co-evolutionary approach to hard and soft issues in the environmental economics of a multi-criteria (monetary and non-monetary) valuation and appraisal of life-cycles (see also Voogd, 1983; Massam, 1998; Nijkamp and Perrels, 1994; Grillenzoni *et al*., 1997). The significance of this rehabilitation is as follows:

- valuation and investment appraisal is still a major issue in terms of understanding the effects land use development and building programmes have upon the environment of cities;
- it proposes the valuation and appraisal in question ought to be co-evolutionary in nature, based upon a multi-criteria (monetary and non-monetary) analysis;

- such an analysis should rehabilitate concerns over money, energy, income, costs, uncertainty, risk, growth, obsolescence, depreciation, time and space;
- these concerns should form the basis of an economics that allows any such (re)development of land use and building programmes to be measured in terms of the effect that they have on the environment of cities;
- such a form of environmental economics requires both life-cycle analysis and environmental impact assessments;
- the concerns over money, energy, income, costs, uncertainty, risk, growth, obsolescence, depreciation, time and space allow the *discounting mechanism of market valuation and non-standard hedonic and contingency forms of investment appraisal to co-exist and evolve alongside the environmental economics of both life-cycle analysis and environmental impact assessment*; and
- this co-existence and evolution of the discounting mechanism (in the life-cycle analysis and impact assessment of environmental economics) provides a means to establish whether the (re)development of land uses and building programmes, with energy-saving, clean-air technologies, is not only environmentally friendly and green, but meets the sustainability requirement in the way it deals with the inter-generational downloading of costs.

REHABILITATING THE DISCOUNTING MECHANISM

While the aforementioned goes some way to rehabilitate the discounting mechanism into the valuation and appraisal of environmentally friendly, green land uses and building programmes, the question of how to do this in the co-evolutionary logic of a multi-criteria approach still remains. The question is whether the form of environmental economics under discussion should search for some universal standard of value: that is, the consumption of energy in the law of thermodynamics for the appraisal of development programmes; in other words, put the hard certainties of the bio-physical and ecological-based issues first, and the more uncertain, risky social relations which are 'softer' and by nature more difficult to predict second. While the co-evolutionary logic of a multi-criteria analysis and assessment does not lay down any rules in this respect, it is possible to see the bio-physical dimensions and ecology of energy (non-monetary themes) as *nesting* within the monetary (market, hedonic and contingency-type valuation and investment appraisal). If we can accept the co-evolutionary and multi-criteria approach to valuation and investment appraisal allows this, then the virtues of an NAR-type model become apparent. The virtues in question are as follows:

- it has an implicit bio-physical and ecological dimension shown in the energy factor in the operation and maintenance costs, illustrated in $R_i - O_i$ and

represented as the enumerator in formulas (1) and (2). When supplemented with a life-cycle analysis and impact assessment, the environmental economics of energy consumption become more explicit and can be represented not only in monetary terms but in its own universal standard of measure; and

- a formal time and space dimension is built into the model and as a result, its formula for the selection of a discount rate which is risk, growth, obsolescence and depreciation is made explicit.

The main criticism that may be levelled at the model is the way the formula deals with risk and it in turn relates to obsolescence and depreciation. For what it does is represent risk in terms of systematic and specific market, rather than environmental risk. However, as the search for environmental risk (in relation to growth, obsolescence and depreciation) is seen by both Dubourg and Pearce (1997) and Faucheux and O'Conner (1998) as impractical without the assistance of life-cycle analysis and impact assessments, this omission is perhaps not critical at this stage.

TOWARDS A FRAMEWORK FOR ANALYSIS

So far it has been suggested that the debate over the application of the discounting principle in property valuation and investment appraisal has tended to become separated from issues concerning land use, building obsolescence, depreciation and the effect the (re)development process has on the environment of cities. It has also been argued that any attempts to progress the matter should be grounded in the environmental economics of the discounting principle and draw upon what is understood about valuation methodology and investment techniques to advance a knowledge of obsolescence and depreciation via life-cycle analysis and environmental impact assessment.

It is for this reason that the chapter proposes that a framework for analysis should be grounded in a form of environmental economics which provides the opportunity for a detailed examination of meaningful relationships between the dynamics of the time horizons and spatial configurations of what have been referred to as land use, building obsolescence, depreciation and expenditure on experimental designs, aimed at the introduction of energy-saving, clean-air technologies. That is to say undertake a detailed analysis of how obsolescence and depreciation react back on operating costs, repairs, maintenance, improvements, etc.; or, from the NAR model's point of view impacts upon the relationships which exist between $(I + r)$ and O_i. This is the relationship Rydin (1992) is critical of due to its apparent inability to produce land uses and building programmes with operating costs, repair schedules, maintenance programmes and refurbishments, aimed at low carbon, fossil fuel

consumption – the relationship that also appears to be of particular interest to Vale and Vale (1993). Accepting that Rydin's criticisms and call for downward adjustments to r are not supported by Pearce and Turner (1990), and this is something which leaves the whole question of the relationship between valuation, investment appraisal and the environment wide open, it is possible to argue the best way to further any common interest in the debate over the market basis, bio-physics and ecology of both life-cycle analysis and environmental impact assessment (and in that sense the sustainability requirement) is through a closer examination of the relationship between O_i and r, the discount rate.

In terms of the NAR notion of net income, it is only possible at this stage to qualify the equation so that r represents $K = RFR + r^* - g + d$. While this will be common for both equations (1) and (2), it will also affect R_i and O_i due to the fact that r will be net of obsolescence and depreciation. While the modifications appear minor and perhaps insignificant, it is proposed that their true value lies in the fact that the adjusted NAR model addresses many of the criticisms made about the tyranny of the discounting principle and selection of an appropriate rate, draws particular attention to both risk and growth in setting the return on capital *and makes it possible for the rate of interest to evolve from the life-cycle analysis and environmental impact assessments undertaken rather than the other way around*. This is an important point, because approached in this way it is not the market that sets its standards upon the environment, but the life-cycle analysis and environmental impact assessment (i.e., environmental economics of the green contingent in the design, engineering and construction sector) whose valuation and appraisal produces the rate of interest acting as a return on capital. The following lists the potential benefits of any such examination:

- It would focus attention on the nature of the relationships between O_i and r in the NAR model.
- It would build upon the advances of contemporary property valuation and investment appraisals, not only in terms of the income approach to risk and growth but in the cost-based thesis (Deakin, 1997) on outgoings associated with operating costs and capital expenditure on repairs, maintenance, improvements and refurbishments.
- The collection of information on such expenditure would augment our understanding of land use, building obsolescence and depreciation, by using the criteria set out by Baum (1991) and Rydin (1992) to establish whether experimental designs of the type in question have notable benefits.
- It would also make it possible for the benefits of contemporary valuation and investment appraisal to be formally integrated into the field of development

analysis – something it may be difficult to believe has not yet been delivered (DoE, 1991; Harou *et al*., 1994; Deakin, 1996, 1997; Brooks *et al*., 1997).

- Such data would also allow life-cycle exercises to be undertaken in the valuation and appraisal of investments, obsolescence and depreciation and also be capable of incorporating an environmental impact assessment into the (re)development of land uses and building programmes (Deakin, 1999a, 1999b). This would also allow the market-based criteria of the adjusted NAR-type model to be integrated with the life-cycle analysis and environmental impact assessments of BREEAM (see Cole, 1997; Cooper, 1997, 1999; Cooper and Curwell, 1998). Here, adjusted NAR-type models would provide the market criteria, whereas life-cycle analysis and impact assessments like BREEAM could in turn provide the bio-physics and ecology of energy conservation. Nesting within each other, the adjusted NAR-type model would be able to value in line with the market, while the standard for the conservation of energy could be represented in a universal form. The integration of the adjusted NAR-type model with that of life-cycle analysis and environmental impact assessment, would also add the valuation and investment component currently absent from such an analysis or impact assessment (Birtles, 1997). This life-cycle analysis and environmental impact assessment would provide the information to establish whether the (re)development proposal meets the sustainability requirement. This would be done by benchmarking the impact against a number of indicators to establish what effect the (re)development has on the downloading of costs and index of sustainability associated with such measurements (Mitchell *et al*., 1995; May *et al*., 1997; Curwell *et al*., 1999; Ding, 2005; Danman and Elle, 2006).
- Such a schedule of costing would provide information for the valuation and appraisal of the initial capital and subsequent revenue expenditures in terms of outgoings associated with the energy-saving technologies of clean air. The effect of this on occupational demand for land uses and building programmes and demand for property due to its value as an investment opportunity, could also be analysed.
- The with/without logic of comparative analysis could also be drawn upon to establish not so much the potential but real effects of introducing such technologies. This would identify what value the market puts on such technologies: that is, what price both users and investors are willing to pay for the income benefits of a structure that does not download costs into the future. It would also demonstrate the cost of not taking such a course of action, something which could be measured in terms of the different present values of those properties with and without the technologies in question. While this does

not account for the spillover or external costs/benefits associated with such a course of action it ought to be possible to satisfy this by some non-standard form of hedonic or contingency exercise (in this instance forming the basis of a life-cycle analysis and environmental impact assessment) geared towards a willingness to accept the inter-generational loading in question. The effect this form of valuation has on the appraisal of investments (combining, as it does, both market and environmental criteria) would also need to be placed under examination (Deakin *et al*., 2002);

- RFR + r* gives an indication of the parameters – that is, upper and lower levels of the discount rate, r, or initial yield K – whereas g provides an indication of anticipated growth. The significance of this is that both variables are linked into the capital markets of the economy and provide the opportunity to estimate the effect any change in the relationship between O_i and r will have not just upon the time horizons and spatial configuration of land use and building programmes (for example, the income benefits of longer time horizons, more compact spatial configurations, lower risk, greater growth and cost savings) but in terms of the reduced rates of obsolescence and depreciation brought about by the introduction of experimental designs aimed at energy-saving, clean-air technologies. The same is true for equation (2), but here the effect also extends into D and B.
- Here again, the cost of introducing such new technologies into the (re)development of land uses and building programmes could be analysed to establish at what point the income benefits become efficient in economic terms and socially equitable from the environmental point of view. Such an analysis would be in accordance with the policy towards longer-term time horizons and more compact spatial configurations for energy consumption in the use of land and buildings in the city (Breheny, 1992; Symes, 1997; Ding, 2005).

This list of considerations does not, of course, exhaust all the issues in question; it merely sets out a framework for analysis that makes it possible to circumvent many of the criticisms made about the discounting principle. This is the principle that underlies the NAR model of valuation and investment appraisal, in its representation of the time horizons and spatial configuration of land use, building obsolescence and depreciation; this being of particular concern to those with an interest in life-cycle analysis and environmental impact assessment.

What this adjusted NAR-type model does is turn around the principle of 'the polluter pays' by introducing the means by which those agents of change in the market (i.e., designers, engineers, contractors, planners, etc.) can undertake the life-cycle analysis and environmental impact assessments that *not only value – in*

market, bio-physical and ecological terms – the economic efficiency and social equity of such contributions to the marginal productivity of capital but compensate them with a rate of return which is seen as fair and just from the environmental point of view. Without this and what is in effect an environmentally friendly, green pricing mechanism, it would not be possible to overcome the legacy of market failure in dealing with the environment and link the means with the ends: that is, the market basis of the valuation and investment appraisal underlying the adjusted NAR model with the time horizons and spatial configurations of environmentally friendly, green technologies for land use and building programmes. That is, *show 'how it pays'*, in terms of the market and environment, to introduce energy-saving technologies with lower carbon-based emissions. Without this link it would not be possible to demonstrate the range of opportunities open for the state to finance experiments of this kind and show *the real value* such land uses and building programmes offer the public, not only for a form of environmental conservation (be it in terms of energy or natural capital consumption) capable of sustaining economic growth but for an enhanced quality of life.

CONCLUSIONS

This chapter has examined the critique of the discounting principle environmentalists have made in relation to valuation investment appraisal and its application in the income-based NAR model of land use time horizons and the spatial configuration of building programmes. In particular, it has looked at the link made between the selection of a discount rate, the valuation, appraisal of investments and the inter-generational downloading of costs associated with the use of land, repair, maintenance and refurbishment of buildings. In examining this debate, it has found the criticism wanting and sought to expose some of the contradictions within the argument that it is this downloading of cost which works against the introduction of experimental designs aimed at environmentally friendly, green land uses, and building programmes in particular. In doing so, the chapter has also sought to demonstrate that the connection made between discounting, valuation, appraisal of investment and downloading of costs is tenuous and open to question.

In addition to this, it is hoped the chapter provides a means to strengthen the relationship between life-cycle analysis, environmental impact assessment, valuation and appraisal in the context of previous discussions of such matters. With this in mind, it has sought to allay any fears those responsible for valuations and investment appraisals might have about using NAR-type models. It has done this by focusing attention on the positive contribution market-based valuations and investment appraisals can make to life-cycle analysis and environmental impact assessment. This

is an important point because given the undue criticism they have attracted, there is some doubt about the utility of such models, which has led to the switch of attention away from NAR-type models of market valuation and investment appraisal towards life-cycle analysis and environmental impact assessments. This in itself is questionable because it has left a gap between the market and environment.

NOTE

1 This is a revised version of a paper that appeared in Deakin (2004) under the title 'Valuation, Investment Appraisal, Discounting, Obsolescence and Depreciation: Their Impact on the Urban Environment'.

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8

Documentation, Assessment and Labelling of Building Quality

The German 'Building Passport' Issue

Andreas Blum

INTRODUCTION

The Leibniz-Institute of Ecological and Regional Development (IOER) is a non-profit research institute that is active in the areas of documentation, evaluation and communication of environmental properties of buildings. Two of the key terms in this context are 'environmental labelling for buildings' and 'building passport'. The term 'building passport' is currently being used with differing meanings. The political debate in general tends to promote private building passport schemes and services as a voluntary measure, very supportive of high-quality *construction*. It may denote a two-page certificate displaying the most important performance characteristics and technological data of a building – comparable with motor-vehicle documents – as well as a comprehensive collection of various building-related documents (plans, calculations, lists and declarations of materials and products for regulating the *operation and use* of buildings).

In this context, the German federal state of Schleswig-Holstein commissioned the IOER to develop the basic structure for a 'building passport' scheme. The main target of the project was to outline an instrument which would render information on building quality in general, as well as open up a perspective on environmental characteristics and performance criteria. The instrument was supposed to provide guidance for user groups (architects, planners, clients, owners, tenants, financiers), and thereby support appropriate decision-making and provide the basis to enhance the competitiveness of such environmental performance measures.

This chapter presents an overview of the German debate and state of the art, with respect to building passport schemes and a selection of existing examples (first section), along with the results of the 'Building Passport Schleswig-Holstein' project (second section). Although all of the presented schemes include multi-criteria analysis modules as the basis of assessment, their purpose and relevance reach beyond assessment. It is to this end that – beside briefly introducing the scope of assessment criteria and evaluation approach for different schemes – the main focus of this chapter

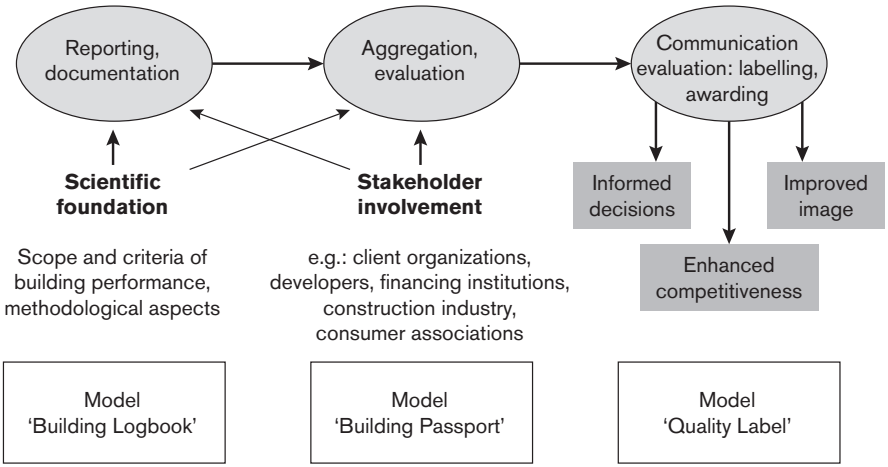
is to put into a wider context the discussion of building passport schemes as a means of public as well as private (market) *communication* about building quality.

'BUILDING PASSPORT': DEBATE AND EXAMPLES

Debate

The term 'passport' for building information schemes was used before the approach became more widely discussed in Germany in the context of the elaboration of the German 'Energy-Saving Ordinance' (*Energieeinsparverordnung*; EnEV).[1] This regulation replaced the former 'Thermal-Insulation Ordinance' (*Wärmeschutz-verordnung*), which was enacted in 2002. According to EnEV, an 'energy-passport' has to be issued for new or substantially changed (e.g., renovated or modernized) buildings, recording the results of standardized energy-demand calculations for the building.

In advance of this ordinance, an initiative from the Construction Committee of the German Federal Parliament had also discussed options to extend the scope of the envisaged passport into a general building passport, which also displays information about other *(environmental) quality and sustainability-related issues* that go beyond energy consumption. Commenting on this option appraisal, the then Federal Minister for Construction (and until 2006 executive director of the United Nations Environment Programme), Klaus Töpfer, recommended



8.1 The main pillars of a building passport approach to building quality communication
Source: Translated from Blum *et al.* (2001)

> the establishment and use of a building passport on a voluntary basis. Such a passport should enhance transparency of technical properties, standards of building services, quality of use and operation costs of buildings for clients and buyers of new property but also for tenants, developers and real estate agents. It should communicate comprehensive and in particular comparable information.
>
> (Töpfer, 1997: 603)

The idea of a building passport is often substantiated by reference to much less expensive and enduring commodities, like cars or electrical devices, that are often sold with much more comprehensive technical information than buildings. From the point of view of market communication, the building passport approach can be seen as a third-party statement on quality in a market environment characterized by risk and uncertainty. For a while, building passport and labelling approaches were widely considered worthwhile (Blum and Christoph, 1999). However, public/political actors in Germany were cautious and reluctant to engage formally with the initiative, especially to the extent to which building passports include assessments and evaluations. One of the reasons certainly was that public actors where cautious about intervening in the market and getting involved in arguments with the construction sector about the sustainability of buildings or different construction materials.

Against this background, the 'Building Passport Working Group' was set up, led by the chairman of the Environmental Committee of the Federal Association of Medium-Sized Enterprises (Bundesverband mittelständische Wirtschaft). The working group provided the collaborative platform for consensus-building and cooperation between construction experts, entrepreneurs, researchers and consultants. The main aim of the group was to draft a common convention for existing building passport schemes, making their results comparable and ensuring procedural standards. A related development was the 'Building Passport and Coaching Saxon House' scheme (Dyck, 2000). This scheme was explicitly intended to ensure and certify high-quality construction as a means of enhancing competitiveness.

Parallel and partly linked with these activities, the *Guideline Sustainable Building* (BMVBW, 2001a) was prepared and published by the Federal Building Ministry as an internal means to support the planning and management of federal public buildings.[2] This guideline also includes a building passport scheme. Based on this, the *Building Folder* for new single-family homes was designed (BMVBW, 2001b). The folder provides a filing structure for building-related documents, such as descriptions, plans, technical information and maintenance manuals. It also includes a building passport scheme for documenting the main characteristics of the building. Besides the different private initiatives and schemes (see examples below), the

guideline and building folder can be regarded as the public state of the art in Germany concerning the building passport debate on national level.

Concerning the aforementioned EnEV energy passport, the current major challenge relates to the development of a scheme for (refurbished) existing buildings. Field studies carried out in 2004 produced a pilot version of the scheme. This comprises an energy efficiency label on the front page, providing information about:

- energy losses and CO_2 emissions for tenants and owners;
- a section for the documentation of consumption figures;
- enhancement and/or refurbishment recommendations based on the outcomes of the aforesaid information and explanations for experts setting out possible courses of action; and
- a list of attachments for additional information.

A final version of this scheme was announced in 2006 that addresses many of the issues set out in the European 'Directive on the Energy Performance of Buildings' (Directive 2002/91/EC). Furthermore, taking into account that the European 'Urban Thematic Strategy' (COM(2005)718) demands the 'development of methods to assess the integrated environmental performance of buildings (beyond energy efficiency)', the building passport debate is certainly something that has not yet come to an end. At the same time, there is still a great (and growing) number and variety of private building passport schemes in Germany. The most widely known examples are introduced in the following section.

Examples

ImmoPass

ImmoPass is a checklist, documentation-structure and assessment approach for sustainable building features/qualities, edited and maintained by DEKRA Umwelt GmbH on the initiative of HypoVereinsbank, Germany.[3] DEKRA is a group of enterprises offering technical inspection, assessment, consultancy and certification in different fields of engineering (DEKRA Umwelt being the environmental branch of DEKRA). HypoVereinsbank is one of the largest German real-estate financing institutions.

The target groups of ImmoPass are:

- clients: through *communication* with architects and buyers/users, briefing/definition of qualities, certification, comparison, evaluation of competitions;
- architects: via *briefing*, design, control, certification;

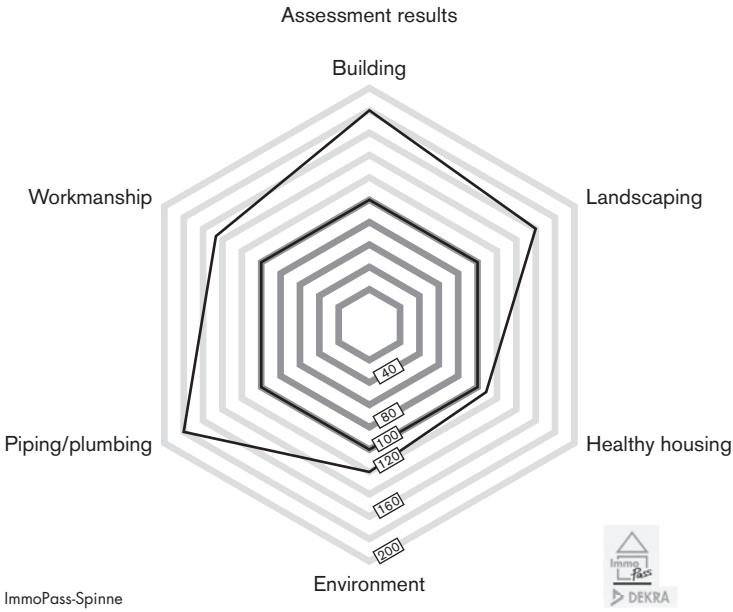
- real-estate investors: via *identification/definition* of quality(targets), dialogue/communication, certification; and
- building administration: through definition of qualities (e.g., for granting of subsidies), evaluation of competition, best-practice labelling, certification.

ImmoPass targets sustainability issues, claiming to have a 'holistic approach', combining healthy housing, energy savings, good-quality and environmentally friendly building. In short, it can be described as a communication tool for use during the design phase and as an assessment and certification instrument for deployment, both during construction and after completion of the building. It is available for new and existing buildings. DEKRA claims that ImmoPass is suitable for all types of buildings.

The six topics of certification are the building (conception), open/green space, healthy housing, environment, building services (water, heating, etc.) and building quality after completion. The issues/criteria tackled are:

- economy: cost-optimum for the realization of the need for a building looking at the whole life-cycle (building, use, maintenance (life-cycle of building elements), refurbishment, dismantling/demolition and disposal);
- ecology: energy, recycling, minimization of land use, avoiding damages in buildings, avoiding toxic substances (indoor and outdoor); and
- social: user-friendly, affordable housing, users' participation in planning and maintenance, integration of housing, work, culture, supply, recreation, health characteristics.

The ImmoPass approach of assessment has two phases: a *planning check* with feedback on the basis of plans and conceptions (list of intended/used materials, planned insulation, ventilation, noise protection, colouring/design) and three *quality audits on the building site*, including a final analysis of indoor climate (measurement of possible harmful/toxic substances). The assessment follows a credit scheme with more than eighty pass/fail criteria with one credit each. To receive certification ('building passport'), a minimum number of credits have to be achieved for the six checked topics. Calculation methods and measurements follow legal requirements (as per the existing Energy Saving Ordinance) or the instrument's own specifications (for example, target values concerning indoor air quality). The results are presented as a detailed report listing all criteria, the reports of the quality audits on site and a spider's web results chart (see Figure 8.2). The spider's web results chart presents the percentage of credits assigned, relative to the minimum for each of the six topics, and thereby gives a quick assessment of overall building performance. ImmoPass can be considered the most comprehensive and commonly used tool for assessing the sustainability of buildings in Germany.



8.2 The ImmoPass spider's web results chart compares actual building performance with the 100 per cent benchmark defined within the scheme
Source: Translated from DEKRA (2000)

Guideline and building passport Sustainable Building

The *Guideline Sustainable Building* is a mandatory planning and management tool for federal public (office) buildings, and contains, among other things, a planning checklist and a 'building passport'.[4]

The scope of the guideline, checklist and passport is a notion of sustainability that has the minimization of energy and resource consumption at its core. All phases of the life-cycle of buildings are considered – from their planning and construction through to their operation, use, renovation and eventual demolition (the assessments as a rule cover a period of 100 years). The guideline should also help to minimize any possible damage to the natural environment. It serves to emphasize that the early implementation of sustainable planning measures can considerably improve the economic efficiency of buildings, not only in terms of the costs of construction, operation, use, environment, health, but with respect to non-monetary values.

Generally speaking the guideline sets out to:

- decrease the energy demand and the consumption of operating materials;
- reuse or recycle building products and materials;

- extend the lifetime of products and buildings;
- promote the risk-free return of materials to the natural cycle; and
- protect natural areas and promote land-saving construction.

For assessment purposes, more detailed criteria are suggested for the ecological, economic and social spheres of the sustainability concept. The assessments are qualitative/descriptive or quantitative, with respect to given target values. For the assessment procedure, it is suggested to distinguish the different design phases. In the early design phases (competitions, etc.), the necessary input data for a quantified assessment are not yet fully available. This means that a qualitative procedure should be used for the initial assessment ('preliminary assessment'). As the design process becomes more specific, this should be turned into a quantitative assessment ('in-depth assessment'). For the handling of the huge amount of data the exercise generates, the assessment manual recommends the use of computer-based calculation tools for quantitative assessments. All criteria given in the guideline are to be considered separately and provided for the ecological, economic and socio-cultural issues. The results of the separate assessments are combined into a synoptic table (see Figure 8.3).

The completed synoptic table gives a first impression of the sustainability performance of the building (e.g., estimation of energy and material flows, cost categories and socio-cultural impacts). Behind this, the comprehensive documentation of building-related information and documents ('building passport') are kept available (and up to date!) for future use; for example, during the use of the building or future changes or refurbishment measures.

Beside its practical use, the guideline is of political relevance by offering a set of officially adopted principles and issues concerning sustainable building (assessment), and may be regarded as a starting point for a widely acceptable consensus on such matters.

The 'Green House-Number'

The 'Green House-Number' is a public award, maintained by the Ministry of the Environment of the German federal state of Saar (Saarland).[5] It is awarded to environmentally conscious homeowners. Its scope encompasses building ecology, indoor air quality and, in part, the behaviour of the inhabitants (e.g., use of energy and water). The award means a rise of social recognition for the awarded households and helps to communicate good examples. Besides this, it provides a little handbook that serves as a guideline on ecological building for the interested public. The requirements that have to be fulfilled to obtain the award are, in general, reaching beyond existing legal standards. The procedure follows a detailed scorecard that is applied

Guideline for Sustainable Building

Appendix 6:
Assessment of the Sustainability of Buildings and Landholdings

Assessment criteria		Guideline value	Design value	Assessments		
				Single criteria		
				qualitative	quantitative	complex of criteria
1.	**Realization of building requirement (analysis of building requirement)**					
1.1	Building requirement	Appendix 2				
1.2	Continuing use of existing buildings	Appendix 2				
2.	**Protective use of building land and natural resources**					
2.1	Use/conversion of derelict industrial land/military facilities/gaps in built areas	Appendix 2				
2.2	Surface sealing	Appendix 5				
2.3	Area required for transport installations	Appendix 2+5				
2.4	Use of excavated soil within the landholding (mass balance)	Appendix 2				
2.5	Integration into the urban environment or into the					

8.3 First page of the synoptic table listing the results of the preliminary assessment
Source: Extract from BMVBW (2001a)

in the form of a self-assessment. Here forty-seven ecological items are assessed according to a catalogue of credits that encompasses environmentally friendly building materials, energy efficiency, water consumption and natural environment. The results have to be underpinned by respective documents, photographs, etc., and are reviewed by the maintaining authority. A score of at least 100 credits is required to obtain the award (out of a maximum of about 400 credits).

An interesting feature of the instrument is its procedure of criteria definition and setting the benchmark performance targets. The criteria, credits and weightings for the first edition of the scheme emerged from a series of workshops and round-table discussions involving interested parties and stakeholders. It provides a good example of an instrument that seeks to gain transparency and social validity through public participation. One problem of the approach may be seen in the implicit existing

orientation towards the stand-alone single-family home, which itself may be regarded as principally incompatible with sustainability objectives.

The 'LGA Building Passport'

The 'LGA Building Passport' is a certified documentation of selected characteristics of buildings provided by the semi-public Bavarian business association (Landesgewerbeanstalt; LGA Bayern).[6] As an impartial third-party service, it seeks to support transparency and mutual reliance in the construction market. This building passport first of all certifies general building quality but also addresses ecological features. It works as a tool for marketing of advanced building quality. The basis of this assessment is a detailed description of the building project and the certification of a maximum of fourteen issues, called 'modules'. These relate to the:

- contamination of the construction site (e.g., in the case of brownfield developments);
- ground conditions;
- foundations;
- **building materials**;
- **mechanical resistance and stability**;
- **thermal insulation/energy efficiency**;
- **fire protection**;
- noise protection;
- water supply/wastewater disposal;
- building services;
- renewable energy;
- indoor air quality;
- electromagnetic risk; and
- integration into the natural environment.

The modular design reflects a typical pragmatic approach, whereby an extensive set of criteria is to be balanced with usually restricted economic resources. The applicant for certification may partly decide on the scope of assessment. For certification, the assessment of a minimum of four mandatory 'basic modules' (above in bold) and at least two more 'additional modules' is required. To ensure transparency the certificate issued at the end shows a comprehensive table listing all possible certification issues while results are given only for those assessed.

For certification, the results of the assessment have to meet legal as well as specific LGA standards. While the approach does not claim to represent the future of sustainable building, it is nevertheless interesting for immediate action.

Construction practice and especially building damage statistics show that even the certification of compliance with existing standards and regulations is a valuable target on its own. As it was pinpointed by a speaker about legal issues at a conference on building certification, '*quality assurance in construction in Germany increasingly is done before the court*'. LGA offers the possibility to complement contractual agreements, dealing with instances where construction practice deviates from common standards or usual practice. Such solutions may especially be chosen in the case of innovative ecological technologies, where no long-standing experience exists. In these cases the agreements help to strengthen mutual assurance and confidence among the partners within the planning and building process.

THE 'BUILDING PASSPORT SCHLESWIG-HOLSTEIN' FRAMEWORK

Context and foundations

The 'Building Passport Schleswig-Holstein' project had the overall aim of integrating existing practical experience and theoretical considerations into a framework for further development. The project was carried out in three stages: inventory of the existing specific context and possible 'anchor-points' in Schleswig-Holstein; identification and definition of the aims and requirements of the political players and interest groups in the building and construction industry; and, finally, the drafting of the basic conception and of an implementation scheme.

Existing approaches and 'anchor-points'

The political and economic conditions in Germany, especially with the Energy Saving Ordinance and the implementation of the European directive on the energy performance of buildings, provide a good starting point for the development and implementation of a building passport scheme. Schleswig-Holstein had committed to a 'Low Energy Standard for Buildings' ('Niedrigenergie-Haus-Standard'; NEH-Standard), included in the public guidelines for subsidized housing, long before the EnEV and measures in the 'Initiative Programme for Thermal Refurbishment' ('Impulsprogramm wärmetechnische Sanierung') attempt at supplying information as a precondition for environmentally responsible action.

The 'Criteria for Ecological Building' published by the Ministry for Nature and the Environment of the federal state of Schleswig-Holstein as far back as 1993 (Minister . . ., 1993) is also particularly noteworthy. Irrespective of the degree to which some of the criteria had to be revised (in the area of energy requirements, for instance), the content of the brochure, on the whole, reflects a public consensus at

a given time, and thus provided an excellent starting point for the conception of a building passport.

Requirements and expectations

In order to achieve a high level of acceptability, communication with the interest groups formed a large part of the project work. Representatives in Schleswig-Holstein were interviewed by telephone and questioned on their opinions about the issues underlying the development of the building passport. Additional information came from a nationwide study conducted earlier (Blum and Christoph, 1999). The results of the survey were presented as feedback to the participants at a workshop with the aim of focusing discussion on major topics. The following issues were identified as essential for the passport: *quality assurance* as a main focus; the *simplicity* of the tool with regard to *readability/comprehensibility*; and orientation on the *information for the end user*. The necessity for continuous updating and amendments was also discussed. The topics of building materials choice (ecological aspects and health issues) and energy were stressed by all concerned as being the most important issues.

With the aim of defining the principal objectives of the political players involved, four different general scenarios for building passport concepts were presented for discussion. These were titled 'Good Construction Practice/Assurance of Quality' (main focus: traditional qualities in building and construction as a precondition for ecological orientation); 'Ecological Performance through Competition' (main focus: widespread implementation and transparency of ecological good practice); 'Ecological Excellence' (main focus in environmental policy: promoting innovation; better practice); and 'Foot in the Door' (a combination of low level tools – e.g., energy passport – and long-term implementation).

Against this background, the discussions culminated in the decision to use a combination of scenarios one and two as the primary orientation, with the main target being assurance of quality. For the implementation of the tool it was suggested that the 'protected sphere' of semi-public intermediary organizations be used. This suggestion referred in particular to the Working Group of Contemporary Construction (Arbeitsgemeinschaft zeitgemäßes Bauen e.V./ARGE) in Schleswig-Holstein. ARGE was established in 1946 to organize emergency programmes and self-help programmes in post-war housing, and today it is still a very interesting institution, both politically and professionally. Almost all important institutions in the building and construction industry and housing development sector are represented by this association. It is valuable in this instance because it provides a link between private economy and public players, and connects them in the development and implementation of a building passport for Schleswig-Holstein.

Basic models

As a starting point for the design of the 'Building Passport Schleswig-Holstein', the *three typical models* were referred to, which represent the basic components (and stages) of a comprehensive approach (see Figure 8.1 above). The basic model – 'building logbook' – does not include any assessment, but ensures a well structured and updated documentation of building-related documents and available data. In Germany such schemes may refer to the aforementioned *Building Folder*. The second model makes up the 'building passport' in a narrower sense. It aims at quality assurance and certification. Although the buildings are not explicitly assessed (in terms of best practice), widespread use of this model can lead to better market transparency. The third model – 'quality label' – formally puts into operation the objectives of the issuing institution. In the case of Schleswig-Holstein, it was intended that the instrument should serve to reward high-quality construction and outstanding voluntary and innovative achievements concerning environmental and health aspects of building projects. As well as being effective in marketing such buildings, it was felt such a high-profile status would also communicate best practice.

The basic conception of the 'Building Passport Schleswig-Holstein'

The developed framework starts with an integrated definition of quality.

Integrated definition of quality

In detail, the integrated definition of quality in the basic concept of the 'Building Passport Schleswig-Holstein' comprises the following core elements:

- *Building quality/quality of construction and planning*: current experience shows that building projects that strive to reach ambitious energy-saving targets require a sharpened awareness of quality and sensitivity to both strengths and weaknesses. Quality in this sense first of all denotes a *reduction in the risk of shortcomings in technical quality*, especially with regard to typical cases of building damage. The inclusion of other, notably aesthetic, issues was considered but not elaborated at this stage of the framework development. Consultancy during the planning stage, monitoring throughout the construction process and final inspection of the building are the main suggested elements of an appropriate process.
- *Environmental quality*: unlike problems of (technical) building quality, which at least can generally be dealt with objectively by means of technology and legal requirements, the definition of the environmental quality of a building heavily depends on a political (or, more general, social) consensus regarding

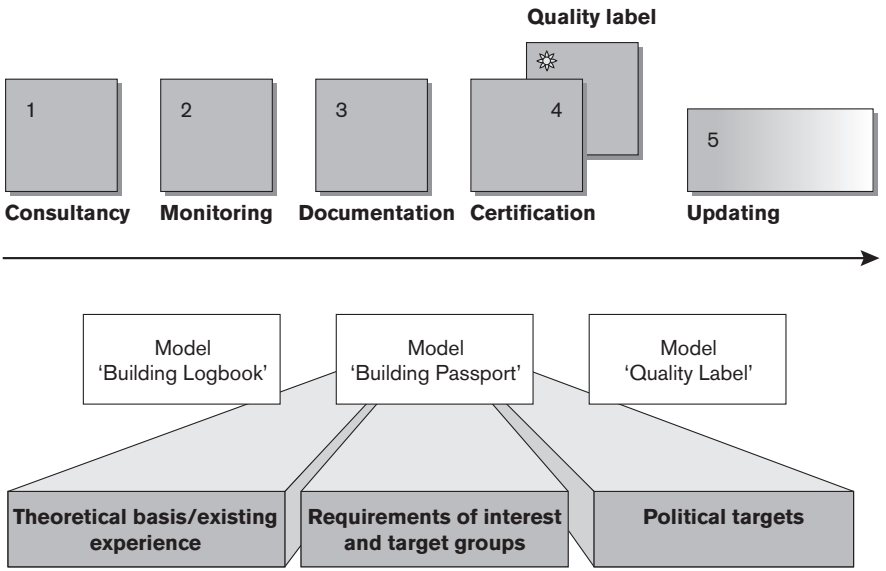
environmental aims and criteria. For this reason, the 'Criteria for Ecological Building' mentioned above was referred to in this project. The 'minimum standards' defined in this scheme provided a very good starting position for development of a basic conception for the building passport. By also listing possible voluntary 'further measures', the Criteria at the same time includes the option of development, if the 'further measures' of today are interpreted as the minimum standards of tomorrow.

- *Health-aware construction*: the assessment of the degree to which a building considers health issues within a building passport scheme is difficult for a number of reasons. In particular, this applies to the methodology of actual measurements and the references used in evaluation, due to the fact that well-being and health cannot be separated from individual user-specific requirements and sensitivities in which they are embedded. Therefore, an examination of the finished building, with regard to health-related issues by means of comprehensive screening of chemically, biologically and physically harmful substances in the course of the building passport assessments, did not appear appropriate.[7] It was also considered inappropriate to comply with the aim of keeping costs low. Individual estimation of health risks and their reduction to a minimum were therefore suggested to be handled beforehand by measures such as choice of location, careful planning, well-targeted choice of building materials and, in particular, a transparent documentation and declaration of materials used: for example, through product and material lists to be provided under the scheme. Monitoring for harmful substances should be restricted to cases of actual doubts and then be selective and well targeted.

Components of the basic conception of the building passport scheme

Based on the three general models and the integrated definition of quality, a concept was suggested that combines 'soft' pragmatic elements (checklists, consultancy) with actual requirements regarding priority target areas (airtightness, energy consumption, building materials, etc.).

In accordance with the general aim of supporting high-quality construction, this approach cannot be limited purely to documentation of the (eventually inadequate) status quo. Therefore, the drafted toolkit covers consultancy during the planning and monitoring stage of the construction process and before entering the phases of documentation, certification and updating. It is important that the approach is not centred on control and the imposition of 'correct' solutions, but rather on cooperation according to the principle that 'two heads are better than one'. The basis for this cooperation is the approach already described – promotion of high-quality construction not by means of stipulating desired characteristics of a building but rather



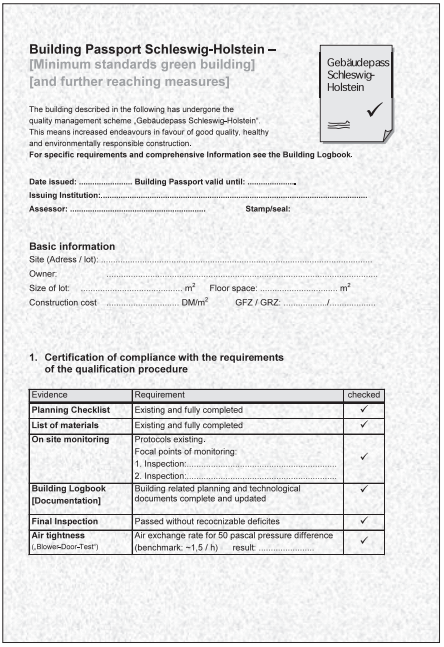
8.4 Basis, models integrated and core elements of the basic conception for the 'Building Passport Schleswig-Holstein' scheme
Source: Translated from Blum *et al.* (2001)

by creating a general awareness of quality issues and especially the risks of quality failure. Experience from external consultancy in the area of subsidized building in Schleswig-Holstein shows that when adopting this approach it becomes possible not only to qualify a project but – as a general rule – to save costs in the process.

Altogether, the basic concept for the 'Building Passport Schleswig-Holstein', outlined as a basis for further discussion and development, contains five main components (Figure 8.4).

Assessment and labelling

With respect to assessment – documentation and evaluation of building properties – and labelling for the 'Building Passport Schleswig-Holstein', three levels of certification were suggested. On the basic level, the completed building passport (see Figure 8.5) certifies compliance with the procedural elements of the overall scheme and some basic facts about the building, such as: the results of the construction site monitoring; the 'blower-door test' following completion of the building (test for airtightness of the construction); an energy-demand calculation carried out in accordance with German regulations; and a documentation of the construction materials used. In short, the first level of the 'Building Passport Schleswig-Holstein' can be considered as a certification of the adoption of a quality management scheme.



Building Passport Schleswig-Holstein –
[Minimum standards green building]
[and further reaching measures]

Gebäudepass Schleswig-Holstein

The building described in the following has undergone the quality management scheme „Gebäudepass Schleswig-Holstein". This means increased endeavours in favour of good quality, healthy and environmentally responsible construction.
For specific requirements and comprehensive Information see the Building Logbook.

Date issued: ..... **Building Passport valid until:** .....
Issuing Institution: .....
Assessor: ..... **Stamp/seal:**

Basic information
Site (Adress / lot): .....
Owner: .....
Size of lot: ..... m² Floor space: ..... m²
Construction cost ..... DM/m² GFZ / GRZ: ...../.....

1. Certification of compliance with the requirements of the qualification procedure

Evidence	Requirement	checked
Planning Checklist	Existing and fully completed	✓
List of materials	Existing and fully completed	✓
On site monitoring	Protocols existing. Focal points of monitoring: 1. Inspection: ..... 2. Inspection:	✓
Building Logbook [Documentation]	Building related planning and technological documents complete and updated	✓
Final Inspection	Passed without recognizable deficites	✓
Air tightness („Blower-Door-Test")	Air exchange rate for 50 pascal pressure difference (benchmark: ~1,5 / h) result:	✓

2. Charakteristika und Kennwerte

Nachweis	Kennwerte
Minimum standards green building	☐ fully ☑ mostly ☐ partly complied to (see „Planning Checklist")
Implementation of „further reaching measures"	Description .....
„Energy passport" within the building passport	Heating energy demand ..... kWh/a Final energy index ((Energy source 1)) ..... kWh/m²a Final energy index ((Energy source 2)) ..... kWh/m²a Final energy index ((Energy source n)) ..... kWh/m²a Primary energy index ..... kWh/m²a Emission index CO_2-equivalent ..... kg/m² a
„Material passport" within the building passport	Minerals ..... kg total / ..... kg/m²a Cement/brick ..... kg total / ..... kg/m²a Metals ..... kg total / ..... kg/m²a Glass ..... kg total / ..... kg/m²a Plastics ..... kg total / ..... kg/m²a renewable materials ..... kg total / ..... kg/m²a Total material input ..... kg total / ..... kg/m²a Share of recycled materials ..... kg ..... % ..... kg/m²a
Land use	Land use-factor (building and related infrastructure): ..... Covered / sealed land per m² floorspace .....

Energy consumption label

Remarks
.....
.....
.....
.....

Updating	**Dates (to be) updated (see building logbook):**		
(The validity of the building passport is expires on the date of the next recommended updating)	1. [4 years after issuing]	5.	9. .....
	2. [Intervals e.g. 10 years]	6.	10. .....
	3.	7.	11. .....
	4.	8.	12. .....

8.5 The actual building passport within the 'Building Passport Schleswig-Holstein' scheme
Source: Translated from Blum *et al.* (2001)

An important tool on this first level is the planning checklist, which provides comprehensive recommendations for good-quality, environmentally friendly and healthy buildings and supports the negotiation of quality features on the design consultancy stage. The completion of this checklist document for each of the defined targets details the way in which certain recommendations have been implemented; or, if not, why not. The checklist is structured along seven target areas (Planning, Construction-site management, Energy, Construction materials, Water, Waste and Landscaping), which are subdivided into a total of thirty targets with different practical recommendations for each. Since the developed scheme was on the level of a basic conception, no weightings were yet suggested for the target areas. According to the understanding of the authors, weightings have to be defined in a political consensus among the different stakeholders involved in the assessment. Reaching this consensus – most likely in a participatory process – is part of the implementation of the scheme.

The second level, 'Building Passport Schleswig-Holstein – Minimum standards of green building', is reached if the building fully complies with the above-mentioned minimum standards of the Schleswig-Holstein criteria for ecological planning and

building (in short: minimum standards of green building). The minimum standards of green building are partly qualitative with pass/fail criteria in the listed target areas, and reflect a public consensus defined among different public and private stakeholders at a given time. Examples are: stormwater seepage or utilization, no electric heating devices, planning according to passive solar energy use requirements, heating system prepared for a future junction with heat production systems that utilize renewable sources (e.g., solar), waste separation facilities provided, no use of construction materials with harmful potentials, locally adapted landscaping, an environmental officer appointed for the construction site, etc.

The third level, 'Building Passport Schleswig-Holstein – Minimum standards of green building and further measures', is reached if, in addition to the 'minimum standards', best-practice measures are volunteered for implementation. For labelling purposes, these are described qualitatively in the building passport documents.

The general idea behind the three levels of certification – and to a certain extent labelling through the building passport – is to support widespread implementation of the scheme and thus to raise awareness (first level/'foot in the door') and to reward best practice (third level/'ecological excellence').

Suggestions for implementation and outlook

For further development and later implementation and use of the 'Building Passport Schleswig-Holstein', it was suggested that a building passport working group be established by the Ministry of the Interior, in which all relevant ministries and important (semi-)public institutions of the building and construction industry in Schleswig-Holstein could be represented. The working group (or steering committee) could further involve the specialized public by means of an additional extended advisory board, where private organizations dealing with certification are also represented. With regard to an organizational basis, it was suggested that the Working Group of Contemporary Construction (see above) would be a suitable fourth-party organization, supervising the implementation of the scheme, accrediting certifiers, etc. ('the building passport agency').

With the aim of achieving the widest level of acceptability, a basic concept for a building passport was developed as a first step. Development of a committed tool was considered to require a significantly longer period of development, and indeed would have endangered the success of the project as conceived here at the early stage. Conflicting interests (e.g., expenditure and demands regarding a comprehensive scope) were discernible during discussions with the player groups. It was therefore suggested that the outlined basic concept should in the future be developed first into a *pilot model* that can be tested in a *pilot phase*, and subsequently be managed by the 'building passport agency'. The 'protected sphere' of subsidized

public housing projects was envisaged to be an appropriate starting point for the pilot application.

In addition to this, as a result of the project, it was suggested to implement the above in the form of a 'Guideline for Sustainable Building', also to be used for assessing buildings belonging to the federal state of Schleswig-Holstein. This meant that, accompanying the building passport process, a system of environmental and quality management would have to be set up for public buildings. This would not only incur positive environmental (and economic!) effects but *provide a good public example* to support the implementation of the general toolkit 'Building Passport Schleswig-Holstein'.

Regrettably, although the results of the project were highly appreciated by all public and private stakeholders, the 'Building Passport Schleswig-Holstein' scheme still has not been implemented as intended. Looking back, the fourth development and implementation scenario ('foot in the door') has proven to be the most realistic. Nevertheless, the recently amended regulations for the Schleswig-Holstein Urban Development Subsidies Programme (Innenministerium . . ., 2005) require 'the use of approaches for the labelling of certified quality in building and construction (e.g., Building Passport, Energy Passport), as far as possible'. Obviously the last phrase leaves scope for interpretation; so, as in other sustainability-related fields of action, more patience is needed.

NOTES

1 For example the great variety of 'Thermal Passport Schemes' in Germany often linked to municipal CO_2 minimization programmes and subsidies. Well-known examples are the schemes of the cities of Heidelberg and Hamburg.

2 The *Guideline Sustainable Building* can be downloaded in English from: www.bbr.bund.de/bauwesen/nachhaltigbauen/download/leitfaden_engl.pdf.

3 General information on the DEKRA-ImmoPass (in German) available at: www.dekra-immopass.de.

4 Parts of the description closely follow passages from the original document (BMVBW, 2001a).

5 General information on the Green House-Number (in German) available at: www.umwelt.saarland.de/1809.htm.

6 General information on the LGA Building Passport (in German) available at: http://lga.de/de/bautechnik/bautechnik_gebaeudepass.shtml.

7 This differs when the building passport procedure deals with existing buildings. Although compiling an inventory of the used building materials often proves to be difficult, at least a screening is necessary where harmful substances are suspected in order to record the extent of the contamination qualitatively and quantitatively and to undertake appropriate

steps in refurbishment. By the way, this is one additional strong argument in favour of a comprehensive building passport approach: to reduce the need of inventories in the case of future refurbishment projects.

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Part II.iv

Advanced and Very Advanced Evaluations
of Neighbourhoods, Districts and Cities

9

The European HQE²R Sustainable Neighbourhood Assessment Toolkit

Case Study Experience

Andreas Blum, Marcus Grant and Antonella Grossi

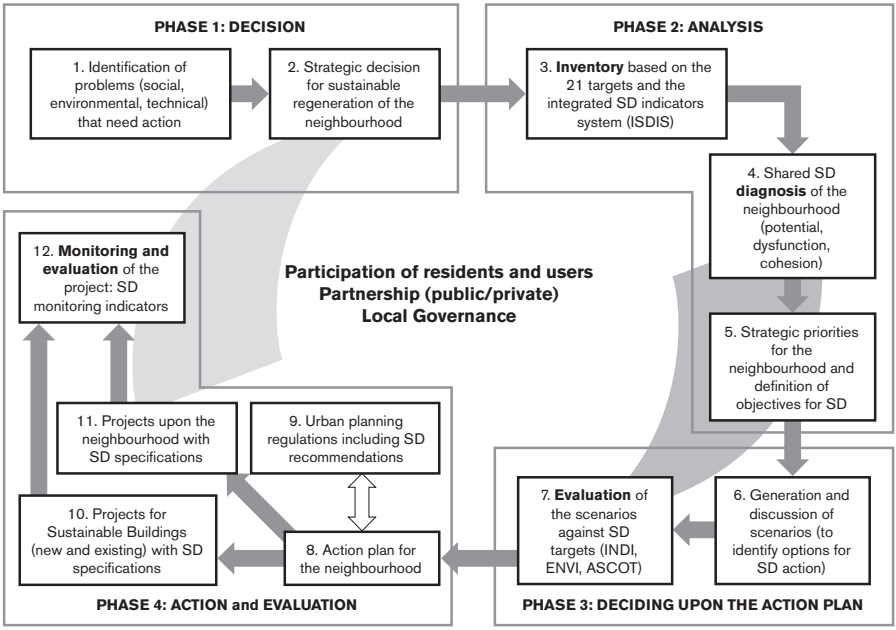
INTRODUCTION

The European project Sustainable Renovation of Buildings for Sustainable Neighbourhoods[1] combined research by ten European partners within fourteen municipal case studies. The project's objective was to develop a new methodology with the necessary tools to promote sustainable development and quality of life at the crucial and challenging level of urban neighbourhoods. At its core HQE²R provides a decision support toolkit[2] for municipalities and their local partners, putting special emphasis on the aims of inhabitants and users of neighbourhoods. In its integrated approach, based on contributions from different national contexts, it is meant to be a framework generally applicable in Europe. The European partner municipalities of the project participated, on the one hand, to support the development of selected neighbourhoods towards sustainability. On the other hand, this opened up the opportunity for testing the methodology in different contexts and under different conditions.

This chapter[3] briefly introduces the core elements of the HQE²R toolkit that was developed, and reflects experience made during the pilot applications in different partner neighbourhoods.

THE HQE²R TOOLKIT

In general, HQE²R provides a methodological framework and basic decision aid tools (Figure 9.1) for municipalities and their local partners (such as public administration, social owners, city planners, residents, users, local economy, etc.) to support them towards the sustainable regeneration of their cities and an improved quality of life. At its core is the assessment of different development paths for neighbourhoods (scenarios) against the prevailing situation and defined sustainable development targets. Thereby, the term 'assessment' encompasses the three stages of *inventory, diagnosis and evaluation* (Antonini *et al*., 2002; Blum and Grant, 2005). A crucial principle of the approach is to encourage and support participation of all the involved or concerned parties from the beginning.



9.1 Scheme of the HQE²R approach, stages of and tools (ISDIS, INDI, ENVI and ASCOT) for assessment (inventory, diagnosis and evaluation/monitoring) for urban neighbourhood regeneration projects (SD: Sustainable Development)

Source: HQE²R project (http://hqe2r.cstb.fr)

After a general public and/or political perception of a need for action and relevant decisions, the process starts with an *inventory* that analyses the starting situation using a wide scope. This inventory must concern all the fields of sustainable development (economy, social and environment) and bring up items of information applicable to each of the global sustainable development objectives.

To support this step, HQE²R provides a framework crossing sustainable development objectives and targets with the defined neighbourhood elements. This cross-coverage leads to the drawing up of an analytical grid consisting of twenty major fields, as shown in Table 9.1.

The analysis grid came into action first during the inventory within the case-study neighbourhoods. Thereby, it was underpinned by the HQE²R 'Issues and Sustainable Development Indicators System' (ISDIS; Outrequin *et al.*, 2004), which encompasses fifty-one key issues and sixty-one indicators for sustainable neighbourhood development.

After finishing the inventory, the definition of what is essential in the neighbourhood is achieved by establishing a 'shared diagnosis'. The shared diagnosis –

Table 9.1 The HQE²R analytical grid for neighbourhoods: sustainable development objectives by spatial neighbourhood elements

	Residential space	*Non-residential space*	*Non-built space*	*Infrastructure*
Preserve Heritage and Resources				
Improve Quality of Local Environment				
Improve Diversity				
Improve Integration				
Reinforce Social Life				

Twenty analytical fields as a shared guiding framework for inventory and diagnosis and basis of the specific works in the case-study areas.

Source: Charlot-Valdieu *et al.* (2003a)

combining users' needs and wishes, and the results of professional analysis – ensures the identification of issues (energy consumption, healthy housing, social services, networks, local economic development, etc.) meaningful for the further development of the neighbourhood. It presents the strong and weak points and is thus the basis to derive, to justify and to debate the proposals for actions or solutions with respect to the situation defined in the inventory. By definition, this is a cross-cutting, 'transversal' approach, encompassing all sectors and services of the city and of the built environment.

On completion of the phase of diagnosis, the local objectives of sustainable development are determined by defining the *priorities* for sustainable development of the neighbourhood. This is done at a given moment with regard to the positions and interests of the different local stakeholders, cross-checked with the global sustainability targets. Thus, the shared diagnosis ideally is understood as a means to organise the identified development issues and problems into a *hierarchy of actions* to be tackled in the short, medium or long term. This general consensus between the different actors forms the basis for the discussion of development scenarios and the drafting of action plans.

The last phase within the HQE²R process comprises the choice of sustainable development indicators for *evaluation*. This choice has to reflect the neighbourhood's specific sustainable development issues and objectives, but it is also supported by the above-mentioned set of pre-defined core indicators. Three evaluation models were developed: INDI (INDicator-based Impact assessment; Outrequin *et al.*, 2004), ENVI (ENVironmental Impact; Outrequin, 2004) and ASCOT (ASsessment tool for additional construction COsT in sustainable building renovation; Mørck, 2004). The evaluation indicators and models are first used for the assessment – more specifically an *ex-ante* evaluation – during the discussion of development scenarios.

EXPERIENCE FROM HQE²R PARTNER NEIGHBOURHOODS

Very different neighbourhoods were chosen to participate in the project. The idea was to develop and test the methodological framework and toolkit in a wide range of contexts and problems. This also included very different political and social situations with different settings, and involved actors and different challenges concerning participation. With respect to formal characteristics, the fourteen HQE²R case-study neighbourhoods were grouped into five types: inner city; inner city – historical centre; former suburbs; suburbs; and special areas to be rebuilt (Charlot-Valdieu *et al.*, 2003b). For the presentation of the neighbourhoods and the development projects, a comprehensive slide show was produced (Ancona *et al.*, 2004).

In the following sections selected examples are presented to reflect the range of experience with the pilot application of the HQE²R toolkit. The first example – the Mantova San Leonardo neighbourhood – stands for a regular implementation as intended. The second example – the Bristol Barton Hill ('Community at Heart') neighbourhood – is presented to reflect some principal challenges that may occur when implementing the methodology. Other examples highlight specific issues to illustrate the range of application potential of the toolkit.

Mantova – San Leonardo: a cross-cutting analysis[4]

The San Leonardo–Porta Mulina neighbourhood forms the northern part of Mantova old town, in the angle formed by the Lago di Mezzo (Middle Lake) and Lago Superiore (Upper Lake). The research partner was Istituto Cooperativo per l'Innovazione (ICIE, Bologna). The neighbourhood has slightly more than 2000 residents in an area of 0.236 square kilometres. Although many of the existing buildings have been modernised in recent years, the neighbourhood still includes many areas that are problematic and decayed, both physically and socially. At the time of the demonstration application of the HQE²R methodology, the Mantova Local Agenda 21 process had barely started, and thanks to the collaboration of the Public Administration and of the Forum, it was possible to coordinate and integrate the analysis and evaluation activities. This parallel experience was extremely fruitful and demonstrated the importance of interaction and synergy between work groups active on two different scales (neighbourhood and the city as a whole) to refine knowledge and 'vision' of the territory with a view to informed actions and decisions for sustainable regeneration.

The first phase of the application of the HQE²R method was the identification of the characteristics and principal critical aspects of the neighbourhood – social, environmental and technical – on the basis of the *general* knowledge provided by the municipal administration. This knowledge was brought by the research group to the HQE²R analysis grid. It was thus possible to get a first impression of the intersections between different elements of the built environment and the sustainable development

targets held – in this preliminary phase – to be critical or of great priority. Furthermore, in this phase, the level and phases of participation were determined and a decision was made for direct involvement of many sectors of the municipal administration (environment, public works, culture, social services, registry office), of representatives of the Local Agenda 21 Forum, of the operators of municipal technological services and of organisations interested or active in the neighbourhood (associations and the parish).

The analysis

The municipality initiated a meeting of all the stakeholders and described the aims and instruments of the demonstration project in such a way as to raise their awareness and motivate all of them to participate effectively right from the first stages of neighbourhood analysis. In this phase, thanks to the contribution made by the participants, further sustainable development issues that were *critical* or a *priority* for the neighbourhood were identified, with the result that the HQE²R analytical guidance grid was adapted, integrating the public administration's initial vision with that of the stakeholders involved. The sustainable development indicators of the HQE²R ISDIS system were supplemented by a set of specific local indicators proposed, discussed and agreed by all the stakeholders. All departments of the municipality were involved and the representatives of the Local Agenda 21 contributed to collection of information and data, ensuring a multi-disciplinary and 'shared' analysis of sustainability. The objective data were supplemented by the views and opinions of the neighbourhoods' inhabitants, collected by the research group in the course of interviews conducted by means of a 'walk through the neighbourhood'.

This 'inventory' phase made it possible to refine knowledge and show best and worst aspects of the neighbourhood, structured along the four spatial categories of the HQE²R analytical grid, and based on *objective* data and on the *qualitative* indications of the inhabitants and of the stakeholders involved. Specifically, it was possible to utilise the investigations and results of the Local Agenda 21 and compare the outcomes of the two scales of analysis in the diagnosis phase.

The diagnosis

All the participants in the process assessed the outcome of the inventory and, in an initial phase, formulated a summary reading of the characteristics of the quarter, specifying the *weak points*, the *strong points*, the *agreed priorities* and the *questions unresolved in this phase of the process*.

In a second step, the results were systematised by the work group into the analytical grid, using the same graphical summary instruments known from Local Agenda 21 (Table 9.2). This graphical presentation made it possible to communicate

Table 9.2 Mantova results presentation using the HQE²R analytical grid (detailed by targets)

Objective		*Target*	*Residential built space*		*Non-residential*		*Non-built space built space*		*Infrastructure*	
			structure	*use*	*structure*	*use*	*structure*	*use*	*structure*	*use*
To preserve and enhance heritage and conserve resources	1	To reduce energy consumption and improve energy management	☹	☹	☹	☹			☹	
	2	To improve water resource management and quality	☹	☹	☹	☹			☹	
	3	To avoid land consumption and improve land management								
	4	To reduce the consumption of materials and improve their management	☹		☹					
	5	To preserve and enhance the built and natural heritage	☹?1		☹?1		☺	?2	☺	?2
To improve the quality of the local environment	6	To preserve and enhance the landscape and to improve visual comfort	☹		☹		☺		☺	
	7	To improve housing quality	?3		?3					
	8	To improve cleanliness, hygiene and health		☺		☺		☺	☺	☺
	9	To improve safety and risk management		☺		☺		☺		☺
	10	To improve air quality								
	11	To reduce noise pollution					☹		☹	
	12	To minimise waste								
To ensure diversity	13	To ensure the diversity of the population	☹				☹			
	14	To ensure the diversity of functions			☹		☹			
	15	To ensure the diversity of housing supply								
To improve integration	16	To increase the levels of education and job qualification								
	17	To improve access for all residents to all services and facilities			☹		☹	?4	☹	?4
	18	To improve the integration of the neighbourhood in the city		☹		☹				
	19	To avoid unwanted mobility and to improve the environmentally sound mobility infrastructure					☹	☹	☹	☹
To reinforce social life	20	To reinforce local governance								
	21	To improve social networks and social capital		☺		☺		☺		

Source: S. Mattararozzi and M. Gualandi, ICIE

clearly the neighbourhood's 'state of fact', facilitating review of strategic priorities and leading to a grid of 'shared' priorities on which to base the subsequent formulation of scenarios for action. The shared diagnosis has been synthesised as follows:

- *Weak points*: depopulation of the neighbourhood, significant proportion of buildings that require rehabilitation; old sewer and water systems; not friendly access at the neighbourhood for 'weak' users.
- *Strong points*: historical architectural heritage of great value; good endowment of services and greenery.

The open discussion on the weakness and the potential of San Leonardo led the Mantova Municipality to define the following shared strategic priorities for sustainable development (see Table 9.3):

- to conserve and exploit the architectural building heritage integrating sustainable development;
- to promote sustainable mobility and accessibility of services;
- to improve integration between the different urban areas; and
- to maintain and reinforce diversity in the population.

The scenarios

The subsequent phase led to the discussion and identification of possible *measures* and *actions* by the administration and the stakeholders for each of the strategic 'shared' priorities for the future of the neighbourhood (outcome of the diagnosis). These measures and actions – set out in relation to three alternative scenarios proposed by the group of stakeholders – were arranged by the research group within the analytical grid, each showing any effect on other non-priority intersections. This summary structure made it possible to perform an initial check on coherence with the general and specific objectives for the neighbourhood, and review the formulation of the actions themselves. Following this review, each scenario was then evaluated analytically in relation to its possible impact on indicators of sustainability through application of the HQE²R INDI model.

Conclusion and remarks

The use of the analytical grid in the analysis and diagnosis of the neighbourhood of San Leonardo has been evaluated as a positive methodology for involving users, inhabitants, stakeholders and the municipality in a regeneration process. The grid gave them concrete support to define strategic priorities of rehabilitation of the urban areas. For this reason, the Municipality of Mantova decided to apply these instruments

Table 9.3 Sustainable development diagnosis table for Mantova San Leonardo neighbourhood

	Residential built spaces and users	*Non-residential built spaces and users*	*Non-built-up spaces and users*	*Infrastructures and users*
STRONG POINTS	• Historical architectural heritage of great value • High proportion of non-EU residents • Good social integration • Near total absence of crime	• Good endowment of services	• Good endowment of greenery (Piazza Virgiliana) • Good endowment of services • Good state of conservation of public open spaces	• Urban characteristics (road surfacing, etc.) of great historic value and greatly prized
WEAK POINTS	• High proportion of elderly inhabitants • Depopulation of the centre • Significant proportion of buildings that require rehabilitation	• Growing demand for services of assistance to the elderly • Little retail trade • Low percentage of employees in the neighbourhood (little economic activity in the neighbourhood)	• Deficit of car parking for the inhabitants of the neighbourhood	• Pavements very narrow or absent, which makes the routes difficult for 'weak' users • Infrastructure networks are old and require frequent maintenance, especially the sewage system • Street lighting old and not always adequate
PRIORITIES	• To conserve and exploit the architectural building heritage • To improve integration between the different urban areas • To maintain and reinforce diversity in the population	• To conserve and exploit the architectural building heritage • To promote sustainable mobility and accessibility of services • To improve integration between the different urban areas	• To promote sustainable mobility and accessibility of services • To maintain and reinforce diversity in the population	• To promote sustainable mobility and accessibility of services
UNRESOLVED QUESTIONS	• Which priority, rehabilitation or sustainable rehabilitation? • Residential density: value or problem? • How to reconcile conservation of the historical archaeological heritage with actions that promote sustainable mobility (on foot, by bicycle)?	• Which priority, rehabilitation or sustainable rehabilitation?	• How to reconcile conservation of the historical archaeological heritage with actions that promote sustainable mobility (on foot, by bicycle)? • To remove cars from the roads. Space for parking or fewer cars? Car parks to serve residents or to serve the entire city?	• How to reconcile conservation of the historical archaeological heritage with actions that promote sustainable mobility (on foot, by bicycle)? • To remove cars from the roads. Space for parking or fewer cars? Car parks to serve residents or to serve the entire city?

Source: S. Mattararozzi and M. Gualandi, ICIE

and this part of the HQE²R methodology to another neighbourhood where it is defining a new regeneration plan. The first result has been the starting point for an organic participation process involving users in the design of the new regeneration plan of the neighbourhood.

Bristol Barton Hill, 'Community at Heart'

This contribution[5] attempts to provide a commentary on the interactions between the HQE²R project and the UK local partner and case study at Barton Hill, Bristol – Community at Heart. The academic partner was the University of the West of England (UWE). During the three-year HQE²R project period, there was an intermittent but continual exchange of information and interaction between Community at Heart and the research project. But what was the legacy of this activity? What can be learned?

Case-study outline

The UK project case study was based in a neighbourhood in Bristol, south-west England, which had been earmarked by the government for a major regeneration project called New Deal for Communities. Against a background of multiple deprivation, the neighbourhood, which has 5900 residents, is receiving £50 million over a ten-year period from 2000. A baseline study revealed that 9 per cent of the residents are from a black or ethnic minority group. Fourteen per cent of households are headed by a lone parent and 38 per cent of children are brought up in a lone-parent household. There are 3000 households, 44 per cent of which are local council tenants. The programme is part of a socially led initiative across the UK that aims for comprehensive, community-led regeneration delivering improvements in health, education, employment, crime, the environment and housing.

In the case-study area, Community at Heart is the organisation delivering the New Deal for Communities in Bristol. It is managed by the community, with the local authority, Bristol City Council, being just one of several partner agencies. The neighbourhood has a strong sense of community and participation in the regeneration process, although many are sceptical. The built form consists of a mixture of housing types and tenure: privately owned nineteenth-century terraces, social housing in 1950s and 1960s blocks, and more recent homes owned by housing associations.

HQE²R and Community at Heart

A number of project officers and local resident board members showed a keen interest in the HQE²R project. Officers and board members not only attended but fully contributed to three of the international meetings. A member of the central government funding body, the Neighbourhood Renewal Unit, was also involved in the HQE²R programme. The researchers at UWE used funding created by the project to

build a bridge to the Community at Heart programme. Baseline studies were undertaken that involved the training and use of local residents in participatory research. These included: testing the INDI model on alternative scenarios for the future of the area; and helping to create local indicators of environmental stress which could be added to the standard HQE^{2}R indicator set in this specific area.

In spite of this mutual exchange of information and dialogue there were fundamental obstacles that prevented a long-term and integrated relationship between HQE^{2}R methodology and Community at Heart. The basic issues were:

- The New Deal for Communities programme is led from a community regeneration perspective. This contrasts with the HQE^{2}R methodology, where the five objectives and twenty-one targets have a broader socio-economic and environmental outlook. To put it bluntly, there is no internal incentive in New Deal for Communities to address environmental inefficiency and to conserve resources. A community failing environmentally, for instance in terms of energy use, water use or waste generation, could be left that way, even after a 'successful' New Deal initiative, as long as the 'local environment' was kept aesthetically 'clean'.
- The New Deal for Communities programme incorporates its own centrally accountable measures of outcome and success. The programme is managed against tightly drawn year-on-year outcome targets. This factor, combined with the socio-economic focus, meant that it was difficult to engage officers at Community at Heart with the HQE^{2}R objectives. These were seen as an additional set of targets/objectives and a set that did not assist with meeting government measures or local priorities.

The ideal of community self-determination is central to Community at Heart. This ideal may not always be achieved, but it is an overt aim and one of which the local community is strongly aware. Community at Heart thus has a culture of asking the community to define its problems, and to seek consensus on the solutions. By contrast, HQE^{2}R sought to apply a technical solution to the pre-defined 'problem' of neighbourhood sustainability, albeit with some community involvement. Neither Community at Heart nor the community served by it understood their problems in the same way as HQE^{2}R sought to address them. This proved to be a serious obstacle to full engagement, despite the research team's efforts to bridge the gap.

The legacy for HQE^{2}R and Community at Heart

The high level of interest in the HQE^{2}R project generated discussion, optimism and ideas. The researchers at UWE have moved on to other projects but interestingly all three are still involved in bridging the 'environment'–'socio-economy' gap often found

in urban development. Community at Heart participants have taken away with them thoughts about the importance of sustainable development in regeneration. Although not as joined-up as the HQE²R methodology, this is pursued vigorously in the UK through building regulations, planning obligations and architectural aspirations. There is a new-build programme, consisting mainly of additional social housing, together with new public open spaces, a Healthy Living Centre and some shopping and office units. In the case of Community at Heart, the building regulatory approach (although at a tangent to the government funding programme) is resulting in some buildings that have outstanding environmental performance. So some similar outcomes arise, but by a different route and probably with less synergy than might have been delivered through adhering strictly to an HQE²R approach.

Involvement with Community at Heart also had an impact on the development of HQE²R. For example, the project continually helped to flag up the importance of community involvement. This helped to communicate a social emphasis to the research partners that was at the core of the New Deal for Communities. One lasting legacy was the 'wheel' diagram (Figure 9.2) that assists with communicating the HQE²R issues and targets to a wider audience.

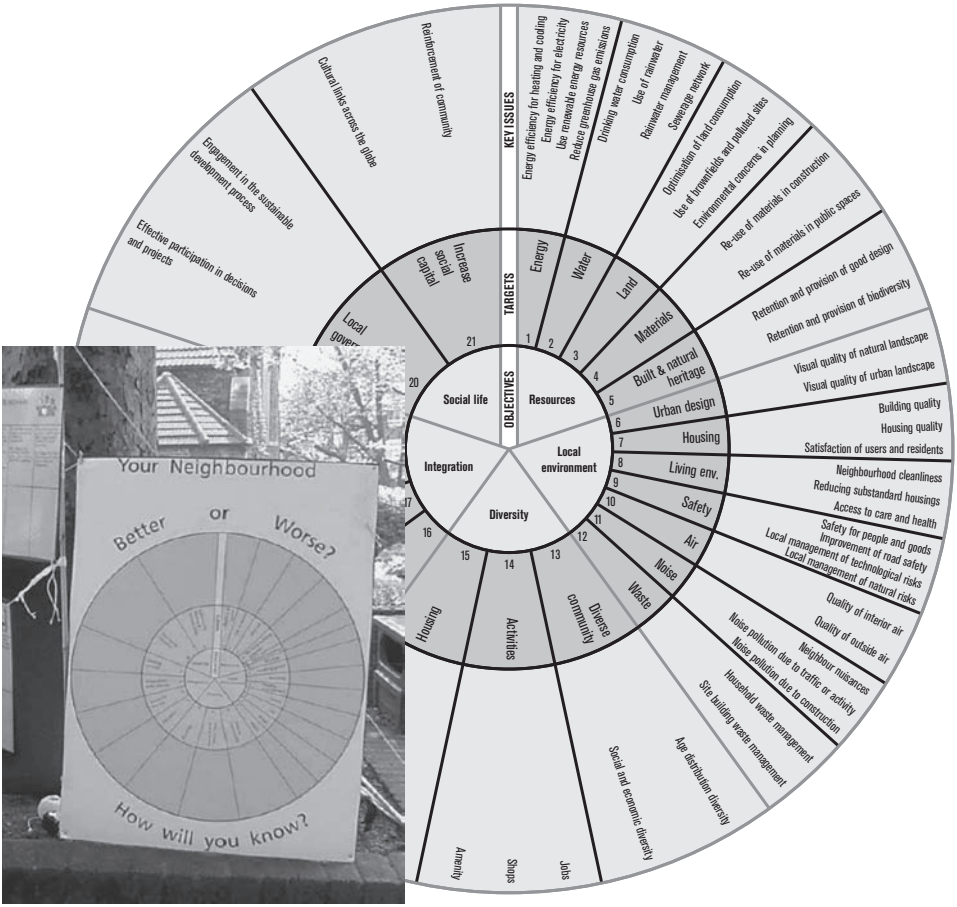
Experience from other neighbourhoods

These examples stand for the broad range of experience made during the pilot application of the HQE²R approach and toolkit in the different partner neighbourhoods. In general, the experience spans from a use of the toolkit for practical support of development processes to use as a means of communication and awareness-raising for sustainable development issues. Other experience, in detail, concerns, for example, the design of briefing documents (Charlot-Valdieu and Outrequin, 2003; Grossi and Mattarozzi, 2003), and evaluation of proposed projects within the call for tender processes for French neighbourhoods (Figure 9.3).

As a follow-up to the HQE²R project and according to practical experience, the INDI Model for France was adapted ('INDI.RU 2005'; Charlot-Valdieu and Outrequin, 2005) by adding specific indicators and changing the results scale to a range of 0–10 instead of the initial –3–+3 to avoid negative values that may have a discouraging affect on (public) consultations and debates.

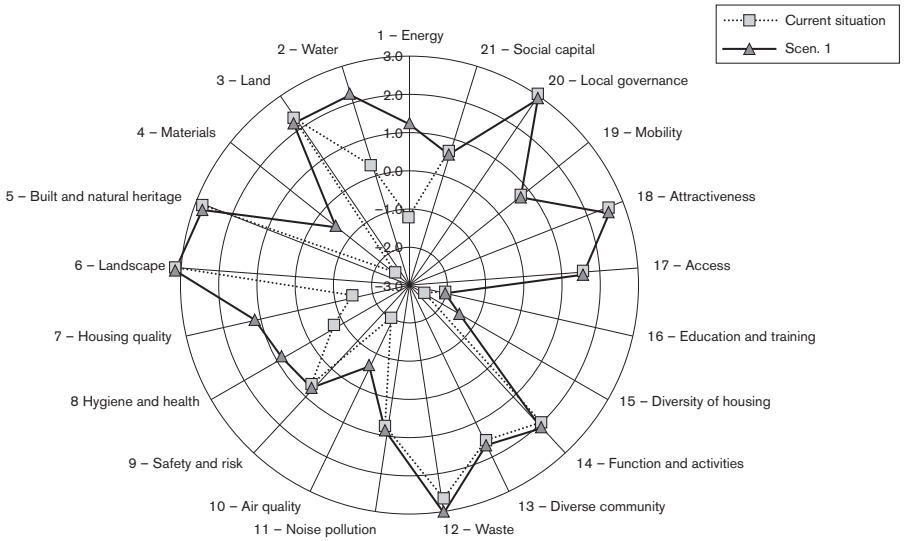
In a Dutch case study – a large harbour area and former shipyard to be redeveloped – the HQE²R approach was used to start a public communication process ('city debate') and to keep sustainability issues on the agenda. Nevertheless, as was seen in the Dutch case study, strong economic interests still make it difficult to introduce a wider scope.

For a German case study the HQE²R toolkit was, on the one hand, especially welcomed as a framework to reflect existing programmes and measures. Together



9.2 The HQE²R 'wheel' diagram of sustainable development issues and targets as conceptual framework and 'on the road' inviting suggestions for indicators. The original idea arose from the Community at Heart partners as a way of engaging their stakeholders with the HQE²R objectives

with the start of the HQE²R project the case-study neighbourhood was redefined as a formal regeneration area, and part of the inventory and diagnosis could thus be seen as an evaluation of earlier actions – especially the renovation of a large share of the building stock. On the other hand, because the financial context for the development of the neighbourhood was not yet clear, the municipal administration was very careful not to raise expectations in the public that might turn out to be too expensive to fulfil afterwards. In addition, the city of Dresden and the project neighbourhood were struck by a disastrous flood during the project period and this dramatically changed



9.3 Example for the result of an HQE²R scenario analysis from a French neighbourhood indicating that the proposed project improved selected issues from an overall sustainability approach
Source: Outrequin (2004)

priorities of urban development. Thus, for the German case study, the HQE²R toolkit was merely used in the conceptual stage.

CONCLUSIONS

A general experience of the work with the partner neighbourhoods was that the municipal partners (public and private) welcomed the opportunity and support for a structured reflection of the concept of sustainability for their specific local context. Nevertheless, it also became clear that urgent local problems have to be addressed first or in close connection with the more global sustainability issues. At the least, we can say that at any stage of a neighbourhood regeneration process the HQE²R toolkit provides an excellent framework to structure the discussion and to raise the questions necessary for informed decisions that will support sustainable neighbourhood development. In addition, the HQE²R toolkit, as a neutral space for dialogue, promotes increased cross-boundary communication, between different stakeholders as well as, for example, between different municipal departments and so helps to keep sustainability on the agenda; which is an important contribution in keeping Local Agenda 21 processes alive thirteen years after the Rio Conference.

NOTES

1 The acronym HQE²R stands for *Haute Qualité Environnementale et Economique Réhabilitation* (High-Quality Environment and Economy in Regeneration). The project was co-financed by the EC under the Fifth Framework Programme (Cities of Tomorrow; 2001–2004) and co-ordinated by CSTB France (Centre Scientifique et Technique du Bâtiment; Catherine Charlot-Valdieu). For more information, see http://hqe2r.cstb.fr/.

2 For an overview, see Charlot-Valdieu *et al.* (2004); for a brief presentation, see Blum (2006).

3 This chapter is the result of extensive teamwork. In addition to the authors, Catherine Charlot-Valdieu, Matteo Gualandi, Sandra Mattarozzi, Philippe Outrequin, Martin Symes and Jan Zieck contributed to this chapter in writing or with comments. For contact details, see http://hqe2r.cstb.fr/.

4 Contribution provided by A. Grossi, M. Gualandi and S. Mattarozzi, for ICIE, Bologna.

5 Contribution provided by M. Grant, for UWE, Bristol.

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10

The REGEN Assessment of the Porta Nuova District's Central Railway Station, Turin

Patrizia Lombardi

INTRODUCTION

The link between urban regeneration and the (re-)development of transport systems, in particular rail, is evident in many cities in Europe. Combining investments in transportation systems with urban regeneration takes place, for example, in Paris (Promenade plantée), Lyon (La Part Dieu), Zurich (HB), Stuttgart and Amsterdam. This is often driven by the attempt to pursue two objectives simultaneously: the implementation of technological innovations, which are required for improving the transportation system; and the wish of the landowner, often a railway company, to develop property in the area (Lami *et al*., 2005).

The transformation of the city of Turin emblematically sums up various phenomena which have characterised urban development over the last twenty years: de-industrialisation, technological innovation and the expansion of the service industry (Pugh, 1996; Mega, 1996; Brotchie *et al*., 1999). The case study offered in this chapter concerns an urban planning decision intertwined with large infrastructure interventions (Roscelli, 2005). Over the next ten years, Turin will see the completion and the realisation of an important set of infrastructure works and territorial re-assembling that could lead to a complex re-organisation of urban functions, resulting in remarkable repercussions on the building, economic and social systems of the city.

In the short term, the re-design and re-development of the Porta Nuova station building will need to be considered. Although this re-design can be considered as an internal re-organisation of the station premises (e.g., service equipment and underground car park), it will result in the increased availability of land that can be used for commercial purposes. Furthermore, the re-design of the station will also have major implications for the building stock, its architectonic values, and the future use of the area. As a consequence, it is interesting to study this re-development in detail (see also www.grandistazioni.it).

Various adaptations to the infrastructure were necessary to accommodate the Winter Olympic Games hosted by the city of Turin. In the mid-term, the completion of the so-called 'Spina Axis' is considered important. These investments encompass the construction of a railway underpass and the final completion of the metropolitan

railway system. Line 1 of the underground system will also be completed between Porta Nuova and Lingotto/Nichelino railway stations, and the high-velocity line between Milan and Venice will come into operation. All these infrastructural investments will be accompanied by the re-development of abandoned industrial areas located in the vicinity of the railway station. In the long term, the high velocity/high capacity link between Turin and Lyon will be completed.

These infrastructure investments are aimed at improving the transport and communication infrastructures of the city of Turin. Furthermore, the aim is to make the airport system and railway system (international, national, regional and metropolitan) and road network (motorways and ring roads) more efficient and closely connected in order to improve the accessibility of the Turin area. These improvements are considered essential for the economic and social development of Turin, and therefore form an important objective of the strategic plan of the city (see also www.torino-internazionale.org).

Many effects are foreseen to be associated with these interventions in the internal organisation of the metropolitan area of Turin, but the renewal of the railway system (station building, etc.) is seen as the catalyst of a set of transformations that will lead to an overall re-designing of the city and of the metropolitan area.

This chapter offers a REGEN(eration) assessment approach which has been applied to the above-mentioned situation. The basic aim is to define and evaluate potential scenarios for the urban transformation of the area. The first section describes the case study and the urban regeneration strategy of the city and the stakeholders involved. Then there is a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) for the transport scenario which underlies this urban (re-)development. This is followed by the results of a multi-criteria analysis application (Analytic Hierarchy Process) with the aim of evaluating different land uses for future public–private partnership initiatives. Finally, some conclusions will be drawn.

SETTING THE CONTEXT FOR PORTA NUOVA DISTRICT'S CENTRAL RAILWAY STATION

The Porta Nuova station forms the central node of the Turin and Piedmont railway system: it is the so-called 'head station'. A significant number of convoy trains halt at the station (about 179 starting trains per day), making it one of the busiest in Italy (about 70,000 passengers per day). The station is used by trains that have a regional or international destination. Finally, it is important to note that various activities are located in the vicinity of the station building that are not directly related to the operation of the railway, but do benefit from its presence, such as offices and other economic activities which profit from the (regional and international) accessibility it offers.

The next section discusses the re-organisation of the railway areas between Porta Nuova station and Lingotto station, and the potential impact this may have on this district of the city.

The urban regeneration strategy

The re-organisation of the railway system constitutes the construction of an improved railway link between the two stations mentioned above. As this improved link will be placed underground, this creates various opportunities for urban re-development of the concerned areas. Furthermore, the construction of the new railway link will result in other railway stations also being connected to the so-called 'Spina Axis'. This creates a new central metropolitan axis that runs from north to south through the city of Turin (Curwell and Lombardi, 1999). Along this new axis various urban development projects will take place.

Compared to traditional 'area enlargement' development models, which are used to expand the central area of a city, the proposed development may allow a greater spread of the effects of centrality and induce better relationships, conditions and chances of exchanges with adjacent districts, while increasing the level of homogeneity and reducing the degrees of congestion.

The axial centrality that is caused by the new railway link remarkably increases the functioning of the metropolitan railway system; a system whose sections form a network that covers the larger metropolitan area, and which condenses along the area of the railway link that offers support to the north, south-east and west interconnections. The underground line that interconnects all lines to the main station completes the basic public transport network, and, in particular, covers the western part of the area which is not directly served by the railway system.

The construction of this network system constitutes the necessary conditions to offer a structural response to the problems of metropolitan mobility from a sustainable development point of view, but in order to be efficient it must be integrated with coherent urban and transport policies that encourage the use of this (improved) network.

From this point of view, it becomes crucial to focus the territorial organisation of the stations not only along the railway link but in relation to the whole metropolitan area. Underlying this scenario, the re-organisation of the stations and their reference areas becomes of strategic importance, and makes them places of great urban quality, with the presence of activities and functions that are coherent with the levels and roles of the different stations, as well as with a general re-qualification of the urban environment.

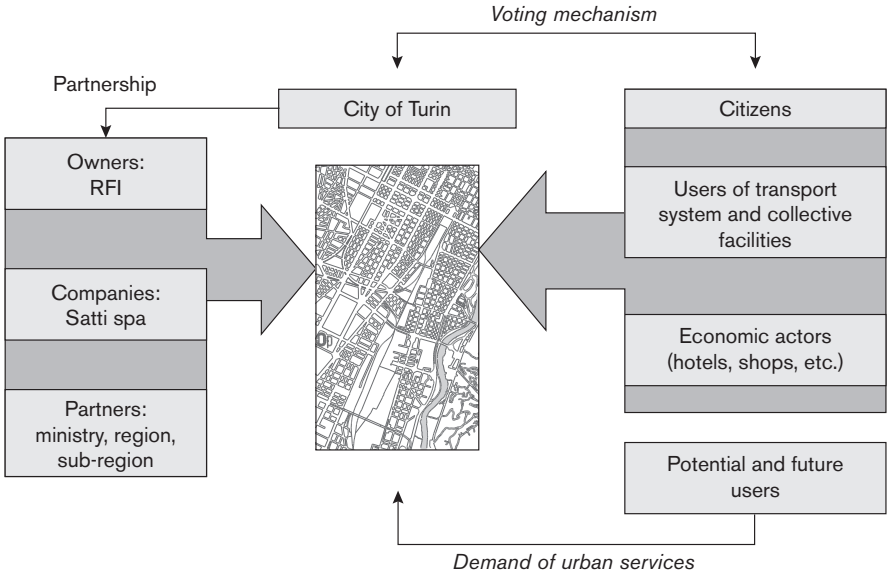
The network of stakeholders

Due to the strategic importance of the re-development of the area, the network of stakeholders involved in this decision-making process is quite large and complex. Based on an extensive stakeholder analysis, the city of Turin is marked as the key actor and promoter of this project. The following groups of players can be linked to the city (see Figure 10.1). On the supply side:

- the owners of the land and infrastructure (the Italian Railways Company – RFI);
- transport and mobility companies, such as Satti, and potential partners of a public–private partnership (PPP) initiative; and
- other partners, such as the Ministry of Transport and Infrastructure, Piedmont Region and Turin Sub-Region Authority.

On the demand side:

- citizens and local communities around this central area;
- users of the public facilities and transport system;
- economic actors: there are a number of commercial and business activities based around the Porta Nuova station; and
- other potential users.[1]



10.1 The network of stakeholders and their relation in the voting system

The actors mentioned above are all linked to the city by means of the voting mechanism that is effective during administrative elections.

Albeit at various intensities, there is consumer demand for (new) facilities to be offered, and consumers hold special relationships with the council administration (e.g., electoral ties). The success of this specific strategic project will have implications for households and businesses currently located in the concerned area. This could lead, for example, to the relocation of families and businesses, but it also offers opportunities to increase economic activities and wealth in the area. On the other hand, if the initiative fails, this could lead to an exodus of companies, activities and wealth from the area (Camagni, 2000).

Although the decision-making network may seem to be stable, it can still be characterised by extreme fluctuations in terms of interactions between players, institutions and the other players belonging to the same context and operating within the same (or adjoining) sphere of action. Furthermore, during the decision-making process, some players may disappear and new ones may join in; moreover, owing to the *communicative* relationships that are established between the many participants in the process, the identity of players may alter, along with their role in the decision-making process.

AN INFRASTRUCTURE SCENARIO FOR THE TURIN PORTA NUOVA STATION

A transport system analysis was initially conducted with the aim to identify and compare different infrastructure scenarios and their relative operation models. As a result of this analysis, four different scenarios (S) have been designed. These are:

- **S1**: The areas adjacent to the tracks at Porta Nuova that at present are used for backing-up services will be recuperated.
- **S2**: The number of tracks at Porta Nuova will be reduced and larger areas will be recuperated.
- **S3**: The tracks at Porta Nuova will be lowered and reduced in number according to the second scenario, and an underground station, whose covered area could be used by the city, will be constructed; several different sub-scenarios can be considered in relation to the location of the lowering of the tracks (Corso Sommeiller, Corso Dante or Corso Bramante).
- **S4**: All the railway infrastructures at Porta Nuova will be removed, together with the access tracks, while an adequate infrastructure is newly created at Lingotto, or at other sites; and the entire railway area of Porta Nuova will be recuperated.

Table 10.1 Comparison of infrastructure scenarios

Scenarios	*Accessibility*	*Permeability*	*Area renewal (m^2)*	*Cost*
S1: recovery of the tracks	Concentrated	Reduced	70,000	Very low
S2: reduction of the track area	Distributed	Reduced	130,000	Low
S3: reduction and placing the tracks underground	Distributed	Recovered	300,000	Very high
S4: withdrawal of Porta Nuova station to Lingotto	Distributed between two poles	Recovered	300,000	Very high

Although all four scenarios are feasible from a technical viewpoint (see Table 10.1), S3 is deemed more interesting than the others from an urban perspective. Both S1 and S2 do not allow for a significant urban transformation/re-qualification; S4 has major technical difficulties. S3, though, foresees the lowering of the tracks and the possibility of a new underground station which, while protecting the transport requirements, is interesting from an urban point of view, even though it could cause problems during the construction phase.

In terms of strengths and weaknesses, S3 seems to be preferable to S4 in the sense that:

- it allows the original urban central position of the railway station to be maintained and offers immediate access to the urban centre;
- it does not radically change the present working situation model and, as far as the long-distance trains are concerned, does not require a further connection of the Lingotto–Susa link to be made with a deviation of the Porta Susa–Porta Nuova underground railway line towards Lingotto; and
- it does not require an upgrade and/or relocation of Lingotto station.

Both scenarios, but especially S4, have a link with the project that is already under construction, and which implies the upgrading of the central axis of the railway link and improving the development prospects of the city; at the same time, this answers the growing request for 'localities of excellence', where significant and promotional activities will be located. On the other hand, S4 poses the problem of passenger accessibility to the urban centre, and therefore has the 'defect' of bringing some basic choices, such as the local public transport system (TLP) and the underground system, to the fore once again. The implementation of this scenario would need to connect the new Lingotto station with the metro system. This includes the re-structuring and intensification of the service, so it can respond to the increase in passenger carriage originating from Lingotto and Porta Nuova. The TPL service should also be verified

and improved so as to be able to bear the new urban activities that will be located in the space freed by the tracks (an improvement that is necessary because of the patrimony development of the area). Obviously, adequate car parks should also be provided and be in coherence with the offered activities.

The Turin underground is a 'light', quick and high-frequency system. However, in order to be efficient, an underground system should also have an efficient intermodality policy between other transportation services. This is particularly important for the realisation of S4. Another element of risk and uncertainty concerns the sphere of conflict between the stakeholders and the possible contradictions with other development plans made by the owners that are currently implemented (for example, the realisation of the Large Stations project), which will have to be carefully verified in the future. A great deal of disturbance is also foreseen for the citizens due to the works that will be conducted in the area, which will be in addition to the works that are already under construction.

From the urban (re-)development point of view, both S3 and S4 offer exceptional opportunities to 're-sew' the urban texture, which has been cut in two by the railway axis. This will result in a general improvement in urban quality and permeability. Furthermore, through the recuperation of deteriorated areas that are in contrast with the architectural characteristics of the zone, the urban forecasts proposed by S3 would allow important topical points of the city to be evaluated, such as the area of the church of Saint Salvatore at the end of Corso Marconi, an area that, at present, is blocked by a consolidation of urban lines which would be better located at Lingotto.

Results of a SWOT analysis on the infrastructure scenario

A SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis was conducted on S3 (reduction and placing the tracks underground). The results are shown in Table 10.2.

To summarise, the results of this analysis confirmed the time lines of a territorial re-organisation of the Porta Nuova area, which is congruent with the general strategies that have been outlined for the city of Turin, through the Master Plan and the Strategic Plan. As both documents see the sustainable metropolitan development of Turin as dependent on this redefinition of the local public transport system and the underground railway system, future actions should be directed towards reinforcing this objective.

The centrality of Porta Nuova can be considered consolidated, in terms of functional layout and services, transport, accommodation and commercial activities. There are precise reasons of a functional and urban order in its favour. These relate to the layout of the surrounding area and the role the station plays in this. The building forms an intergral part of the aesthetic values the surrounding areas have to offer: in

Table 10.2 SWOT analysis of Scenario 3

Strengths	*Weaknesses*
• Frees a relevant urban space from Porta Nuova to the Corso Dante railway bridge • Does not change the railway transport layout along the route • Maintains centrality • Improves urban permeability • Improves mobility between the areas • Improves urban quality • Exploits topical points of the city	• Very high realisation costs • Great disturbances because of the works • Requires verification of the TPL system to guarantee accessibility • Impacts on the socio-economic texture
Opportunities	*Threats*
• Complementary functions already exist (accommodation and commercial activities) and improvement programmes of these are under way • Improvement programmes exist and are under way for the accessibility and upgrading of the TPL lines that allow interchanges (for example, with the underground stations) • Integrates with the upgrading plan already under way of the railway link and with the development prospects of the city • New role of sustainable development of the city in the field of tourism and evaluation of the cultural patrimony	• High pressure of interest in the property in the area and contextual uncertainty of the capacity of realisation of the investment • Accentuation of the polarisation and specialisation of the central core that gravitates on Porta Nuova • Difficult to define overall coherence, with reference to the laws in force • Difficulty in obtaining financial resources

particular, Porta Nuova station forms a prestigious component of the architectonic patrimony of the city, and, as such, is the 'entrance' in tourist and cultural terms of Turin. As a consequence, it is not possible to imagine its transport role being completely eliminated or even being relocated from the central urban area. The hypothesis of keeping Porta Nuova as one of the main entrances to the city, while reducing its transport role (which at present is over-shadowing all other land uses), seems congruent. The recuperated space could be re-designed, starting from its urban borders – that is, from the city with which it relates – and not just 'filled', like a void that is indifferent to the conditions that are historically installed in context. An overall and integrated re-qualification and development path could thus be explored, which could include elements that have disappeared over the years: for example, the original quality of transparency that the station building once had in the relationship between the consolidated city and the territory behind it.

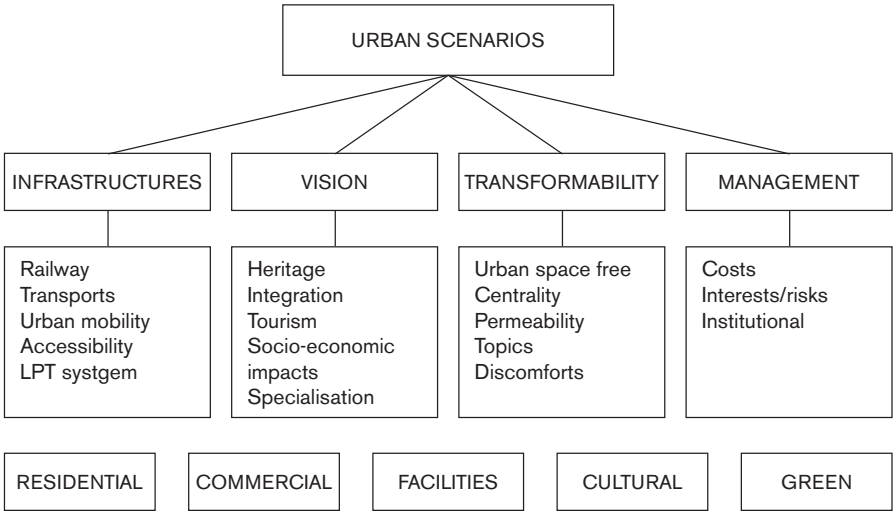
AN URBAN SCENARIO FOR TURIN PORTA NUOVA

A multi-criteria analysis, using AHP methodology, was conducted, with the aim of developing a future scenario for the district by selecting a scale of priorities for possible target uses. This analysis is useful in this pre-design phase, where the public authority implementing the urban transformation has limited time and financial resources, while considering the formation of partnerships to carry out the works. Indeed, one advantage of the AHP method is that it produces a scale of alternative choices, based on paired comparison of the elements that make up the problem (Saaty, 2001).

The decision-making process

The topic to be decided upon, which is complex and made up of numerous variables and risks, is analysed by breaking it down into elementary parts: namely, objective, criteria, sub-criteria and alternatives, which are later regrouped into uniform sections to create a hierarchical structure (Figure 10.2). In this particular case, the decision-making variables can be summed up as follows:

- target uses, as established in focus group meetings held with international experts in the fields of urban planning and design, transport, railway mobility and management, on the territorial re-organisation of the Porta Nuova district and confirmed in later meetings with the public authority (alternatives);
- themes and issues emerging from the study workshop (evaluation criteria); and



10.2 The hierarchical evaluation model

- sub-criteria, constituting a more detailed definition of the criteria, arising from the SWOT analysis illustrated above.[2]

The first target uses considered for Porta Nuova were:

- 'innovative' residential schemes linked to railway accessibility;
- commercial/professional;
- hotel and tourism facilities;
- culture and exposition; and
- green and parkland.

The evaluation criteria are:

- *Infrastructural set-up*: it is important to have a clear idea of the role of Porta Nuova and Turin's other main transport nodes, along with the future set-up of the entire system. Transport is not an 'exclusive' aspect, although it does have a decisive influence on urban planning around Porta Nuova.
- *Observance of the city's development strategies*: through an analysis of the Porta Nuova area in relation to the rest of the city, in order to understand its image, character and identity, both current and future, compared to other areas in the city centre. The city's overall vision, such as 'Turin – City of Culture' or 'Turin – City of Tourism'.
- *Transformability*: defined in terms of density, accessibility, target use (this theme concerns the relationship between what to design and the flow of visitors/users of the area under discussion), or the transport demands that the new facilities would create (variable according to the size and specific function of the facilities).
- *Management model*: smooth running of the partnerships. The ideal model depends on the context, and particularly the institutional framework. In many cases the partnership is between the city and the railway company. In all cases, short- and long-term management objectives are incisive; as, therefore, is deciding how and when to involve the general public.

In-depth analysis of the evaluation criteria was carried out using the SWOT analysis, referred to above. The SWOT analysis performed on S3 thus led to identification of the following sub-criteria, based on each criterion:

- Infrastructural set-up (INFRASTRUCTURE):
  1 Does not change the set-up of long-distance rail transport (S).

2 Improves inter-zone mobility (S).
3 Improves accessibility and strengthens rail link (O), thereby contributing to the re-organisation and re-development of the Turin node.
4 Requires monitoring of the local public transport system, to ensure effective accessibility (W). *As this is a negative criterion, it is measured in the opposite direction to the previous*.

- Observance of the city's development strategies (VISION):
  1 Urban facilities already existing and under improvement (O).
  2 Rail link integrated as an enhancement feature (O).
  3 Development prospects for the city in the tourism sector (O).
  4 Impact on the social and economic fabric (W).
  5 Specialisation of the central nucleus around Porta Nuova (T).
- Transformability, defined in terms of density/accessibility/target use (TRANSFORMABILITY):
  1 Frees up a sizeable urban area (S).
  2 Maintains centrality (S).
  3 Improves urban permeability (S).
  4 Draws attention to topical areas of the city (S).
  5 Heavy disruption caused by works (W). *As this is a negative criterion, it is measured in the opposite direction to the previous*.
- Management model, i.e. the smooth running of the partnerships (MANAGEMENT):
  1 Very high working costs (W).
  2 Interests/risks relating to possibility of completion (T).
  3 Current legislation (T), in terms of procedures or institutional practices.
  4 Difficulty in finding financial resources (T). *The last criterion cannot be evaluated at this stage, due to insufficient information. Therefore, it is not considered when applying the AHP method.*

Development of the multi-criteria analysis

Multi-criteria evaluation involves assigning degrees of importance (emphasis and/or scores) to the various sections of the hierarchy, beginning with the criteria (on the first level), through sub-criteria and finishing with alternatives, which are placed on the last rung of the ladder. The distribution of emphasis among the criteria on level one is a fundamental part of the evaluation, in that it defines the 'reference context' (or scenario). This is a 'political' operation (*how else would it be possible to decide, for example, whether it is the infrastructural set-up or the management model that is more important to the final choice*?).

For the case in question, the 'reference evaluation scenario' was determined on the basis of the opinion expressed by Turin City Council. Later, other scenarios were defined according to the opinions of various groups of experts who had taken part in the evaluation. In particular, the transport scenario, with opinions given by the CSST (Centro Studi Sistemi Trasporti[3]), and the 'transformation' scenario, with opinions given by the experts at the High-Quality Experimental Laboratory – LAQ – of Turin Polytechnic.

The assignment of points to the elements of the subsequent levels, sub-criteria and alternatives, in relation to the original criteria, was, on the other hand, a purely technical operation and based on the opinions of the experts. The panel of experts who took part in the second round of assessment was chosen according to the skills needed specifically for each criterion, that is:

- Criterion 1 – CSST (experts in the transport sector).
- Criterion 2 – Turin City Council (experts in urban planning).
- Criterion 3 – LAQ (experts in urban planning).
- Criterion 4 – Turin Polytechnic (experts in economics matters).

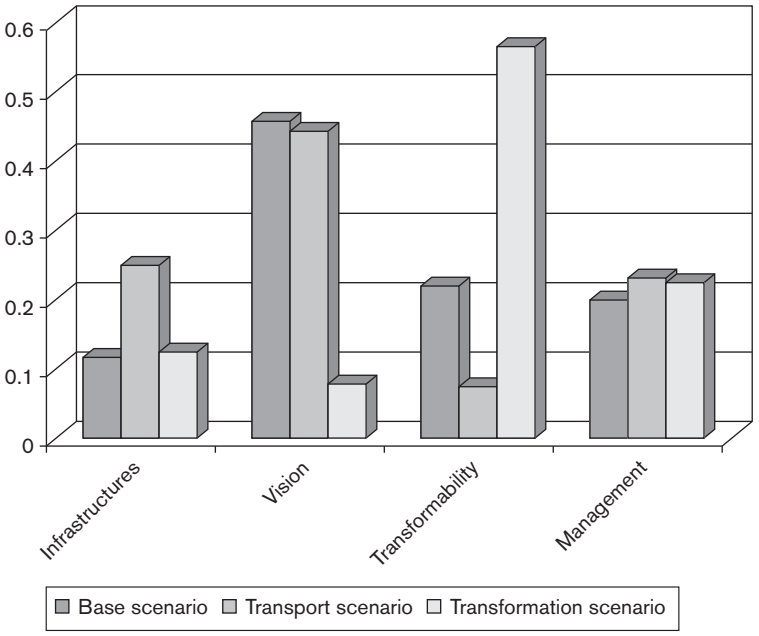
The measuring method used to assign a level of priority to criteria, sub-criteria and alternatives consisted of paired comparison of the components of each level of the hierarchy, against each component in the level above it. In the case in question, paired comparisons were made by the experts and converted into real numbers using a nine-point fundamental scale of values.

The following sections show the scales of priorities given to the components of each level (beginning with the criteria), based on application of the method, together with the coherence measurement and a sample of the opinions expressed by the panel of experts.

The evaluation scenarios

The base evaluation scenario places a strong emphasis on the criterion of observance of the city's development strategies (almost fifty of the total weight) with limited consideration of infrastructure and economic-management criteria. According to the public body, on the one hand, the infrastructural set-up contains elements of intense flexibility and adaptability, and does not constitute an obstacle to assigning a mixed function to the area. On the other hand, the kinds of partnerships that are likely to form in the completion of the works appear to be somewhat limited, considering that the interested parties are the City of Turin and RFI.

The scenario produced from the opinion of experts in the transport and infrastructure sector resembled the one created by the City of Turin, in terms of the



10.3 Comparison of criterion weights in the three evaluation scenarios

emphasis given to the criterion of observing the city's development strategies. This is currently considered a major priority, in confirmation of the close relationship between development strategies for the city and its infrastructure (rail link, rail system, etc.). In this scenario, however, the weight given to the infrastructural set-up and management model is greater. According to the opinion of the experts in the urban planning sector, transformability, also meaning flexibility, is far more critical than the other criteria, this being the only way of giving a mixed function to the area. Furthermore, the management model and the kind of partnership are important factors.

Figure 10.3 illustrates the comparison of the evaluation scenarios. The greatest divergence of opinion between experts can be seen in the area of transformability, while the greatest convergence is seen in their views on the management model. The infrastructural set-up is given similar emphasis by the urban planning and design experts, while it is given more consideration by the experts from the transport sector. On the other hand, observance of development strategies is given equal emphasis by transport and planning experts.

The scales of priorities of the sub-criteria

In the infrastructural set-up, within the transformation proposal to move the station back and lower the rails, the sub-criterion of re-organising and enhancing the Turin

Railway node has even greater importance, while less emphasis is given to the control system, which must be carried out regardless and does not characterise that scenario. According to the chosen target use, some may require greater monitoring, especially for the hotel sector, followed by the commercial and professional sectors.

For observance of the city development strategies, it is fundamental to consider the social and economic impact, whereas little emphasis is placed on the criterion of urban facilities that already exist or are undergoing improvement. For urban transformability, the priority is to improve urban permeability, which is linked to correctly identifying the scale of intervention and the functional mix. Certain choices may indeed create zones that are totally permeable, yet unattractive (an example would be an area consisting solely of offices, which remains completely abandoned at night). It is important to make a master plan and clear morphological rules, yet without going as far as 'macro-architecture'. Real estate risks heavily influence the feasibility of complex intervention in the area, and consequently, the formation of partnerships. Costs seem to be a less decisive factor, while procedural considerations appear to be easier to manage.

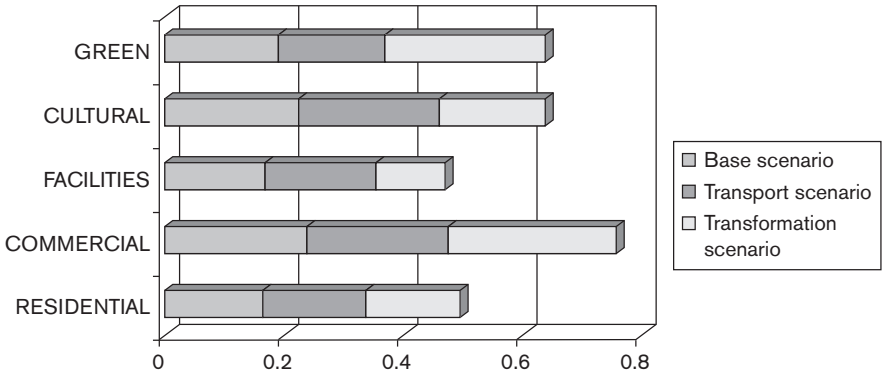
The final results: the scales of priorities of the alternatives

The following scales of priorities are the result of the evaluations made through paired comparison of the alternatives with the various sub-criteria, for the previously defined scenarios, based on the importance given to the various criteria.

The results are in alignment, in that they place greater emphasis on assigning a commercial target use (see also Figure 10.4), particularly for professional offices, which would make it possible to give a more specific character to the project and differentiate it from the Spina 2 project, which is particularly relevant for the transformability/permeability proposal ('transformational' scenario).

Overall, there is even a strong preference for the parkland and cultural targets. However, while culture is seen as a priority in both the 'base' and 'transport' scenarios, the 'transformation' scenario leans more towards the parkland hypothesis, since there are no breaks in a long built-up stretch of the city fabric (running from Piazza d'Armi right to the River Po). Residential and hotel target uses are considered less important. Although the first is necessary in order to enable full use of the area throughout the day, it is considered a feature that is less characteristic of the entire project. Hotel target use, on the other hand, is regarded as being already sufficiently represented in the area.

A comparison of the three scenarios shows a definite overlap in the results of the 'base' and 'transport' scenarios, with the 'transformation' scenario differing from the other two in its different distribution of priorities to the evaluation criteria.



10.4 Comparison of the results obtained in three scenarios

Sensitivity analysis

The sensitivity performance analysis tests the performance of each alternative target use (measured as a percentage along the y-axis) with regard to different evaluation criteria (measured as a percentage along the x-axis). The analysis carried out for the 'base' scenario showed that the commercial target not only has a very high performance profile (it is ranked first) but responds well to both the transformability and infrastructural criteria. As a consequence, if these criteria were to become more important (as indeed happens in the 'transport' and 'transformation' scenarios), the importance of this alternative would, likewise, be heightened. On the other hand, despite a remarkable performance in terms of observance of development strategies for the city, the hotel alternative does not perform equally as well for other criteria. The same can be said for culture, which only fulfils the requirements for urban development strategies and the management model. The parkland proposal also gave a varied performance: extremely high in economic terms (thanks to low feasibility and management costs), but rather low with regard to the urban development strategy. A linear yet modest profile was shown by the residential target, in that it responded rather favourably to all the criteria, without fulfilling any of them completely.

CONCLUSION

Analysis of the case study has revealed how, despite having its transport value reduced, Porta Nuova railway station still has an important role to play in the city of Turin, both infrastructure-wise and with respect to the urban fabric and the context in which activities take place. This function has been reinforced over time, thanks mainly to the high level of accessibility provided by the station (see Lombardi and Roscelli, 2004).

An urban transformation operation, such as the renovation of the Porta Nuova district, requires the formation of partnerships between the public and private sectors with projects that are valuable to each of the stakeholders, and demands an 'evaluation approach' capable of weighing up the specific objectives, often non-convergent, of public decision-makers and private investors (see Roscelli, 2005; Lami *et al*., 2005). Thus, the REGEN assessment was developed, which made use of both a SWOT analysis and an AHP methodology. This was developed with the purpose of identifying a scale of significance for the various target uses assigned to the Porta Nuova area of Turin, with interviews carried out with various professionals and decision-makers. The aim was to compare possible choices in terms of quality, while bearing in mind the large number of subjects who influence the decision-making process, thereby further validating the use of evaluation techniques that are capable of communicating and making a case for urban transformation choices.

The results obtained by the AHP analysis made it possible to verify the importance of introducing tertiary/commercial concerns to the area (ranked in first place). For the other target uses, the importance varied according to whether the reference context was observance of the city's development strategies, as in the transport scenario, or whether it was based on transformability. In the first case, culture prevailed; whereas in the second, parkland was more important. Residential and hotel target uses prevailed in none of the other scenarios.

It is wise to underline the fact that the conclusions of this study are exploratory. In other words, the results obtained here must not be taken as final, but rather as an aid to the decision-making process that may be used at a later stage in the intervention work. A more detailed study focusing on the transformation proposal for Porta Nuova district's central railway station illustrated in this chapter is currently in progress. This will also include an evaluation of all the physical-environmental, socio-economic, financial and institutional aspects influencing sustainability at district level. This analysis will make use of more effective and supportive visioning and forecasting evaluation methods, such as a spatial decision support system based on MCA and GIS technology (Roccasalva *et al*., 2007).

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NOTES

1 'Protocollo d'Intesa tra Ministero delle Infrastrutture e dei Trasporti, Regione Piemonte, Comune di Torino, RFI spa e Satti spa per la Rilocalizzazione della Stazione Porta Nuova e l'abbassamento dei binary sotto il fiume Dora con la trasformazione della stazione Dora in fermata', Rome, 2002.

2 The use of SWOT analysis as a base for structuring the problem in multi-criteria analysis is not a novelty. For instance, the Analytic Network Process (ANP) – a developed version of AHP – can be structured by using a similar procedure (Saaty, 2005; Saaty and Vargas, 2006).

3 The Transport Systems Study Centre.

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11

Assessment Methods Underlying the Planning and Development of Modena City's CSR

Patrizia Lombardi and Stefano Stanghellini

INTRODUCTION

In planning, traditional tools have largely lost their original meaning of predicting the future assets of a town. There is a clear understanding that, on the one hand, local development takes into account a bigger spatial scale with many more stakeholders. On the other hand, globalisation and transnational integration processes have increased the role of cities inside the socio-economical and territorial development of countries (Mazzola and Maggioni, 2001).

The role of strategic planning is to build incrementally a shared vision of the future development of a city through networking and multidisciplinary effort (Archibugi, 2002). The main differences with traditional physical planning – e.g., the city master plan – is the inclusion of uncertainty and discontinuity in the decision-making process, the networking of actors, competitiveness, global vision and direction for the future urban development (Ciciotti and Perulli, 1998). Strategic planning implies taking a holistic view of the context in which the action is performed. It requires retrospective and monitoring evaluation approaches as learning tools for transparent inclusive decision-making (Ciciotti *et al*., 2001; Pugliese and Spaziante, 2003).

The re-emergence of the environmental agenda in the 1990s, with its focus on global sustainability issues, renewed the call for wider stakeholder involvement. The model of *participatory democracy* postulates that policy-making takes place in continuous interaction with citizens. It aims to build up the capacity of individuals to exercise greater control over decisions (Davoudi, 1999). It originates from a generally accepted definition of strategic planning as the process which aims at building a shared vision of the future development of a community or a town (Bryson, 1988). The stakeholders in this shared vision are all individuals who have specific interests regarding future development and have the opportunity to influence decision-making, and all those contributing to the building of value. It also includes all concerned citizens. A strategic planning process includes a number of methodologies. This paper specifically deals with the SWOT analysis and corporate social reporting (CSR), with reference to the case study of the Modena Strategic Urban Plan developed between 2002 and 2004.

STRATEGIC PLANNING

Strategic planning started as a means of increasing business competitiveness in the private sector, subsequently spreading to the public sector and non-profit organizations (Bryson, 1988). It assigns considerable importance to analysing an organization's strengths and weaknesses, as well as to exploring the opportunities and threats that can be expected to arise. Through the use of various techniques entailing participation by the members of the organization who are involved in strategic planning, it identifies that organization's 'vision of success', or, in other words, the scenario towards which the organization has decided to evolve. It then formulates the strategic guidelines, goals and action that must be taken to make this vision a reality. Developed for private enterprise, strategic planning as carried out for public organizations differs significantly, especially because it must encompass a thorough understanding of the effects that its decisions will have on the context at hand, and specifically of the effects they will have on the decisions of other public organizations (Archibugi, 2002).

Strategic planning does not always involve decisions that have repercussions on the territory's physical condition; for example, the strategic planning of a non-profit organization whose work addresses social or cultural issues may have no significant territorial effects. When, however, strategic planning is carried out by a public organization whose institutional responsibilities include governance of a given area, its effects on the territory are of crucial importance (Stanghellini, 2003). In such cases, strategic planning can be seen as a process whereby a shared vision of the territory's evolution can be constructed. This process of construction hinges on the networked integration of many institutions and players, and of the skills drawn from different disciplines, as part of an effort to interpret the trends that can be expected to affect the territory in the future. In other words, the central aim of strategic planning is to build a stable consensus around a mutually acceptable goal (Ciciotti and Perulli, 1998).

From the conceptual standpoint, strategic planning differs in a number of substantial respects from physical planning, whose major expression in Italy has until recently been the master plan. Characterizing these differences is useful in order to pinpoint the type of innovation that strategic planning proposes for the future of regional and urban planning in Italy. For, while the concepts underlying the traditional plan are certainty and continuity, strategic planning embraces their opposites: uncertainty and discontinuity. Strategic planning is well aware that that real-world processes are characterized by discontinuity and that, consequently, decisions are made in conditions of uncertainty. Thus, strategic planning pushes physical planning to evolve, passing from rigid patterns to flexible models (Gastaldi, 2002).

One characteristic of physical planning is that of postulating a situation of equilibrium in the long term, which is to be reached through the appropriate deployment of measures which are instrumental in achieving this equilibrium. By contrast, strategic planning looks to the players' dynamism and competitiveness. As a result, strategic planning forces physical planning to extend its purview from the physical structures to the players and their relationships.

The regional or urban plan, finally, is a document produced by a local administration, developed and approved in accordance with the procedures established by law. It regularizes property rights to real estate and governs how players make use of the territory; as such, its connotations for control can be significant. The strategic plan, on the other hand, is not a regulatory instrument: it puts the stress on coordination and its legitimacy lies in the players' acceptance of its vision and goals. The strategic plan thus strives to be a plan for the entire city and not simply that of the local administration, though it recognizes the latter's leading role.

The main steps of a strategic planning process are (Bryson, 1988):

- framing of the issues;
- networking of the stakeholders; and
- evaluation of the actions undertaken.

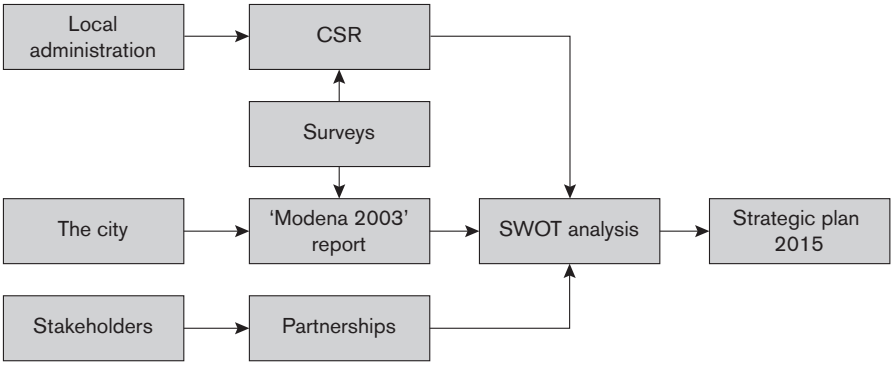
The framing and networking activities aim at:

- exploring the decision-making problem;
- identifying the strategic issues for the development of the vision of the future;
- analysing the relationships between the issues and the actors involved; and
- recognizing partnerships and strategies of the stakeholders.

The evaluation of the administrative actions aims to:

- analyse the consistency, effectiveness and efficiency of administrative action, as well as whether it is economical;
- support the decision-making process and consensus-building through openness and learning;
- increase strategic planning's potential for success, thanks to the regional governance thus achieved.

The process of evaluating administrative action must be circular and continuous, and designed to check that results comply with the initial goals that were established as the planning activity's targets (Bezzi and Palumbo, 1998). Given its aims, the



11.1 The components of the strategic plan of Modena showing the location of the SWOT analysis in the process

evaluation model is retrospective (i.e., it uses *ex post* and ongoing analyses), and is based on a holistic system of economic and performance indicators.[1]

The following scheme shows the role of the SWOT analysis and the CSR with reference to the strategic planning process adopted by the city of Modena (2004) in Italy. The CSR, based on the programming documents of the local administration and on specific surveys, furnishes inputs to the SWOT analysis, providing a critical understanding of the current strategies and of the obtained results. Data and qualitative information required for the development of the SWOT analysis are also obtained from a structural survey on society, population and the urban environment.

In the next sections, a more detail application of the SWOT analysis and the CSR will be illustrated with reference to the strategic plan of Modena (Figure 11.1).

THE SWOT ANALYSIS

The SWOT analysis first originated in the field of corporate management, but quickly gained importance in the territorial environment. It has been widely used in Italy in the fields of strategic planning, in the *ex ante* evaluation of development programmes in the south, and in integrated territorial projects. It offers a valid aid in the study of complex projects in that it deals with the problems in a compact and synthetic way, concentrating on the critical elements of the situation which are determinant to make decisions.

The strong and weak points of this analysis can be put down to the context involved in the intervention and the result, which is directly influenced by the instruments that are activated by the project. Strengths and weaknesses can be analysed in three stages. The first stage considers the tangible and intangible

resources available to the local administration and the city. The second deals with the strategies that the administration promoting the plan has used in the past. The third summarizes the main results that the administration and the city have achieved to date.

As for the first focus of analysis – i.e., the resources – the factors that are critical in the context may include social problems (an ageing population, large numbers of immigrants, etc.), economic issues (unemployment, industrial decline, etc.) environmental concerns (e.g., increases in air pollution) or even urban planning problems (poor accessibility, deteriorating building stock, etc.). The same is true of the strengths. Thus, for example, a well-developed voluntary sector can be a strength from the social standpoint, while from the economic perspective the manpower that immigration provides can be important. The particular organization of the urban mesh, green areas, and the presence of buildings with historical or architectural merits can all be strong points that can be used to underpin an urban renewal strategy.

An analysis of the administration's current strategies and its results, on the other hand, focuses on the administration's ability to pursue goals centring on administrative and institutional efficiency, economic and productive development, regional organization, environmental stewardship, cultural growth and social cohesion. This type of analysis can be carried out in various ways, even simply through the use of interviews or focus groups. In the cases dealt with here, on the other hand, it relied on CSR and an original evaluation model developed specifically for this purpose.

The other half of the analysis consists of exploring opportunities and threats. Here, the scope of the investigation extends from the city (and the administration that promotes the plan) to the relationships established between the city (and its administration) and the outside environment – that is, the surrounding region and other administrations. Unlike the earlier part of the analysis, which refers to the present, this stage is forward-looking.

In the first place, the opportunities and threats generated by external forces and trends must be investigated. For example, the law which enables municipalities to levy taxes on real estate independently represents an opportunity, whereas a law that interferes with political stability is a threat. Second, SWOT analysis turns its attention to the opportunities and threats associated with action by the city's users, and thus to the opportunities and threats created by the movements of tourists, immigrants, students attracted by the local university, etc. Lastly, the analysis considers the opportunities and threats generated by potential cooperation and competition. For example, competition from adjacent municipalities in attracting particular businesses, encouraging major shopping centres to relocate, or acquiring sizable government or regional investments can be a threat; while an agreement between several public bodies to create a light rail system can be an opportunity.

SWOT analysis in the strategic plan of Modena

The city of Modena (178,000 inhabitants in 2003) is home to nearly one-third of the province's population of around 630,000 people. Covering an area of over 180 square kilometres, the municipality of Modena accounts for 6.6 per cent of the province, which extends over a total of 2700 square kilometres, including around 1300 square kilometres of plains and 950 square kilometres of mountainous terrain. Located at the center of the province, the city of Modena is crossed by the Bologna–Milano rail line.

Strengths and weaknesses

Unlike other cities, *demographic trends* are not a cause for particular concern. While the number of inhabitants has remained substantially stable, the increase in the population's average age has been accompanied by an encouraging rise in the numbers of young people. Immigration from outside Europe has been considerable: between 1991 and 2003, foreign citizens residing in Modena increased from 1 to 7 per cent of the population.

Social services figure among the city's strengths in two ways: first, access to these services is recognized as a fundamental right of all citizens; and, second, they free household resources for the labour market as well as creating employment within the services sector itself. The principles which inspire the administration's action in the area of social services are integration and diversification. Integration aims at providing services of equal quality regardless of whether they are managed publicly or privately, whereas diversification is intended to broaden the range of service offerings in accordance with the public's needs. In the close mesh of relationships that link the economy and welfare, the widespread presence of *non-pprofit organizations* is another of Modena's distinguishing characteristics: almost 400 such associations are recognized by the municipality.

The rapid pace of change in society and the economy, however, has put a certain amount of strain on several services: the ratio of slots available in public or subsidized private day-care centres for children under three years of age puts Modena well ahead of the national average (26.8 as against 6 per cent), but the recent surge in births and the lack of government funding make it unlikely that the situation can be improved, or even that current levels can be maintained. Likewise, the increase in the number of families and the corresponding decrease in their size have upped a demand for housing – particularly for low-rent apartments – that the city is unable to satisfy.

According to surveys conducted by the local administration, *security and safety* are still perceived as a major problem, though the public's fears have been allayed

considerably in recent years, as the concerted efforts on the part of the administration and law enforcement authorities have succeeded in bringing down crime rates.

Another related problem is that of traffic safety. Since the late 1990s, the large number of traffic accidents in relation to the size of the resident population – one of the highest in Italy – has put traffic safety at the centre of public institutions' attention. Though the situation has not worsened over the last two years, and has indeed shown some slight improvement, it is still critical.

On the economic front, a strong work ethic, an ability to solve problems, and an awareness that business is the real driver for prosperity are all important aspects of the 'Modenese' character; traits that aided the population's transformation from farmers to entrepreneurs in the last century. This flair for problem-solving is also seen in industrial relations, where it helps prevent excessive social tensions.

The province's economy is characterized by a manufacturing system with an extremely large number of small and medium-small businesses. There can be no doubt that this local system's solidity, wide range and vitality are among Modena's chief strengths. However, despite its current strength, the local manufacturing system also has a number of potentially critical weaknesses. The first is its low level of capitalization and somewhat shaky financial base. Another critical problem arises from the difficulties that companies run by their founder and his or her family encounter when handing over the reins to the next generation.

A characteristic trait of Modena's economic and social system is the significant presence of *cooperative enterprises* and their associated structures. Engaged by their nature in joining the production of wealth with its distribution, cooperatives are a force in virtually all aspects of the local economy.

A critical weakness of the local socio-economic system lies in the *interrelations between production, research and education*, which are not as well developed as they need to be today. From the *regional standpoint*, one of Modena's strengths is its excellent access to a large and highly qualified territory as one of the urban complexes situated in the dense relational system of the Po Valley. However, Modena's accessibility is penalized by the congested condition of certain infrastructures and the lack of others – including logistical networks, railways and road systems – that are needed to serve the enormous volume of traffic generated by the ceramics industry and commuters, as well as by the poor connections between the city's road system and the higher-level infrastructure network.

The quality of the urban environment, and especially of its historical and cultural resources, are among the city's major strengths. Modena's city centre boasts a number of monuments of outstanding historic and architectural interest, offers a range of cultural facilities, and is a frequent venue for cultural and social events with considerable popular appeal.

Opportunities and threats

The external forces and trends that can generate opportunities for the city of Modena fall into four categories: political, economic, social and technological.

The *political forces and trends* are various. In the area of infrastructures, important opportunities can arise from the construction of Trans-European Network 6, Trans-European Network 1 and Corridor 5. The major threat in this area is that the government may not prove itself able to deploy a national infrastructure policy which assists Italy's integration with the rest of Europe by establishing firm priorities for allocating scarce financial and public resources. As for social services, should the national government decide to reduce the amounts it transfers to local bodies without providing alternative means of funding, the municipality of Modena might not be able to maintain these services' current quality and coverage.

The *economic forces and trends* are chiefly connected with the process of economic integration on the international scene. Over and above the difficulties now afflicting the worldwide economy, which penalizes exports by certain key sectors of Modena's economy, globalization threatens the local economy's position in mature sectors where the high cost of labour has hitherto been counterbalanced by high product quality.

The *social forces and trends* are largely associated with the arrival of new inhabitants. Immigration from non-European countries brings both threats and opportunities. On the one hand, surveys by the local administration reveal that a significant portion of the population regard immigration as a threat to its safety. On the other hand, Modena needs a planned flow of immigrants in order to increase its population, particularly in the intermediate age groups, and to achieve a stable demographic composition with a balanced age distribution. The new residents, moreover, can bring labour capacity in areas that now tend to remain uncovered.

The main *technological forces and trends* operate in a number of sectors. One of these is transportation and communication. Technological advances are creating favourable conditions for improving freight transport (logistics) and personal mobility both in the city (light rail) and outside it (high-speed/high-capacity rail).

The city's *users and consumers* are changing rapidly: Modena is fast becoming a multi-ethnic and multi-cultural city. While maintaining cultural and religious diversity, integration and inclusion policies must strive to promote an acceptance of Modena's system of values on the part of its new residents. Achieving this goal will provide an opportunity to maintain and perhaps improve the quality of life in the city.

There is a high level of *cooperation between the main local players*, who show an increasing willingness to work together to boost the competitiveness of Modena's economic and social system. Making the most of the synergies which can be generated by this willingness is one of the most significant opportunities, given the

particular structure of the local economy and the interdependence between the public and private sectors.

Major opportunities are associated with the growth of the university. Here, more effective policies should be put in place for attracting faculty, researchers and students to the city, thus strengthening a resource which is crucial to its vitality. Tourism can also hold significant opportunities for the city. The initiatives promoted in recent years by the local administration and business associations have not only met with considerable success but have shown that there is enormous potential for further growth.

The city's economic and social growth will hinge, to a large extent, on whether local groups in Modena will be able to cooperate with *public and private players at the supra-local level* and with *complementary cities*, or whether other cities and regions enter into competition with them. The Modena area, in fact, is a 'para-metropolitan urban system' located in a zone where there is a strong presence of complex urban systems connected at several functional levels by commuter flows and mutual exchanges.

CORPORATE SOCIAL REPORTING (CSR)

In strategic planning, an essential role is played by evaluation, or, in other words, by monitoring the effects of urban policies and setting new goals for the future. Evaluation fuels and gives structure to a circular and continuous process, which is designed to gauge the qualitative and quantitative extent to which the needs and expectations of the users – that is, the citizens and businesses who benefit from public services – are satisfied. There is thus a strong conceptual link between strategic planning and CSR, with clear methodological implications.

CSR is a retrospective evaluation process based on a system of performance indicators of economical, social and environmental nature (thus the term '*triple bottom-line approach*'). The aim is to evaluate the actions (decisions, projects, investments, etc.) undertaken by a local authority in the past in order to improve future decisions and eventually correct current mistakes (Hinna, 2002).

Key issues relating to CSR:

- it is a marketing and managerial tool for local governance, derived from the private sector with an ethical underpinning (e.g., eco-audit);
- it has evolved from 'one' to 'triple bottom-line' approach: economical, social, environmental;
- it is based on *ex-post* evaluation and *monitoring*; and
- it includes both tangible and intangible effects of the actions undertaken by the local authority.

The concept of CSR has evolved during the past few decades from a simple act of counting – that is, of listing information of a financial nature (one bottom line) – to a more sophisticated tool which links this information to the underlying process of actions (i.e., the accounting); comparing the required information with appropriate criteria or goals, in order to evaluate and produce evidence to the local community of the consequences of those actions (see Figure 11.2).

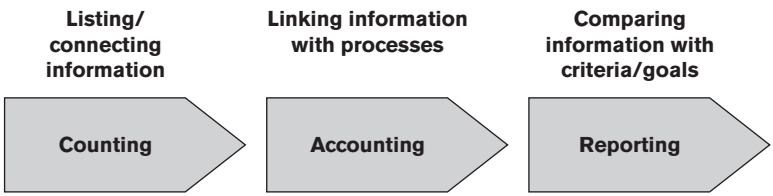
The evolution of social CSR has been reflected in the legal framework of both Europe and Italy. Table 11.1 illustrates this framework.

Such reporting stems from a need that is seen as increasingly vital: at the end of their term of office, in addition to presenting the economic results of their management as shown in the accounts, those who governed the city must present the public with a report consistent with the factors that were earlier identified as strategic, and document the extent to which stated objectives have been met.

Naturally, the structure of these disclosures and presentations cannot be based solely on the usual accounting methods, as it must essentially extend its review to the effects that the administration's actions have on the territory which it governs. Consequently, it must consider factors that are not contemplated by traditional financial accounting, including:

- the times needed to implement projects;
- the impact that the administration's action has had on the social and manufacturing fabric;
- the degree of satisfaction expressed by the users of the services managed by the administration; and
- other factors that measure management quality.

This is the direction taken by the reporting method illustrated below. This method has the advantage of satisfying the ethical requirements outlined above and, at the same time, of contributing to the development of the strategic plan. Performing a SWOT analysis, in any case, calls for specifying the current strategies of the public organ-



11.2 The evolution of the concept of CSR
Source: Viviani (2002)

Table 11.1 The legal framework

Italy		*EU*
Private sector	*Public sector*	*European Union*
Batelle Institute, Geneva, 1975 Legge Draghi, 1998 GBS-Task-Group Guidelines, 2001	L. 142/1990 Digs 77/1995 Digs 267/2000 (TUEL)	EMAS, 1993 for eco-audit Network for Building Social Responsibility in Europe, www.ebnsc.org Green Book, 2001, www.europa.eu.int/comm/off/green/index_it.htm Corporate Social Responsibility, 2002

ization which promotes the strategic plan's formation, and for verifying the results that are achieved.

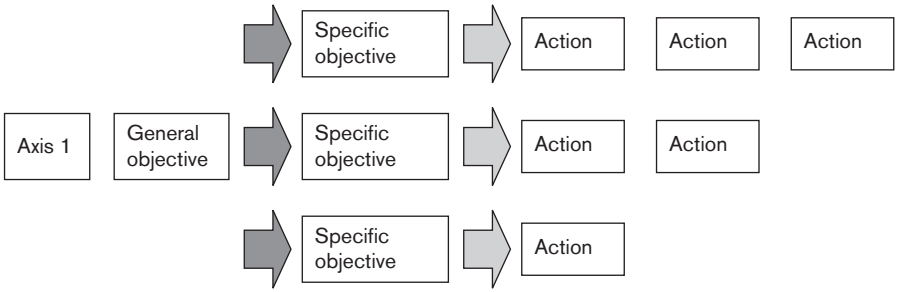
The reporting process of the city of Modena

The reporting process of Modena was developed using a number of steps, as follows:

1 An identification of the main actions and programmes undertaken by the local authority during the first and second administrative stages of the major provisional programme and its additional administrative documentation (i.e., the Italian: 'Programma elettorale', 'Relazioni previsionali e programmatiche').

2 A taxonomy analysis of the actions and programmes, as illustrated in Figure 11.3. The analysis consists of mapping the goals, as advised by Scettri (1999), and makes it possible to specify the logical path, or, in other words, the connections between the goals and the action taken by the administration to reach them. This analysis has identified five strategic axes, or macro-programmes (packages of programmes containing groups of projects), as follows:
   - Strategic axis n.1: 'Innovation'. It deals with economic development and technological and infrastructure endowment.
   - Strategic axis n.2: 'Urban quality'. It deals with environmental and physical quality, parks and greenery, waste management, energy consumption, transport and mobility and urban regeneration.
   - Strategic axis n.3: 'Social issues'. It deals with social integration, crime, sport, culture, tourism and citizens' rights.
   - Strategic axis n.4: 'Welfare'. It deals with education and sanitary policies (hospitals, nurseries, etc.).
   - Strategic axis n.5: 'Administrative issues'. It deals with an improvement of public services supplied to citizens.

3 The selection of a number of performance indicators for each action, related to four specific measures (named 'E-model') of:



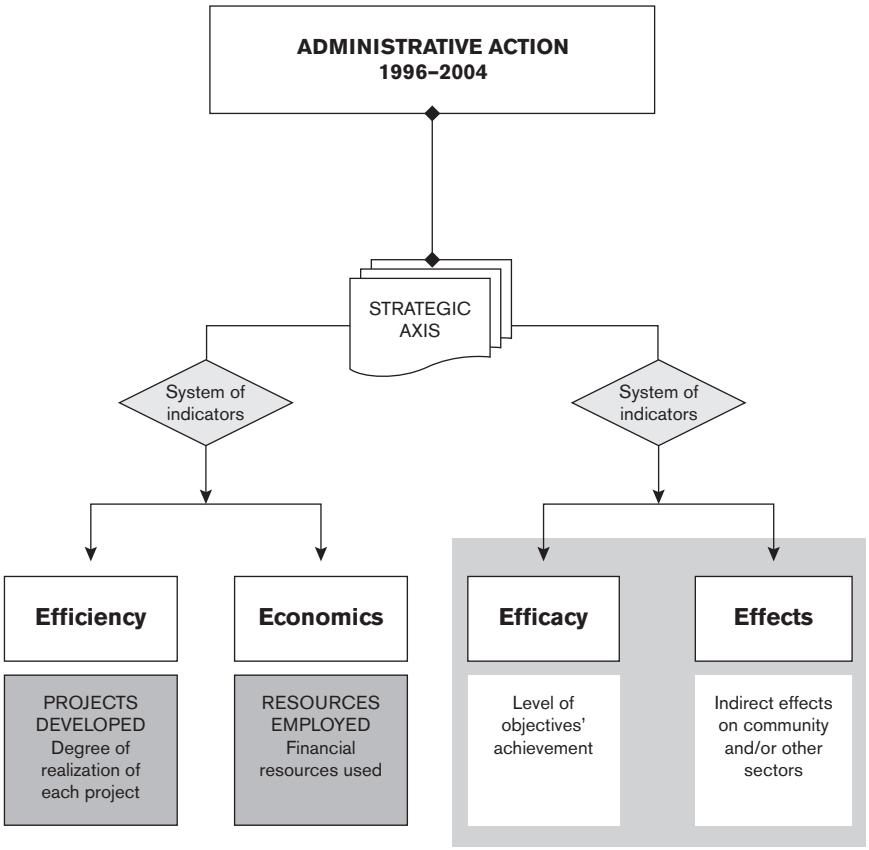
11.3 Example of taxonomy analysis
Source: Lombardi and Mambelli (2002)

- Efficiency. It deals with the managerial capacity of the local administration by measuring the number of projects which have been undertaken compared with those planned and their degree of realization.
- Economics. It measures the minimization of the financial resources used for the development of the projects.
- Efficacy. It measures the achievement of goals for each project.
- Effects on the community. It measures the benefits of each project on socio-economic sectors and on the community.

4 A measurement of each performance indicator in terms of percentage of decrease or increase in the period of analysis (1996–2004).

Figure 11.4 provides a graphical illustration of this model (named the '4-E Model'). This system of performance indicators provides a rich picture of the results obtained by the local administration during the years of activity by measuring the achievement of each target declared in the administrative political programme. The selection of indicators was specifically developed on the basis of a number of criteria, largely chosen from the principal international organizations on sustainability, such as OECD (1997) and the United Nations (UNCD, 1996):

- they must be relevant and fit for the purpose for which they are intended to be used;
- they must be reliable so that you can trust the information that the indicator is providing;
- they must be easy to understand, even by the people who are not experts in the field; and
- they must be based on accessible data where the information is available while there is still time to act.



11.4 A graphical representation of the model used for each strategic axis of CSR of the city of Modena

Source: Brandon and Lombardi (2005)

Efficiency and economics

The first stage of evaluation for the report took the form of determining the extent to which the investments financed in the 1996–2004 period were implemented. This made it possible to gauge the *efficiency* of the administration's action.

For each axis, Table 11.2 shows the number of completed projects and those in progress during the reference period (1996–2004). For all axes and areas of action, analysis indicated that an average of 57 per cent of all funded investments had been brought to completion and 43 per cent were still in progress.

Determining the efficiency of the administration's action also entailed analysing the investments promoted by the municipal authorities between 1996 and 2004,

Table 11.2 Implementation of the projects in each axis (1996–2004)

Strategic axes	*Completed*	*In progress*	*Total*
Innovation	69	49	118
Urban quality	109	68	177
Social issues	36	19	55
Welfare	59	37	96
Administrative issues	32	60	92
Total	305	233	538
Percentage	57%	43%	100%

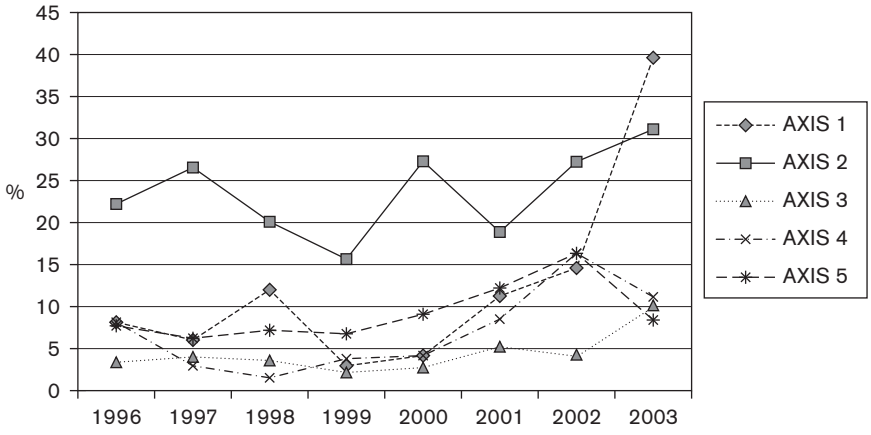
Source: City of Modena (2004)

which was followed by an analysis of the administration's current expenditures for the same time period. The purpose of the first analysis was to assess the resources employed to reach set goals. The second stage – analysing current expenditures – made it possible to achieve a better understanding of the administration's efforts to implement policies for strategic axes that generally differ from the major areas of investment. It is thus essential that the two analyses be considered in parallel.

As can be expected, the *resources employed* during the period in question are not distributed uniformly among the five strategic axes. The axis that accounts for the largest quantity of resources – 39 per cent of total investments – is the second, 'Urban quality', with a total of over 205 million euros in nominal terms, corresponding to 189.4 million euros at constant 1996 prices.[2]

In regards to the efficiency of the *investments promoted* by the municipal administration in terms of time (i.e., their implementation status), it was found that the total number of completed investments more than doubled (the increase was equivalent to 102 per cent at constant 1996 prices) between the beginning of the first term of office and the end of the second. The totals go from 49.9 million euros in 1996 to 117.8 million euros in 2003, corresponding to more than 100.8 million euros at 1996 prices. Investment trends, however, differed significantly in the administration's two terms of office. In the first term, investments were substantially stable, though levels were above those of previous years. At the time of the administrative elections between the first and second terms, investments were not able to hold to the level reached earlier. The second term was marked by strong growth: between 1999 and 2003 investments increased by 215.8 per cent at constant prices (249 per cent at nominal value) as a result of the administration's extremely energetic investment policy (Figure 11.5).

The analysis of the municipality's *current expenditure*[3] refers to fiscal years 1996–2003. Spending volumes in that period showed a total increase of 15 per cent in nominal terms, corresponding to a 2 per cent decrease at constant 1996 prices. In 2002, by contrast, there was a sharp decrease in spending in comparison with



11.5 Investments promoted by the local authority in each axis per year
Source: City of Modena (2004)

2001, with expenditures dropping by 10 per cent in nominal terms and 12 per cent at constant prices. The decrease in current expenditures that started in 2001 was substantially due to the 'Administration' axis, where the livestock market was closed and internal pharmacy services were discontinued. The cutback was thus particularly pronounced in this axis, with current expenditure dropping by 41 per cent at constant prices between 2001 and 2002.

Compared to the other axes, 'Welfare' was found to have a greater quantitative weight, accounting for 40 per cent of the total volume. Growth in this axis resulted from the increase in spending on education (in particular nursery schools, elementary schools and day-care centres), and in social services provided to families, immigrants, invalids and so forth. In the 'Urban quality' axis, the only appreciable increase between the first and second terms concerned housing policies. The axis which is least affected by the administration's current expenditure is 'Innovation', where no significant services are managed at the municipal level.

To gain an understanding of the *economics* of the administration's actions, the areas of action (specific goals) – where the administration monitors operating costs – were examined. Parameters used included trends for cost coverage, defined as the ratio of income to expenditure, and the operating deficit, defined as the difference between revenues and outlays (in euros and at nominal value).

The municipality monitors services with varying degrees of social impact. These services fall into four groups:

- Services operated at a significant deficit (these are services where the public interest is the primary consideration, such as education and family assistance).

- Services where the degree of coverage is higher, and approaches 50 per cent (chiefly swimming pools and sports facilities).
- Services which are managed with an eye to ensuring that costs and revenues break even (e.g., the school-meal service).
- Services where economical operation is the main priority: the degree of cost coverage is always greater than unity (markets and pharmacies).

Efficacy and external effects

The next step in evaluating the administration's actions consisted of analysing the indicators of *administrative efficacy*, which gauge the municipal administration's ability to achieve the desired results, and the indicators that measure the resulting benefits: that is, the indirect effects on the community and on other objectives. The time frame for processing these indicators was the period from 1996 to 2002, though in certain cases it was possible to extend it to 1995–2003 or, conversely, limit it to 1999, according to the availability of data.

Performance indicators referred specifically to the individual sectoral goals for each strategic axis. The heterogeneous nature of these indicators, which reflects the multiplicity of the actions envisaged by the administration in order to achieve its set goals, makes it impossible to present a concise, aggregate view of the results of this analysis, which focuses on each specific goal on an individual basis. Table 11.3 illustrates, as an example, the specific objective 'Public green', related to the general objective 'Sustainable city' of Strategic Axis 2 – 'Urban quality'.[4]

Table 11.3 Example of indicators for analysing administrative efficacy

Specific objective: *Public green*	*1995–1996*	*2002–2003*	*% Increase*
Efficacy indicators			
• Total public green (square metres)	3,819,375	5,834,323	52.76
• Public green per person (square metres)	21.81	32.62	49.56
• Number of trees of public domain	81,565	119,700	46.75
• Urban parks (square metres)	1,356,706	1,719,895	26.77
External effects			
• Irrigation plants	120	184	53.33
• Leisure equipment	370	700	89.19

Source: City of Modena (2004)

CONCLUSION AND FUTURE PERSPECTIVE

This paper has illustrated the SWOT analysis and the CSR for the city of Modena's strategic plan. Both of these methodologies have made use of urban (or sustainability) indicators.

Sustainability indicators usually aim to identify current urban problems, in order to assist the local administration decision-making processes. However, there are a number of problems associated with the current lists of indicators. Previous studies (see Lombardi and Basden, 1997; Lombardi, 1998) have also shown that they do not put the same weight on all the sustainability aspects recognized in the literature, but mainly on the issues of 'environmental sustainability', and specifically on the threats to the natural environment arising from such issues as mobility, transportation and decisions related to economic appraisal. The extensive literature available in this area has confirmed this observation (see references in Brandon and Lombardi, 2005). In turn, this also reveals a general imbalance in the decision-making process, due to an overemphasis on certain issues rather than others (Lombardi and Basden, 1997).

More specific criticisms are related to the availability of the information required. In Italy, in particular, there are structural shortcomings in the information base: the lack of adequate records makes diachronic comparison impossible (air quality, for example, has been monitored for only a few years), the reliability of crime statistics is undermined by chronic underreporting, and comparisons with past performance are often not feasible because of frequent legislative changes (i.e., in the procedures used to issue building permits, in local real estate taxation, in the time involved in developing and approving urban planning instruments, etc.). Despite all this, the use of indicators to evaluate the characteristics of the city and its administration is spreading rapidly, thanks in part to initiatives such as the Local Agenda 21 programmes, European Union initiatives (e.g., the urban programmes) and the urban audit indicators, which are being used to perform a sort of benchmarking for Europe's cities.

The method illustrated in this chapter played an important part in the development of Modena's strategic plan. Its significance lies in the fact that when preparations for the strategic plan got under way, the administration resolved not simply to look towards the future, ignoring the recent past, but brought the strategies that had already been implemented for this purpose into the equation, reviewing their outcome and taking the major investment projects that had already been agreed upon with other players as essential components of the strategic plan. The outlines of the city's future strategies were then traced from these foundations.

The formulation of the strategic plan can thus come into conflict with Italy's current electoral system for territorial bodies. In general, the administrations are interested in adopting this tool to govern cities and their provinces. However, electing mayors and presidents of provinces directly presupposes the existence of an electoral platform which enjoys public consensus, and the determination to implement it on the part of the elected candidates. This leads to two effects. The first is that the preparation of the strategic plan must essentially be connected with checks that the administration's programme is being implemented: hence the fundamental role of

social reporting. The second is that the strategic plan tends to be formulated halfway through or even towards the end of the administration's term of office, and is thus more of a legacy from the current administration to the next than a binding pact for the future.

Thus, CSR, as conducted in the case illustrated here, that is, independently of how instrumental it may be for the strategic plan – is an important step towards building a 'culture of results' at the city's administration. If the evaluation model is developed and put into practice at the beginning of the administration's term, moreover, it is also possible to overcome some of the limitations encountered when it is formulated and applied on an *ex post* basis.

The improvements that can be achieved start with the availability of *ad hoc* measurements for checking whether goals have been reached. In the case of Modena, for example, it was not possible to align programme goals and the results that were achieved, as the CSR was not linked to the administration's planning stage. This shortcoming is common throughout Italy. The aforementioned conflict can be avoided by fostering a 'culture of results' in the administration of Italy's cities. At the beginning of the administration's term, the evaluation model should be specified, and the monitoring system needed to implement it ought to be set up. At the same time, a work programme should be initiated for developing the mayor's electoral platform.

NOTES

1 However, the model is also frequently used for forecasting purposes (*ex ante* analyses), given that it provides valuable information for formulating the strategic plan.

2 The calculation considered changes in the ISTAT (Italian National Institute of Statistics) cost of living index as indicated on the website www.rivaluta.it.

3 This category includes work for the functions specified in Article 2 of Presidential Decree 194/96.

4 The general objective 'Sustainable city' in Axis 2 includes the following specific objectives: Local Agenda 21; environmental protection and redevelopment; water and sewage pipes management; energy saving; public green.

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Part III

Evaluating the Sustainability of Urban Development

12

The Search for Sustainable Communities

Ecological Integrity, Equity and the Question of Participation

Mark Deakin

INTRODUCTION

This chapter deals with some of the sustainable urban development issues that have not been fully addressed in previous examinations of the subject using the BEQUEST toolkit. It offers a critique of the market-led urban regeneration initiatives and the measures taken by the UK government to replace this with a plan led alternative, where strategic actions are based on a sufficiently 'place-based' knowledge of what communities must do to be sustainable. These critical insights shall be drawn from Research and Technical Development (RTD) actions taken under Framework 5 and 6 of the EC's Environment and Climate (E&C) and Information, Society and Technology (IST) programmes (Deakin *et al*., 2001, 2002; Curwell and Lombardi, 2005; Curwell, *et al*., 2005). The projects in question relate to the BEQUEST, LUDA and IntelCities programmes, and provide a number of insights into the critical role that networks, innovation and creativity play in building the types of partnerships which are successful in offering a sufficiently place-based knowledge of ecological integrity, equity and participation; that which underlies the democratic renewal of urban villages and modernisation of their neighbourhoods as sustainable communities.

THE SEARCH FOR SUSTAINABLE COMMUNITIES

Over the past decade, the assumption that interventions in the land and property market offer the best way to approach urban regeneration is something that has been subject to intense scrutiny and found wanting. This top-down approach to tackling urban regeneration has now been replaced with the more 'middling-out logic' of partnerships, with cities, regional development agencies and business seeking to lever resources from the private sector, and channel money, capital and professional expertise into the development of urban villages and neighbourhoods as part of the search for sustainable communities (Carley, 1995, Carley and Kirk, 1998; Barton *et al*., 1995; Hastings, 1996; Hall, 1997; Barton, 1997; Barton and Kleiner, 2000).

CASE STUDIES

Two case studies illustrate this change in approach.

The South East Wedge (Shawfair), Edinburgh, Scotland

The proposal to develop sustainable communities in the South East Wedge of Edinburgh is supported by a plan-led and environmentally friendly urban regeneration programme. The planning, development and design solution for the South East Wedge appears under the heading of 'sustainable communities'. Under this heading attention is drawn to the principles of sustainable urban development, upon which the regeneration should be based (Deakin, 2002, 2003a and b, 2004). In relation to the development of a sustainable urban regeneration process in the South East Wedge, it is argued that the vision of plan-led, economically viable and environmentally friendly settlements (urban villages and neighbourhoods) ought to be based on the following scenario:

- a distinctive urban culture;
- a spatially compact form;
- a strong landscape framework in a countryside setting;
- a high density of population;
- a balance of land use, economic and social structures;
- an energy conscious public transportation network;
- high levels of infrastructure and shared service provision;
- a pattern of settlement that is able to integrate existing communities with those emerging from the development; and
- a financial structure that is viable in the short-, medium- and long-term horizons.

These design features reflect the findings of the Urban Task Force (1999), which draw particular attention to the virtues of regeneration programmes developing urban villages and their respective neighbourhoods as sustainable communities.

Castle Vale, Birmingham, England

The vision of Castle Vale is of a regenerated, self-sustaining community, living in high-quality homes in a pleasant and safe environment. According to the master plan, this vision of Castle Vale can be realised by developing urban villages around two neighbourhoods (Madanipour, 2005). These urban villages are seen to transform Castle Vale from a high-rise to a low-rise settlement, and allow for the development of two distinctive neighbourhoods, where high-quality homes can be provided in a diversified structure of tenure, supported by other ancillary services.

As Madanipour (2005) points out, the biggest challenge faced is the physical transformation of Castle Vale from a high-rise, post-war public housing estate to a low-rise urban village-type settlement, comprising two distinctive neighbourhoods. In combining this physical transformation with the economics and aesthetics of the regeneration, Madanipour draws attention to the success of the master plan, with its vision and realisation as urban villages made up of distinctive neighbourhoods. While this draws attention to the success of Castle Vale as a regenerated, 'self-sustaining' community, with the master plan and vision to realise the development of urban villages around two neighbourhoods, Madanipour (2005) is also keen to point out that, the physical transformation, economics and aesthetics of the regeneration are insufficient in themselves to capture the social significance of the changes experienced. Turning to the question of what the physical transformation can help explain, attention is drawn to the emerging exchange value of the land and property making up the urban villages, and the use value of the neighbourhoods, along with the symbolic value, shared cultural experiences, positive image, confidence, trust and social cohesion the regeneration of self-sustaining communities can help realise.

THE EMERGING CRITIQUE

Many criticisms have been made of such initiatives. The following attempts to summarise them:

- The plan-led and environmentally friendly design solutions tend to be supported by professional experts responsible for developing the land and property that the design and layout of the regeneration programme advance, and upon which the urban villages and neighbourhoods are based.
- While aiming to be socially inclusive, the urban planning, land and property development, and design stages of the regeneration programmes tend to be market led, economistic and aesthetic, representing stakeholder interests, rather than developing the collaborative platforms that are needed to build the consensus and capacity which communities require to participate in the decision-making processes underpinning such developments.
- The short-term nature of such market-led, economistic and aesthetic decision making tends to bring the ecological integrity and equity of the design solution into question.

To answer these questions, we must shift the focus of attention away from physical capital and towards a more cross-cutting and integrated vision of the regeneration process, because this has the scope required to see the development of urban

villages and neighbourhoods as part of the ongoing search for ecological integrity and equity.

ECOLOGICAL INTEGRITY AND EQUITY

While these criticisms are extensive, the acid test as to their efficacy must be seen to lie with the fact that it is openly recognised that the focus on the physical transformation of the regenerated self-sustaining communities in question tends to underrepresent the social significance of the changes such developments seek to realise. This is because this particular conceptualisation of the role physical capital plays in the transformation is, by definition, insufficient and too light to carry the real economic and environmental weight of the regeneration programmes – too weak in that sense to support the economic and environmental weight of the urban regeneration programme and reveal the social significance of the change which such developments are seen to advance. In that sense they are criticised for being too neo-conservative, offering an overly economistic and environmentally deterministic representation of the transformation. They are criticised for relying too much on land and property markets, image and symbolic value to explain the transformation, and, as a result, not being able to demonstrate either the ecological integrity or equity needed to trust the regeneration and be confident about the ability of the urban villages and neighbourhoods to develop into the types of self-sustaining communities which are required under the policy initiative.

THE QUESTION OF PARTICIPATION

These criticisms tend to hold true because, when reviewing both the South East Wedge and Castle Vale experiments, it is evident that while both focus on the physical anatomy of the transformation, linked to the underlying economic and environmental issues, there is no such connection to the social experience of the change which is in question. This is because both accounts of the transformation are insufficiently networked, and, as a consequence, do not include the innovation and creative partnerships underlying the regeneration of urban villages and neighbourhoods as self-sustaining communities. So the question that emerges is: what key element of the transformation has been missed, or which component is absent? The answer to this question is not so much the market economics, or aesthetics of the transformation, but the networks, innovation and creative partnerships that make up the collaborative platform, upon which consensus is built around the ecological integrity, equity and participatory nature of the democratic renewal, needed for socially inclusive decision-making to institutionalise such values as a basic require-

ment of the developments (Healey, 1996a and b; Hastings, 1996; Roberts *et al*., 1999; Geddes, 2000; Holm and Wambui-Kamara, 2001).

Recognising that the turn towards land and property markets, economics and aesthetics of urban regeneration runs the risk of building a new kind of environmental determinism (which is passive in its representation of the public, engagement of citizens and empowerment of communities in participative decision-making) is critical. This is because it turns attention towards the role of social capital in the development of the collaborative platforms, consensus-building, ecological integrity, equity and democratic renewal, underlying the urban villages and neighbourhoods of self-sustaining communities. Moreover, in turning attention towards the social capital of collaborative platforms and consensus-building, it becomes possible to recognise the critical role networks, innovation and creative partnerships play in representing places, not only as sites of ecological integrity, equity and democratic renewal, but where socially inclusive decision-making can institutionalise the civic values required for the types of regeneration set out in the case studies, to develop as self-sustaining communities under the current policy initiative (Deakin, 2005).

THE SOCIAL CAPITAL OF SUSTAINABLE COMMUNITIES

So what comprises the social capital of sustainable communities? Contrary to Bourdieu (1986), and following Putnam (2002), Halpern (2005) suggests there is a threefold definition of social capital. It is proposed that it is made up of: 'a network, a cluster of norms, rules, values and expectations; and sanctions' (Halpern, 2005, p. 10). Here, communities form networks and cooperate with one another in accordance with the norms, rules and expectations of their constituents, and have the power to sanction actions taken by fellow members who operate outside the said norms, rules, values and expectations. These in turn are also seen to provide the linkages between members of the community, which bridge the norms, rules and values, and that bond them together in accordance with the accepted sanctions both for and against their actions. Halpern also argues these three components of social capital, along with their linking, bridging and bonding qualities, are multi-scalar and exist at the micro, meso and macro levels.

Turning to the policy implications of the aforesaid for sustainable urban development, Halpern (2005, pp. 308–309) draws particular attention to the use of information and communication technologies (ICTs) as forms of social capital. Here, he sets out a number of prerequisites of regeneration based on the development of networked communities. These are examined in terms of the potential networked communities, virtual organisations and managed learning environments have to develop the ecological integrity and equity of regeneration, as part of

the ongoing process of democratic renewal needed for socially inclusive decision-making to institutionalise such values and, as such, meet the requirement for the development of urban villages and their neighbourhoods to be sustainable. Here it is stated:

> while the vast majority of community ICT experiments have to date not met the conditions above [the ecological integrity, equity, democratic renewal, needs and requirements] . . . ICT networks may have great potential to boost local social capital, provided they are geographically 'intelligent', that is, are smart enough to connect you directly to your neighbours; are built around natural communities; and facilitate the collection of collective knowledge. They have the potential to connect the work-poor and work-rich.

THE METHODOLOGICAL TWIST IN THE DISCUSSION ON LEARNING COMMUNITIES

The methodological twist in Halpern's (2005) discussions on the potential of learning communities lies in the fact that this examination of networks, virtual organisations and their managed environments precedes that of the planning, development and design of urban villages and their neighbourhoods, and serves to provide a setting for the ecological integrity, equity and democratic renewal of the regeneration, which underlies this particular modernisation process. These types of networks strengthen linkages and consolidate the norms, rules and values of the urban villages and neighbourhoods to which they are connected. This provides the strength needed for the planning, development and design of the urban villages to carry the economic and environmental weight of the neighbourhoods, forming the content (vis-à-vis, ecological integrity, equity and democratic renewal) of the regeneration underlying their modernisation as self-sustaining communities.

NETWORKING, INNOVATION AND CREATIVE PARTNERSHIPS

So, where are the learning communities with the ICT-enabled networks that boost the norms, rules and values of local social capital? Are they sufficiently innovative, geographically 'intelligent' and smart enough to connect the 'urban villagers' directly to their 'neighbours' and do this by virtue of being based on creative partnerships, which are in turn built around 'natural' communities? Contrary to popular belief, such urban regenerations are not limited to the UK, but can be found throughout Europe. Examples can be found in Edinburgh and Glasgow, but also in Dublin, Helsinki and Reykjavik. The following shall give a very brief account of the networks, innovation

and creative partnerships underlying the urban villages and neighbourhoods of the geographically intelligent, as well as smart learning communities promoting the regeneration of Wester Hailes and Craigmillar as part of Edinburgh City's Social Inclusion Partnerships (SIPs).

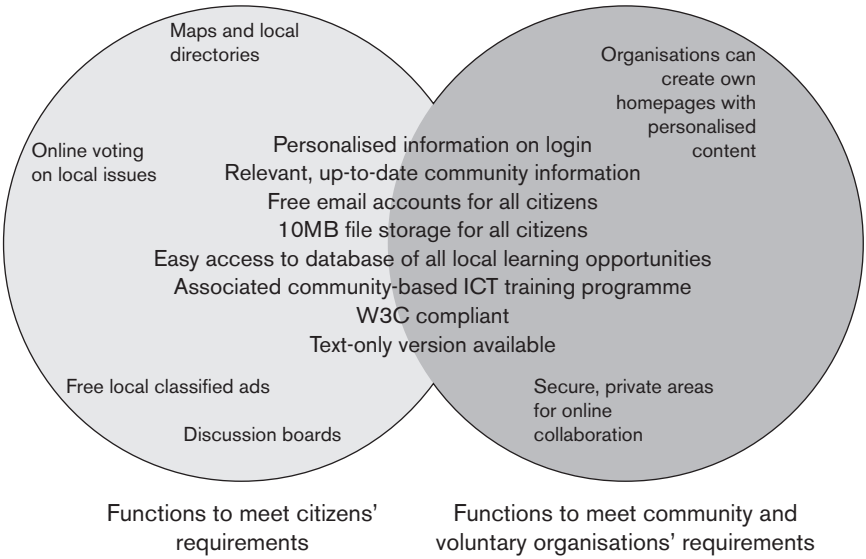
MYEDINBURGH.ORG

As an ICT-enabled network, myEdinburgh.org is innovative for the fact that it provides an information portal and community grid for learning. The information portal provides citizens with the user-friendly tools to access learning opportunities. The community grid provides the infrastructure needed for citizens to learn about the planning, development and design of their cities, and become engaged in local decisions taken about the promotion of urban villages and neighbourhoods as sustainable communities under the city's urban regeneration strategy.

The Edinburgh Learning Partnership, comprising representatives from local government agencies, the education sector, voluntary groups and private sector businesses, provides the creative basis for the networking and innovation the portal and grid provide. As a city-wide collaboration, the venture seeks to encourage and facilitate initiatives aimed at widening access to and participation in learning activities, particularly those enabling the disadvantaged. The key aims of the partnership can be summarised as follows:

- To provide citizens with ICT taster sessions in local, accessible venues; specifically targeting citizens identified as 'digitally excluded' (for example, citizens living in Edinburgh's SIPs).
- To support community and voluntary organisations in the procurement, usage and development of ICTs, including training staff to access and maintain the information portal.
- To develop a Community Grid for Learning (CGfL).
- To use the grid for learning as a means to build capacity and engage citizens in local decision-making about the ecological integrity and equity of planning, development and design proposals.
- To transfer the knowledge required for communities to participate in the planning, development and design of urban villages and neighbourhoods, and democratic renewal needed for this process of modernisation to govern the development in question.

Figure 12.1 demonstrates the various tools and functions of the portal and CGfL. These include: free email accounts and file storage; extensive tools for user

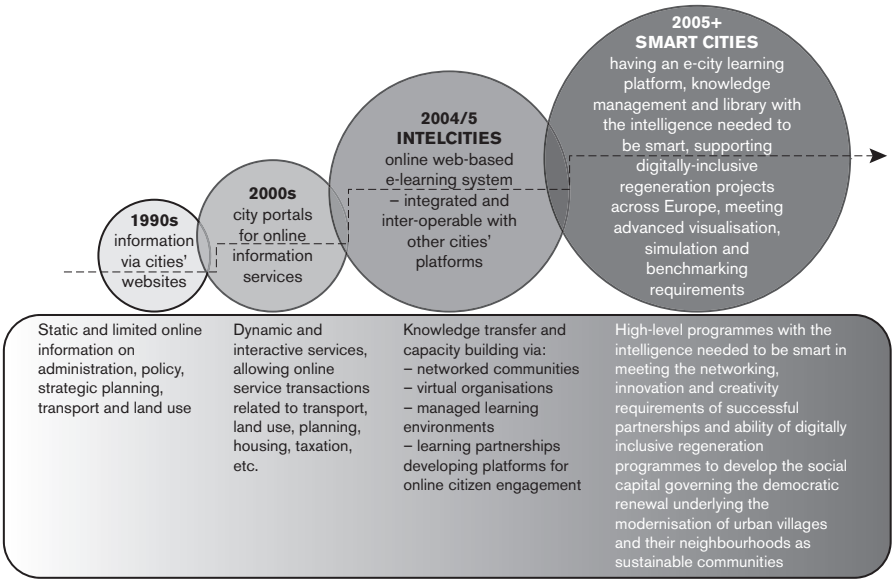


12.1 The tools and functions of myEdinburgh.org's information portal and community grid

personalisation; online collaboration space for voluntary and community-based organisations; and site compliance with W3C accessibility guidelines.

It is this type of dynamic engagement that IntelCities has sought to use as a baseline standard for the e-learning, knowledge-transfer and capacity-building requirements of the digitally inclusive urban regeneration programme being developed under this integrating project (Curwell *et al*., 2005). Funded under Framework 6 of the IST R&D programme, this project has sought to integrate the information portal and CGfL of myEdinburgh into the UK's e-Learning Strategy, and use this as the intelligence needed to be smart in building the capacity – ecological integrity, equity and democratic renewal – required to govern over the development of urban villages and neighbourhoods as modern, self-sustaining communities.

Figure 12.2 sets out the RTD the integrating project (IP) has carried out to integrate myEdinburgh's portal and the CGfL. As the illustration shows, the said portals and CGfL have been augmented and turned into e-learning platforms, supported by knowledge management systems and digital libraries for developing the ICT-enabled networks, innovation and creative partnerships. These are capable of being intelligent and smart in how they go about supplementing the physical capital of economic and aesthetic actions with the social capital, which actively represents the public, engaging citizens and empowering communities in participative decision-making, aimed at establishing the ecological integrity and equity of the much needed norms, rules and civic values governing the democratic renewal of this modernisation



12.2 The development of intelligent and smart digitally inclusive regeneration programmes

process that lies at the heart of the urban villages and neighbourhoods making up self-sustaining communities.

THE E-LEARNING, KNOWLEDGE-TRANSFER AND CAPACITY-BUILDING TECHNOLOGIES

The resulting e-learning city platform makes it possible for the online service applications being demonstrated to be integrated with the knowledge-transfer and capacity-building technologies needed to meet the interoperability requirements of such developments. This allows the citizens, communities and organisations in question to collaborate and build consensus on the competencies, skills and training required for the development of online services needed to support the urban regeneration programmes of the urban villages and neighbourhoods in question. Together, the networks, innovation and creativity of the partnerships organising the development of these technologies, skills and training exercises make it possible to engage citizens, and show how active participation is both intelligent and smart because it develops the social capital – norms, rules and civic values – governing the ecological integrity and equity of the democratic renewal needed to support the design of urban villages, meet the layout requirements of neighbourhoods and support their modernisation as self-sustaining communities.

This is made possible because:

- The ICT-enabled networks are innovative in developing an e-learning platform based on open-source technologies, interoperable across online services, citizens and communities.
- Recognising the need for a formal learning community, this high-tech, digitally enabled network, in turn, allows for the planning, development and design of the online services needed to support digitally inclusive regeneration programmes.
- This allows the ecological integrity, equity and democratic norms, rules and values of the applications being demonstrated to be integrated with the e-learning, knowledge-transfer and capacity-building technologies, supporting the development of urban villages and their neighbourhoods.
- This allows the citizens and communities to collaborate and build consensus on the competencies, skills and training needed for the development of online services required to support the quintessentially civic values of the regeneration programme, urban villages and neighbourhoods they seek to govern as part of this modernisation.
- Together, the networks, innovations and partnerships create the trust needed to engage citizens, and show how the active participation of communities in digitally inclusive decision-making is both intelligent and smart in developing the social capital – norms, rules and civic values – of the ecological integrity and equity of the democratic renewal underlying the modernisation.
- Here, the ecological integrity, equity and participatory nature of the democratic renewal takes the form of consultations and deliberations in government, and citizen-led decision-making as members of an online community.
- The resulting platform supports the distribution, storage and retrieval of learning material; provides the skill packages and training materials needed for such engagement and participation to bridge the digital divides that currently exist; builds the capacity for inclusive decision-making; and transfers the knowledge required by citizens and communities to bond them together as the socially cohesive measures of this modernisation process. The building of the capacity for ecological integrity and equity takes the form of decisions over the development's footprint, biodiversity and environmental loading; the democratic renewal being content to promote the shift from government- to citizen-led decision-making. This, in turn, involves the use of advisory groups, discussion boards, opinion polls, focus groups, petitions, citizens' juries, ballots and online voting as part of the visioning and scenario-building exercises, gaining consensus on the norms of energy consumption, waste and emissions, as a set of

rules underlying the ecological integrity and equity of the democratic renewal governing this modernisation.

- The standards of knowledge-transfer and capacity-building are drawn from a review of leading city information portals across Europe and benchmarking of their respective CGfLs against stakeholder requirements. The intelligence embedded in these applications should be smart enough for the physiology of the built environment to have the strength needed for the planning, development and design of the urban villages and neighbourhoods to carry the real economic and environmental weight of the democratic renewal (vis-à-vis, ecological integrity, equity) governing this modernisation process, and present them as self-sustaining communities.

All this is in contrast with what we learn about how urban villages and neighbourhoods are traditionally represented as self-sustaining communities, and is based on a less neo-conservative representation of the regeneration process; one that is grounded in the social capital of the networks, innovation and creativity of the partnerships upon which the development of such places rests. The following reflects on how the learning communities of ICT-enabled networks, innovations and creative partnerships are successful in building the capacity of the digitally inclusive regeneration process needed for social capital to meet the requirements of the urban villages and neighbourhoods in question. Having done this, it goes on to outline what can be learnt about the critical role the networking, innovations and creative partnerships play in the search for a sufficiently place-based knowledge of the democratic renewal governing the modernisation of the sustainable communities initiative, currently so popular with policy-makers.

CONCLUSIONS

It is clear that physical capital finds it difficult to address matters concerning the ecological integrity, equity and democratic renewal of the urban villages and neighbourhoods underlying their regeneration. This is because the legacy of urban villages and neighbourhoods is neo-conservative, too closely linked with the physicality of the transformation, and not sufficiently connected to the social capital underlying their modernisation as sustainable communities. Based on this critique, there is a clear and pressing need for the urban planning, development and design of the regeneration process to integrate the ecological integrity and equity of democratic renewal, not just in terms of employment and work, but by bridging more extensive social divisions in digital literacy, skill bases and competencies. This is because digital literacy, skill bases and competencies are not only key in providing access to economic and

cultural opportunities but provide the collaboration, consensus, capacity-building and knowledge-transfer exercises around which citizens become engaged and communities are empowered to participate; and it is this that bonds them together in the search for ecological integrity and equity as part of this process of democratic renewal.

In turning attention towards the social capital of collaborative platforms and consensus-building, it becomes possible to recognise the critical role networks, innovation and creative partnerships play in representing places; representing them not only as sites of ecological integrity, equity and democratic renewal but as locations where socially inclusive decision-making can institutionalise the civic values required for the regeneration process to develop urban villages and neighbourhoods as self-sustaining communities under the current policy initiative.

Having outlined an ICT-enabled network that is innovative in the sense that it provides an information portal and CGfL, this chapter set out the creativity of the partnerships successful in organising the development of these technologies, skills and competencies. These partnerships are successful because they make it possible to engage citizens and show how active participation is both intelligent and smart, in the sense that they develop the social capital, norms, rules and civic values of the ecological integrity, equity and democratic renewal, not only needed to support the design of urban villages or meet the layout requirements of neighbourhoods, but to govern the process of modernisation, under which they become self-sustaining communities.

The aforementioned points to new priorities and focuses attention on the critical role networking, innovation and creative partnerships play in successfully bringing the public sector's position on the development of a sufficiently place-based knowledge into sharper focus. This, in turn, requires that the predominantly market-based, economic and aesthetic understanding of the regeneration process be supplemented with a knowledge of the norms, rules and sanctions of the social, cultural and civic values underlying the ecological integrity and equity of the democratic renewal governing the modernisation of urban villages and neighbourhoods as self-sustaining communities.

These critical insights indicate:

- Questions about the critical role of networking, innovation and creativity of partnerships have previously remained unanswered because of the tendency for policy-makers to assume they are resources that can be easily assembled, and which can be left to develop as virtuous circles of mutually reinforcing actions.

- This underestimates the extent of the resource base needed to build partnerships and for them to be successful in meeting their capacity building and knowledge-transfer requirements.
- Many such partnerships tend to represent little more than short-tem measures at self-help and exercises in communities learning about the economics of how to 'pull themselves up by their own bootstraps', and practising the so-called self-help aesthetic, as opposed to basing their actions on a knowledge of the social, cultural and civic values underlying the ecological integrity and equity of the democratic renewal governing the modernisation of urban villages and neighbourhoods.
- Lacking the networking, innovation and creative partnerships needed to acquire the requisite social, cultural and civic values governing this modernisation means the traditional neo-conservative representation of regeneration must be seen as offering an insufficiently place-based knowledge of urban villages and their neighbourhoods; this, in turn, undermining their claims to represent self-sustaining communities.

These critical insights challenge convention and ground what is understood about sustainable communities in a sufficiently place-based knowledge of the critical role networking, innovation and creativity play in building partnerships that are successful in regenerating urban villages and their neighbourhoods as self-sustaining communities.

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13

Governing the Sustainability of Urban Development

Krassimira Paskaleva-Shapira

INTRODUCTION

This chapter describes an SUD governance toolkit for governing the sustainability of urban development. An argument is put forward for the need for such a governance toolkit and its instruments are outlined: the governance framework, the protocol and the assessment methods advanced as a collaborative platform for governing decisions taken about the future of urban development.

The author's assertions as to the structure, form and content of the toolkit are drawn from case-study material demonstrating how the governance of SUD works in urban tourism and cultural heritage. Case-study research is used to underline the value of the governance framework, protocol and assessment methods as tools for evaluating the sustainability of urban development. The focus of the chapter is on how the new ways of using alliances and partnerships in (re)development mark significant steps forward in governing the sustainability of urban development.

URBAN SUSTAINABILITY

Worldwide urbanisation is one of the most powerful forces influencing sustainability. In the countries of the European Union, the convergence of new public management[1] with civic engagement and citizenship creates new challenges for reforming public institutions, strengthening governance and achieving sustainability (Agranoff and McGuire, 2004; Denhardt and Denhardt, 2002; Ferlie, 1996; Fortin, 2000; Lane, 2000; Kettl, 2000; Pollitt and Bouckaert, 2004). Urban governments are faced with major responsibilities in addressing these challenges. To meet the expectations, they need to be equipped with the most up-to-date knowledge and advanced management tools available. The world of research is rich in resources and novel approaches and the SUD governance toolkit developed in this volume aims to continue in this vein and mark a step-change in how we go about evaluating the development of urban sustainability.

In Chapter 12 Deakin showed how the interdisciplinary language adopted for the BEQUEST toolkit, the framework and the process by which the said stakeholders can 'beat a path' to SUD and proceed to 'stay on track'. He also illustrated

how sustainable communities offer the opportunities to manage growth in development that are plan-led and where ecological integrity and participation enable a balance to be struck between growth management, development planning, settlement models and design solutions which meets the governance requirements advanced by those responsible for evaluating the futurity of the proposals. This chapter aims to go further and show how BEQUEST provides a toolkit – a framework, set of protocols and assessment methods for cities to manage the sustainability of urban development based on the principle of participatory decision-making.

SUD, THE BEQUEST FRAMEWORK AND URBAN GOVERNANCE PARADIGM

Within both central and local government throughout Europe, there is a strategic agenda to transform the delivery of public services radically through the adoption of new management tools and approaches. Likewise, as the demands of the knowledge society increasingly penetrate the public sphere, governments in Europe and throughout the world weigh up the use of these tools to remodel democratic practice and transform relations between citizens and the public sector. Addressing these challenges in many European cities, where competitiveness and sustainable development interface with politics and governance in a complex and active arena of systematic policy change requires advancing the principles of 'good governance' in urban management. In this context participation in decision-making is considered key to good democratic urban governance (Boddy and Parkinson, 2004; Cavallier, 1998; Haus *et al*., 2004; Lawrence and Kotter, 1974; Paskaleva-Shapira *et al*., 2002; Pierre, 2000).

This section of the chapter aims to provide a framework of understanding SUD governance with regard to the relationships between the BEQUEST toolkit components – the framework, protocols and assessment methods from the governance perspective – by linking SUD to innovations in the creation of value throughout European cities and the connections this forges between government and local citizens.

Deconstructing sustainability: the BEQUEST approach

The BEQUEST project has provided a cohesive description of the definition and methodology of SUD developed within the research network. The resulting overall vision of SUD is that of a relative, adaptive process in which the current urban fabric is gradually adapted over time to suit more sustainable lifestyles (Bentivegna *et al*., 2002). This broad definition is applied in this chapter to outline the general framework of SUD governance and the assessment methods involved in evaluating the sustainability of urban development. The concept and vision of urban governance are

presented in regard to the specific objectives of the BEQUEST toolkit and the key policy challenges of SUD governance are defined in respect to the 'good governance' principles. Finally, an attempt is made to provide answers to questions SUD governance continues to raise. First, however, sustainability needs to be deconstructed.

In the new century, the fundamental economic, social and technological development sets the stage for a new urban dynamic. As European societies become more complex and interdependent, all dimensions of sustainable development should be pursued together (Ciccone, 2002; Ciccone and Hall, 1996; EC, 2002; Graham, 1999; Lovely *et al*., 2002; Mitchell, 1997). In the urban environment, where development is complex and diverse, a holistic approach is necessary to address the challenges. A four-dimension value matrix of sustainable development must be employed to reflect the aspirations of all individuals and groups of society interactively and interdependently.

The economic dimension is central to urban sustainability. Globalization and transition to a knowledge society have considerably strengthened the position of the cities as nerve centres of the 'new economy' (Castells and Hall, 1994). Cities, with their diverse economies, often form the incubation environment for new developments, economic innovation and creative processes (Franke and Verhagen, 2006; Hall, 2004; Healey, 2004; Jacobs, 1984; Landry, 2000). Key challenges to the economic sustainability of cities are economic viability of the community, urban additionality, business profitability, corporate and locational competitiveness and allocational, productive and dynamic efficiency. Recent globalization and 'informalization' of society have further sharpened urban competition (Ritchie and Crouch, 2000; van den Berg *et al*., 2004). Reconciling urban competitiveness with sustainable development objectives and approaches poses a new test for urban developers. Novel management approaches are necessary to address the issue. The 'glocalization' concept, which defines urban competitiveness as based on local assets, capacity and the ability of cities to deliver global competitiveness at a local level, while seeking far-reaching sustainable development goals, offers an alternative (Brenner, 1999; Pacione, 2005; Smith, 1999; Swyngedouw, 1997).

The environment and resource use dimension of sustainability is the one that keeps us most busy. In the new century, dematerialization of production and immaterialization of consumption and lifestyles, green entrepreneurship, sustainable lifestyles, responsible living, corporate responsibility and sustainable communities are key tenets of urban sustainable development (Dobson 1998; Holden, 2004; Hunter and Haughton, 2003; Munda 2005; Nijkamp and Opschoor, 1997). The social dimension is the one that provides for social progress and quality of life, better education, new forms of employment and labour equality, access to jobs and social inclusion, stakeholder participation, urban governance, prevention of segregation

and poverty and benefits for all (Fusco-Girard, 2003; Polèse and Stren, 2000; Satterthwaite, 1997). The cultural dimension, in multicultural and united Europe, is increasingly more important for SUD (Norton and Toman, 1997; Throsby, 1997). Some of the challenges to cities in the modern world include appreciation and respect of cultural diversity and social cohesion, empathy with place and communities, trust and security, cultural identity, citizenship, exchange and share of cultural services and products and heritage communities (Drakakis-Smith, 1995)

These multi-level and diverse SUD pursuits provide cities with the incentive to invest in their overall attractiveness as the 'customers' of the cities – citizens, businesses and visitors – often put high demands on the quality of the business, living and visiting environment (Braun and Meer, 2000). Urban sustainability hence reflects in the overall attractiveness of cities where quality of life is a key benchmark of progress (Mudacumura *et al*., 2005). Raising its standards can become a driver for urban change and governance. Addressing the challenges, however, requires reorganizing the capacities of the cities: that is, their ability to work with their partners (public and private, internal and external) jointly to generate innovative ideas and plans and to implement the policies that create the conditions for cohesive and sustainable urban development. In turn, this leads to the need to build urban partnerships and alliances to match the enormity of this task.

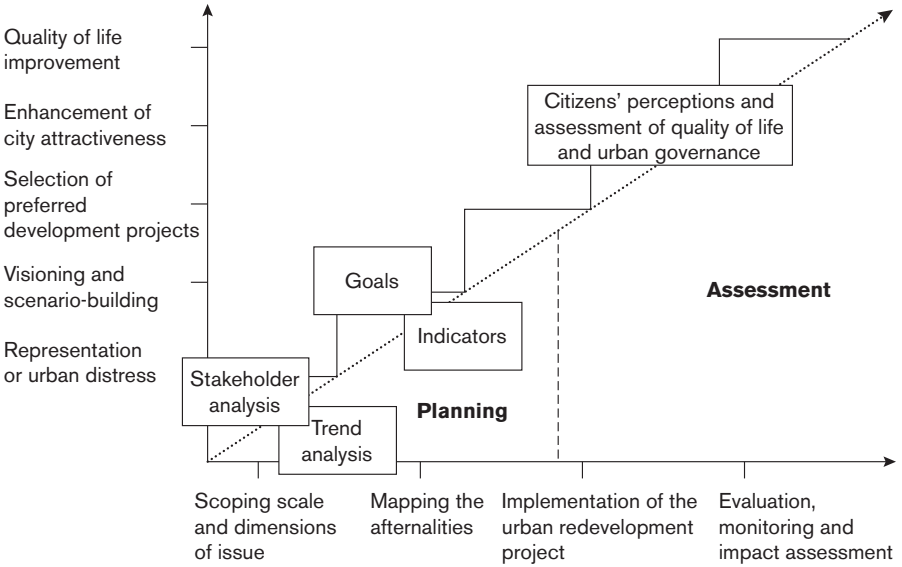
As the sustainable well-being of all citizens is a primary concern of local government, the latter is expected to play a major role in shaping such partnerships by developing new participatory models of government. Creating the political and social support to implement the necessary policies becomes a critical part of the process.

Cities and governance in the knowledge society

In the modern world of high-tech information flows and global competitiveness, urban scientists debate the role of cities in knowledge societies. 'Do places still matter?' ask many. To what extent are knowledge production processes place-bound and city-specific? Are there relationships between physically experiencing and mentally constructing the city? (Helbrecht, 2004).

In the literature on cities, innovation and creativity, there are generally two conceptual models: one that sees the world from the point of view of abstraction and representation, and another that looks at the world from the perspective of the concrete, experience and dwelling. While both views are helpful as theoretical perspectives to analyse the changing role of cities in the new economy, we focus on the second vision of cities in the knowledge-based societies. This will allow us to emphasize the urban governance agenda in these new and powerful centres of knowledge and learning in which government's mission is perceived as knowledge creation and application: that is, the use of knowledge as a strategic resource of

urban development and steering its application in tackling the wider economic, social and environmental problems faced by urban communities (including the sustainability agenda). Together with the notion of cities as places for innovation and creativity leading to enhanced urban fortunes (Hernández-Murillo, 2003), these concepts of knowledge creation and application will be fundamental to developing the SUD governance toolkit as a decision support tool for cities and a mechanism for stakeholder engagement and participation in urban decision-making (see Figure 13.1).



13.1 The urban community and government decision-making axis

Source: Based on Deakin and Allwinkle (2005)

Building sustainable cities: from urban management to urban governance

The cultural approach to the urban management of developed capitalist states consists of sharply contrasting and incompatible angles in the *technocratic*, *market* and *public participation approach* (Rydin and Pennington, 2000). In this chapter, we take forward the participation approach considered central to achieving the urban sustainability agenda particularly in the European representative democracies, where citizens seek to exercise their rights in democratic deliberations, and decision-making and post-materialist value orientations, along with the resulting governance policies, are seen to have better prospects for success than in other market-oriented societies. The participation approach, however, calls for a radical shift from government-delivered urban management practices to urban governance of decision- and policy-making.

It should be emphasized that urban governance in particular differs from the broader governance agenda, which has tended to concentrate on macro-levels, in that it focuses on the meso- and micro-levels. It also differs from the urban management perspective of operation and maintenance of infrastructure and services, because it acknowledges that one should not ignore the complex social and political environments in which these services are being provided.

'Good governance' therefore should be concerned not only with good urban management but with the interactions between the stakeholders in the city. Therefore, it is at the planning and assessment level of urban (re)development that governance mostly applies. Here, the political, contextual and legal dimensions need to be considered in relation to one another. In this chapter the UNCHS (Habitat)'s Urban Governance Campaign's 'bottom-up' definition of urban governance is adopted because it is intrinsically linked to the long-term goals of sustainability and the creation of new public value: namely, the assumption that urban governance is the sum of the many ways individuals and institutions, public and private, plan and manage the common affairs of the city. Here it is represented as a continuing process through which conflicting or diverse interests may be accommodated and cooperative action can be taken. It includes formal institutions as well as informal arrangements, and the social capital of citizens within 'good urban governance' can be characterized by seven interdependent and mutually reinforcing norms:

- sustainability in all dimensions of urban development;
- subsidiarity of authority and resources at the closest appropriate level;
- equity of access to decision-making processes and the basic necessities of urban life;
- efficiency in the delivery of public services and in promoting local economic development;
- transparency and accountability of decision-makers and all stakeholders;
- civic engagement and citizenship;
- security of individuals and their living environment.

While the operational principles supporting these principles need to reflect the wider regional conditions, their implementation ought to be grounded in the local urban planning and management approaches. Hence, implementing good governance in cities and metropolitan areas requires enabling local leadership and the endorsement of democratic and participatory processes (Peters and Savoie, 1998; Stoker, 2000). Public authorities, because of their democratic mandate, have to be in the front line of this to promote these objectives. Governance can be taken as a means to a goal where government is seen as a public organization set up by society for the purpose

of pursuing its development objectives. Governance thus must reflect the organizational mechanisms, processes and policies for deploying good public management by government, supporting and promoting effective and efficient interaction, cooperation, transparency, decision-making and networks with the local actors. Enjoyment of public consent and appreciation constitute the source of a government's legitimacy. From this perspective, the chance, but also the threat, of governance within the city is related to the exploitation of the value of a wide participation of citizens, businesses and associations in governing in terms of distributed knowledge and practices (Davis and Meyer, 2000; Miller and Dickson, 1998; Munda, 2004; Rhodes, 1997).

The important thing to note about this distributed knowledge is that it highlights the rise of a new socio-economic scenario based on the networked society, which must be taken into account by urban governments if they are to meet tomorrow's challenges. Viewing the challenge governance sets us in this way, we can thus assert that the BEQUEST toolkit can drive the development of urban communities through its partners' knowledge of participation and future governance. Accepting this, the key message is that SUD governance has a future in modern democracies, particularly in urban communities and smaller neighbourhoods, where collective consciousness and values from the place of residence are articulated into the environmental debate over the quality of life. Thus the proposition offered is that, contrary to some theories, sustainable development is not doomed in large cities and metropolitan areas (e.g., Fagin and Jehlicka, 1998), but is something which can be fostered. This is because in many proactive communities, where there is an ingrained culture of localism (Baker and Jehlicka, 1998), local authorities can serve their communities by promoting a participatory democracy, even when the outcomes of such decision-making are seen to work at the expense of the wider national interest. To the degree that European cities manifest such institutionalized collectivism and communal trust, their value systems can practically benefit a flourishing participatory democracy of this kind.

GOVERNANCE AS AN INSTITUTIONAL AND PARTICIPATORY ISSUE OF URBAN GOVERNING

Governance as an instrument of new public management

The discussion has revealed that governance poses two main challenges: government innovation and stakeholder participation. Urban management thus becomes an issue of reinventing the way in which cities and citizens interact and transform government processes, provide community leadership, enable economic development and reinvent the role of government itself in society (Pierre, 1999; Osborne and Gaebler, 1992; Stoker, 1999; UN, 2006). Addressing these challenges in European

cities requires advancing the principles of 'good governance' in public management where participation in decision-making becomes vital to democratic urban governing. Cities nowadays are faced with the need to focus more on building efficient and accountable public sector institutions, rather than simply providing discrete policy advice. Creating functional public institutions that are accountable and are capable of sustaining development becomes central to public sector reform necessary to facilitate organizational and knowledge management changes, innovation and inclusive decision-making (Agranoff and McGuire, 2004; Arnkill *et al*., 1996; Denhardt and Denhardt, 2002; Ferlie, 1996: Ferlie *et al*., 2001; Fortin, 2000; Lane, 2000; Kettl, 2000; Pollitt and Bouckaert, 2004).

Governance as a platform for urban partnerships and networks

Reforming public institutions and strengthening governance also require fostering trust and transparency through collaboration, partnerships and networking (Brindley, 2000; Painter *et al*., 1997; O'Toole, 1997). Inclusiveness becomes part of both, the city vision and strategy. Participatory decision-making processes appear as essential means to achieve the 'inclusive city', a place where everyone, regardless of wealth, gender, age, race or religion, is able to participate productively and positively in the opportunities that cities have to offer (Kaufmann *et al*., 2003).

The SUD governance toolkit developed next highlights the key challenges of these urban topics. Its aim is to enhance the knowledge and capacities of municipalities and those working in the field of urban governance to improve and institutionalize participatory urban development approaches in their practices.

SUD GOVERNANCE: THE EUROPEAN CASE

This section uses a PICTURE Project study (Paskaleva-Shapira *et al*., 2004) to describe urban governance and SUD in one specific sector – cultural tourism. The latter is one of the fastest-growing industries in many European cities which leaves marks on urban spaces and affects the lives of many urban stakeholders. The sector is largely diverse and fragmented, forming extended links and relationships in the local economy and community. Hence, governance of the sector is found to be strongly influencing SUD. The findings result from a 2004 study[2] in forty-one small and mid-sized cities in Europe which aimed to identify the key trends and needs of local authorities for improving sectoral management as part of a six-point action strategy for governance, namely:

- governance framework;
- inclusive management;

- strategic policy;
- stakeholder participation;
- government leadership;
- sustainable partnerships.

The discussion focuses on key constructs of SUD governance that were identified in the previous sections. Given the complex nature of cities, it is argued that urban cultural tourism requires a city-wide management approach based on the governance principles and strategic vision of sustainability and competitiveness of the city destination (Paskaleva-Shapira, 2007).

Governance framework

There are wide differences in cultural tourism management approaches across Europe. Variations are by nations and cities, based on cultural specifics, factor diversity and development priorities. On the state level, administrative and management traditions are defining. For example, in France, urban municipalities and public tourism offices are predominantly in charge; in Germany, private tourism bureaux have the control; and in the United Kingdom, multi-actor partnerships manage sectoral development. On the urban level, differences are wide too, often regardless of the regional or national conditions. Local contexts and community priorities, structures and processes define the process.

While larger cities have already shown success in governance of the sectoral management, small and mid-sized towns lag behind, often lacking the resources and the capacities to promote participation in urban development. The majority have generally failed to deal with tourism comprehensively, in the context of the larger urban economy. This is evident despite the fact that sustainable development appears strong on their policy agendas – 80 per cent have developed SUD plans, 56 per cent use Local Agenda 21 for Tourism, and 70 per cent include sustainability-driven objectives in urban policy-making. The latter, however, are often scattered among other urban areas and have thus failed to link issues of viable urban economy, city competitiveness and community quality of life, for example, with tourism development. Missing, too, is comprehensive data on the sector's dynamics that can support effective, city-wide decision-making.

The potential benefits of governance to the urban community are not well known. Some sectoral impacts have attracted attention – tourist satisfaction (88 per cent), local economy (76 per cent) and residents' quality of life (71 per cent) – but other important issues of sustainability, such as responsible tourist behaviour, environmental quality and long-term viability of the community, are outside the current scope. Tourism, culture and heritage professionals often do not understand the need

and rationale for establishing a governance framework of urban cultural tourism that can ensure more sustainable management of the sector (58 per cent).

Inclusive management

In smaller cities, the governance of cultural tourism depends strongly on the type of organization in charge of management. While local authorities focus on the interests of the overall community, private tourism bureaux, by contrast, place the attention predominantly on the needs of the tourists. Overall, however, day-to-day management practices are limited to basic clean-up and maintenance of the cultural sites and facilities. Issues of cultural authenticity and identity, regarded as key to service quality, are considered infrequently (less then 50 per cent). Integrated impact assessment, carrying capacity and ecological planning, as innovative tools of effective management, are uncharacteristic (18, 19 and 39 per cent, respectively). The lack of an integrated approach to tourism management generally results from the lack of public participation in urban development, including cultural tourism (31 per cent). Other key factors are insufficient skills, resources and expertise as well the lack of knowledge-transfer by national, regional and local organizations and research institutions.

As a result, cultural tourism management is practically failing to yield large-scale benefits for smaller urban destinations in Europe. Innovative approaches and styles are necessary to create new value to the services offered by the sector. Monitoring urban quality of life can be used to measure success and facilitate a consensus among the stakeholders. Educational and learning programmes can help create responsible tourists and engaged local residents. Quality control schemes can improve day-to-date practices, engaging the citizens and visitors alike. Impact assessment and other innovative management tools can be employed to ensure long-term viability of the sector and the larger urban economy.

Strategic policy

The majority of smaller tourist cities in Europe are predominantly concerned with tourism's economic and fiscal policies (81 per cent), aiming at the refurbishment of the facilities (84 per cent), or the opening of new museums and galleries (74 per cent), for example. Few have policies dealing with larger urban cultural districts or historic centres (37 per cent). Almost none use comprehensive policy approaches for urban cultural tourism as part of the larger economy and urban spatial development.

In contrast, almost all (91 per cent) cities wish to pursue long-term goals in tourism policy and promote activities which can result in cross-cutting urban outcomes (97 per cent) – destination development (87 per cent), job creation (77 per cent) or tourism marketing (71 per cent). Different stakeholders, however, manifest different interests. While public authorities generally underplay the importance of the urban

quality of life objectives (44 per cent) and the built environment (39 per cent), local tourism boards and private companies give them more credit (75 per cent each). Policy approaches differ by professional affiliation as well – while tourism experts display a greater concern in the sector's impacts on the whole city (77 per cent), culture and heritage professionals appear much less concerned (33 and 17 per cent, respectively). As a result, policy objectives among the stakeholders are often conflicting, hence the need to deal with the issue collaboratively, as part of the long-term urban agenda.

Stakeholder participation

Involving stakeholders in the urban affairs of cities is considered important by the majority of small cities in Europe: 89 per cent promote local culture and tradition of collaboration and partnerships; 80 per cent include the stakeholders in decision-making; and 94 per cent inform the public on important issues regularly. Almost all feel the need to work with local actors in tourism as well (97 per cent). Yet, this does not necessarily mean the participation of the public as a whole; rather, it usually concerns other public and business organizations. Moreover, when it is about cultural or sustainable tourism, the objectives are much more modest, especially where private companies are concerned.

Relationships in cultural tourism are both formal (83 per cent) and loose (49 per cent). Private companies (80 per cent), economic development organizations (63 per cent), tourism bodies (59 per cent) and local commissions and boards (55 per cent) opt for flexible and informal arrangements, in which the public is generally uninvolved. Less than one-third of the cities tend to engage with citizens in formulating issues of local importance, defining the actions and the criteria for evaluation. Even less so in identifying the solutions (7 per cent) and solving the problems (21 per cent). In collaborative practice, cities resort to the traditional instruments of dialogue (77 per cent) and consensus building (57 per cent). Objectives are sustaining the process of collaboration or improving services to meet the growing demand (61 per cent). Dealing with conflicts in governance is another objective (64 per cent), driven by private (74 per cent) and economic (67 per cent) interests in particular. Citizens' and tourists' considerations are given marginal importance. Religion, language, ideology and race are uncharacteristic of the process.

Government leadership

Urban cultural tourism involves many activities and stakeholders. While local government appears in the best position to set the governance management style, tourism councils (47 per cent) and private companies (34 per cent) are in fact in control. Yet, the majority of the stakeholders recognize the importance of government steering the process (84 per cent) and the promotion of local public–private

partnerships to enhance performance (87 per cent). The evidence is overwhelming, with 71 per cent of the existing partnerships established by local authorities to: seek common goals (69 per cent), share interests (66 per cent), ensure communication (60 per cent), share finance (51 per cent), monitor results (49 per cent) and divide resources and responsibilities (43 per cent). Dealing with risks is, however, less important (9 per cent) and benchmarking performance is marginal (13 per cent). So despite the growing need, local government maintains a marginal role in key areas of urban cultural tourism. Its role in promoting collaboration, openness and sharing the benefits among the wider community, however, seems indispensable, hence the need for greater involvement, either through direct management or by delegating responsibilities to public–private tourism organizations, providing local government's steering position in the pursuit of long-term urban goals is maintained.

Sustainable partnerships

In the majority of cities, partnerships in urban cultural tourism are formed as a result of pressure from businesses and other stakeholders. Other factors, such as increasing public awareness, addressing issues of sustainable development or strategic policy demands, have less weight (in their order of ranking). While the majority of public authorities (67 per cent) generally engage in partnerships with other urban actors, only 46 per cent of them are in tourism, and even fewer (36 per cent) in cultural tourism. Partnerships for sustainable tourism are also on the low side (13 per cent). Private companies engage in partnerships less (29 per cent) than other types of tourism organizations. Very few urban partnerships are set to integrate tourism with culture and heritage specifically. Their leadership is often fuzzy and management issues are usually poorly settled, leading to a loss of openness (74 per cent) and undermining the efficiency of the cooperation process. Public organizations and NGOs are rarely involved (33 per cent) and evaluation and monitoring of the partnerships' impacts are generally sparse (less than 50 per cent), hence effective management is often a concern. Yet, the appreciation of the potential outcomes of the partnerships is high, largely perceived as greatly beneficial to the local tourism sector (94 per cent), community (79 per cent), regional development (62 per cent) and the urban environment – ecosystem, townscapes, public spaces, historic and cultural heritage and green spaces. Culture and heritage are particularly highly rated (4.09 and 3.59 on a 1–5 scale), as are cultural life (4.03) and cultural diversity (4.0). Urban quality of life is favoured with regard to city attractiveness (4.06) and aesthetic quality (3.69). Poverty and health are less important (2.53 and 2.48, respectively) and city image is of no special interest.

By and large, the PICTURE study has revealed large differences between the urban stakeholders in management priorities and long-term handling of urban cultural

tourism. Local knowledge and expertise are unequally spread among the organizations involved. Public authorities are more concerned with broader community goals but innovative management tools, such as evaluation, monitoring and impact assessment, are more commonly used by the private actors, highlighting the need for innovative governance styles that can ensure a more integrated management of the sector from a city-, actor-wide perspective and that supports diverse and far-reaching community goals. Progress in destination visioning, strategic framework and stakeholder participation can be viewed as both an improvement and challenge to traditional forms of decision-making in many small and mid-sized cities in Europe. Establishing a strategic policy framework for collaboration by the local authorities to engage with the actors thus becomes a pressing necessity.

SUD GOVERNANCE TOOLKIT

This section develops a framework of understanding SUD governance in regard to the relationships between the BEQUEST toolkit components – the framework, protocols and assessment methods – from the governance perspective. It achieves this by linking the actions being promoted under the name SUD to innovation and value creation processes in cities based on new knowledge and creative processes resulting from collaboration, partnerships and networking. The assumption is made that delivering the BEQUEST toolkit is based on public participation and socially inclusive decision-making about the future of urban development.

The toolkit: design and development

Our objective is to design a multi-dimensional and multi-actor SUD governance toolkit that can facilitate an enhanced role and contribution of BEQUEST in the achievement of 'good governance' principles as part of the European policy agenda on a networked knowledge society (EC, 2002). It specifies the requirements of governance processes and structures involving effective and participatory interactions, relationships and networks of local governments and the local actors in city-governing processes. It also defines the steps and strategies on the key issue of governance policy development and delivery relevant to building and developing a knowledge infrastructure that is able to link the administrative with the strategic planning of city management techniques and connect these to the participatory governance processes of urban stakeholders. This holistic approach to governing and policy builds on leading evidence from existing governance research in Europe and elsewhere.

The framework: linking urban sustainability goals to participatory planning and assessment

As identified in the introduction, the SUD governance toolkit is predicated on the relative, adaptive process view of SUD in which the current urban fabric is gradually adapted over time to suit more sustainable lifestyles. The equity principle declares that the pursuit of SUD requires transparent and inclusive decision-making in which participation is given a particular significance to achieve not just a desired balance between competing needs at any one time but to do this continuously over a long period. This notion serves some of the main constructs of SUD, mentioned earlier. SUD governance also links to urban quality of life as a mere projection of urban sustainability and a key factor in the inter-competitiveness of cities in their medium- to long-term future. Finally, the need to develop an effective and balanced SUD policy depends on three determinants of governance:

- the institutional factors concerned with the management and organization of urban systems;
- their organization into the public–private modes of cooperation; and
- forms of participation with the empowerment necessary to gain the faith of citizens in governance in general and urban (re)development in particular (Bentivegna *et al*., 2002).

Hence, the SUD governance toolkit provides a collaborative platform for multiple urban stakeholders to develop the networking and partnering process to govern our cities. It offers the potential to link the stakeholders, both professional bodies and members of the public, previously disconnected from one another as a community. What is more, in the absence of compulsory measures, it helps engage stakeholders in discussions not just on the sustainable development issues (for example, ecological integrity and equity) but institutional issues of participation based on their underlying concerns about the governance of urban futures. It is drawn from three sources:

- research in the field of urban governance, multi-stakeholder partnerships and networks of sustainable development;
- collaboration and close partnership with the BEQUEST team in other European research and policy projects;
- the combined knowledge of the participants of three European projects dealing with different forms of urban governance and sustainable development; namely, the SUT Governance R&D project on governance and effective partnerships for sustainable urban tourism; the PICTURE cultural tourism innovative urban policy project; and the IntelCities integrated (research) project that has

developed the City e-Governance Policy Framework necessary for the development of a democratic, ambient, integrated, city-wide intelligent information and communication system known as the e-City Platform.[3]

These three multi-disciplinary European projects have elaborated innovative forms and instruments of local governance to improve urban development involving the principles of sustainability and participatory decision-making. These include some novel methodological models and tools, including holistic governance frameworks, defining the key categories, factors, indicators and factors of success to assist in understanding and catalysing governance styles, along with the partnerships for the sustainable management of tourism, culture, heritage and e-governance and other such urban challenges.

The SUD governance protocol: guidelines for community and governance decision-making

The SUD governance protocol describes collective procedures that urban actors can consider to make their cities more sustainable and attractive places in which to live and work. The proposed checklist is not prescriptive. Instead, it offers actions that practitioners working in the different urban development fields – planning, service development, design, construction and operation – can consider, for, in a number of those activities, a good level of professional consensus needs to be established for the SUD actions necessary to address environmental, economic, social and institutional issues in interrelation (Camagni *et al*., 1998).

Earlier the main norms of 'good urban governance' were described. Below, some practical means of implementing these norms in urban (re)development are proposed.

Sustainability in all dimensions of urban development

This equates to balancing the social, economic and environmental needs of present and future generations, based on a long-term, strategic vision of sustainable and prosperous cities. Here the task is to:

- carry out consultations with stakeholders to agree on a broad-based long-term strategic vision and mission statement for the city, using tools such as strategic city planning;
- use consultative processes such as Local Agenda 21 or environmental planning and management to seek an agreement on acceptable levels of resource use, applying the precautionary principle in situations where urban activity may adversely affect the well-being of present and/or future city 'customers' – residents, business or visitors;

- ensure economic viability and social well-being by promoting participation of all citizens in the life of the city, present and future;
- promote diffusion and transfer of new technologies, expertise and knowledge to boost innovation and creativity and create additional value for the community;
- consider urban distress reduction strategies in local development planning.

Subsidiarity of authority and resources to the nearest appropriate level

This means sharing the responsibility for service provision based on the principle of subsidiarity, consistent with efficiency and the cost-effective potential for the inclusion of the citizens in urban governance. This produces the need to:

- decentralize powers and spread local democracy to improve the responsiveness of policies and initiatives to the priorities and needs of citizens;
- consult the stakeholders to develop constitutional frameworks for delegating responsibilities, powers and resources to the city and/or the urban actors;
- empower cities with sufficient resources, capacity and autonomy to meet their needs and responsibilities;
- adopt local legislation to translate constitutional amendments in support of subsidiarity and to empower civil society to participate effectively in city affairs and promote the responsiveness of local authorities to their communities;
- create transparent intergovernmental monetary and knowledge transfers and central/regional government support for the development of administrative, technical and managerial capacities of the cities and their urban partners;
- promote multi-stakeholder cooperation, knowledge transfer and peer-to-peer learning from best practices;
- provide for local competitive advantages and global positioning.

Equity of access to decision-making processes and the bare necessities of urban life

This translates into sharing power to achieve equality in the access to and use of urban resources and opportunities. Here the objective is to:

- aim for 'inclusive cities' to provide for everyone – the poor, disadvantaged, the young and the elderly – with an equitable access to quality employment, education, livelihood and other basic services;
- allow women and men to participate as equals in all urban decision-making, priority-setting and resource-allocation processes;
- create fair and strategic regulatory frameworks;

- establish mechanisms and structures for consultations with and participation of citizens in policy development of service provisions and regeneration activities.

Efficiency in the delivery of public services and in promoting a viable urban economy

This places an obligation on cities to build local capacities in government, businesses and the communities and to use comparative advantages cost-effectively in the management of the resources in pursuit of sustainable city competitiveness. Here the task is to:

- promote integrated urban planning and inter-sectoral city management;
- adopt clear objectives and targets for the provision of public services that maximize the contributions of all sectors of society and encourage participation in city affairs;
- deliver and manage public services through partnerships with the private and civil society sectors;
- develop and implement legal and regulatory frameworks that encourage new business investment, incubation and knowledge clusters.

Transparency and accountability of decision-makers and citizens

Making local authorities accountable to their citizens is a fundamental tenet of good governance and an important means for helping stakeholders understand who is benefiting from decisions and actions. All stakeholders have to embrace this principle because citizen participation is key to accountability and to ensure corruption has no place in urban governing. Urban leaders are to set examples of high standards of professional and personal integrity by:

- applying laws and public policies in a transparent and inclusive manner;
- promoting an ethic of service to the public among officials, public servants and community leaders;
- promoting the public's right of access to city information;
- organizing regular and open consultations with citizens on important urban issues, through such mechanisms as transparent tendering and procurement procedures, participatory budgets and the use of monitoring mechanisms in decision processes;
- using internal independent audit capacity and annual external audit reports that are publicly disseminated and debated;
- involving the public in the onset of urban planning and paying attention to citizens' perceptions of urban quality of life and governance;

- seeking public information in monitoring, measuring and assessment of urban development projects;
- creating public feedback mechanisms, such as an ombudsman, hotlines, complaint offices and procedures, citizen report cards and procedures for public enquiries and/or public interest litigation.

Civic participation and citizenship

Citizens are the main wealth of cities and are both the object and the means of sustainable urban development. This implies that living together is not a passive exercise: in cities, people must actively contribute to the common good of the community. Thus, they must be empowered to participate effectively in decision-making processes by:

- promoting strong local democracies through free and fair municipal elections and participatory decision-making processes;
- establishing the legal authority for civil society to participate effectively through such mechanisms as development councils and neighbourhood advisory committees;
- making use of mechanisms such as public hearings and surveys, town hall meetings, citizens' forums, city consultations and participatory strategy development, including issue-specific working groups;
- promoting an ethic of civic responsibility among citizens through such mechanisms as 'city (or neighbourhood) watch' groups;
- undertaking city referenda concerning important urban development options.

Citizens' security and safe living environment

This means that cities must ensure that every citizen is provided the right to live in a peaceful and stimulating environment, free of conflicts, crime and natural disasters, by involving all stakeholders in the prevention, preparedness and management of urban risks, problems and disasters. Social-mediation and conflict-reduction intermediaries can be involved in the process, and cooperation between the agencies involved should be encouraged by:

- creating a culture of peace and encouraging tolerance of diversity through public awareness campaigns and citizens' involvement;
- creating safety and security through consultative processes based on the rule of law, cooperation and prevention;
- promoting security of livelihoods, particularly for the urban poor and disadvantaged, through appropriate legislation and access to employment, education and training;

- implementing environmental planning, management and assessment methodologies based on stakeholder involvement;
- raising awareness about the risk of man-made and natural disasters and involving the public in formulating local emergency management plans, based on reduction of risk, readiness, response and recovery.

For these actions to take place, an organizational and cultural change must occur to bring about the transformation in the local organizations responsible for SUD, in both the manner they work and in the relations they have with the wider community of stakeholders: that is, in the way urban governance is deployed.

The assessment methods: measuring and monitoring governance to improve quality of urban life and city attractiveness

It is generally a challenge to translate the elements of SUD into practical tools. It is even more difficult to have benchmarks for each element. The level of success of enforcing SUD governance, however, should be measured primarily by assessing the level of success in implementing the principles of 'good urban governance'. The key components of this are described below:

- *Strategic vision*: the extent to which urban leaders and the public have a broad and long-term perspective on good governance, sustainable urban development and the future of their city, along with a sense and action plan for what is needed for such development;
- *Rule of law*: the level of legal frameworks being adequate and enforced fairly, in relevance to the present and future;
- *Participation*: the level of different social groups having a voice in local decision-making;
- *Transparency*: the extent to which processes, institutions and information are directly and equally accessible to all stakeholders, and relevant information is provided to understand and monitor governance processes;
- *Responsiveness*: the capacity and scale of institutions and processes trying to serve the urban stakeholders;
- *Consensus-reaching*: the extent to which different interests are curbed in order to reach a broad consensus on what is in the best interests of the group and, where possible, on policies, procedures and actions;
- *Equity-building*: the level to which all urban citizens have the opportunity to improve or maintain their well-being and long-term opportunities;
- *Effectiveness and efficiency*: producing results that meet needs while making the best use of resources and local potential;

- *Accountability*: the extent to which decision-makers in government, the private sector, organizations of civil society and citizens are accountable to the public, as well as to the institutional and individual stakeholders.

In general, the governance assessment methods of any urban (re)development initiative need to involve clear and consistent procedures and set out the specific requirements for the different stages of development, to ensure proper consideration of sustainable development before, during and after each action. Along with the stakeholder analysis in the planning stage, the consideration of the citizens' perceptions and views on the process, the results and impacts on the urban community are also important. Using quality of life indicators to assess success or failure of the actions is essential to identifying progress and success. Assessment methods should also provide for greater integration across professional and subject boundaries in urban development. Developing an SUD governance index by cities and their stakeholders can help governance assessment and monitoring and improve the indicators of performance.

There are two broad types of evaluation measure available to governance: quantitative and descriptive (Kaufmann *et al*., 2003). Two main types of indicator exist: one measuring 'performance' and providing assessments of the quality of governance; and a second measuring 'process', which describes the institutional inputs that produce governance outcomes. Indicators can also differ in terms of 'specificity' regarding the aspect(s) of governance being assessed and of their 'close links to the SUD outcomes'. The latter is of particular relevance to urban governance, but most empirical evidence linking governance to development outcomes is based on very non-specific indicators, thus saying very little about specific governance reforms that will improve the development outcomes. Indicator selection is a matter of institutional choice. Evaluations, however, are generally likely to be more accurate when based on a larger number of experts and aggregation of indicators that are strongly correlated with one another.

CONCLUSION

This chapter has attempted to examine the governance of SUD. An effort was made to roadmap the new ways of governing for urban sustainability. The cumulative effect of partnerships and networking was emphasized to link SUD to public value creation and urban innovation. The need to reform public institutions and processes and strengthen urban governance has been noted and emphasized as pivotal to such institutional reform. Moving public participation and inclusion to centre stage has emerged as a key notion of implementing 'good urban governance'. Improving and

broadening community learning are promoted as a key driver of knowledge creation and use of others' experiences to achieve a better quality of life and long-term urban sustainability.

The SUD governance toolkit set out in this chapter has attempted to fulfil two main objectives. First, a closer dialogue between all stakeholders from the point of view of sustainability. Second, a greater integration across various urban decision-making professionals and disciplines. As a result, urban policy-makers, planners and developers may see themselves as change-makers, working in partnerships and networks using flexible and integrated approaches that adjust to local conditions and the requirements and specifics of the local community, while seeking global positioning and competitiveness.

This is what SUD is about – a concerted action and not just formulation of theoretical constructs, where stakeholders get together to build a common vision and methodology for development actions integrating the environmental, social and economic dimensions of urban sustainability. Therefore, there is the need for institutional governance structures, the moral and ethical codes of governance, to tackle this head on (Deakin *et al*., 2002). Raising the urban governance agenda further, however, requires strategic future changes, among which capacity-building for 'good urban governance' is the key. The latter should be directed to improve the performance of all local stakeholders to implement the sustainability agenda. First, one main question needs to be addressed – how to build the capacity required for better urban governance in the most effective way? This should be more than just training, for example. Major changes in the institutional context of urban governance must be introduced: for example, local–central government relations and the legal framework for urban development and partnerships with civil society, community-based organizations and the private sector. It is important to link human resource development with the other two main dimensions of capacity building – organizational development and network management.

Working with strategic partners is the key to achieving change. The proposed SUD governance toolkit supports participatory urban decision-making and good urban governance to help realize the vision of the 'inclusive city'. It can enhance knowledge, the capacities of municipalities and all those working in the field of urban governance, especially, by improving and helping to institutionalize such participatory approaches. This toolkit will thus contribute to the wider dialogue, advocacy and capacity-building efforts targeting good urban governance, because governance is part of SUD, and achieving SUD is as much about what is done in the name of good urban governance.

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NOTES

1 New public management is a management philosophy used by governments since the 1980s to modernize their public sectors towards greater effectiveness and inclusive decision-making. The strategy means coupling the public sector reform impulse with governance – government's increasingly important relationship with civil society and the institutions that shape modern life (Kettl, 2000).

2 For detailed information see the PICTURE Project report: Paskaleva-Shapira *et al.* (2004).

3 See these websites: www.picture-project.com; http://sut.itas.fzk.de; www.intelcites project.com, for details on the projects' specific results.

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14

Conclusions

Mark Deakin, Ron Vreeker and Stephen Curwell

INTRODUCTION

All the contributions in the previous chapters go a long way to develop the so-called 'co-evolutionary approach' to environmental assessment, and manage to overcome the limitations of the past methodologies by focusing attention on the so-called 'hard' certainties of the bio-physical science underlying the less certain, risky and 'softer' social relations of SUD. Set within the BEQUEST framework and protocols, the contributions making up this volume provide a detailed account of much current practice in the application of environmental assessment methods key to this transformation. This has illustrated the toolkit supporting the evaluation of SUD and provided an account of the environmental assessment methods key in building the environmental capacity needed to qualify the ecological integrity of urban development, and provide the techniques of analysis required to evaluate whether this brings about an equitable distribution of resources. Those assessment methods and techniques of analysis also required to evaluate if the distribution of resources is the outcome of public participation based on socially inclusive decisions taken about the future of cities.

THE VALUE OF HIGHLY INTEGRATIVE AND MULTI-SCALAR ASSESSMENTS

The value of representing the highly integrative and multi-scalar nature of these assessments in such a way is also confirmed by all the contributions. They expose the value of the protocols in dealing with the hard and soft issues of SUD. For, while in Volume 1 the hard gates of the protocols were represented in statutory terms and therefore as rules of law – for example, the requirement of SEA and EIAs – Volume 2 provided the harder edge to the bio-physical, economic and social science underlying urban land use planning, property development, design and construction of buildings. In this way land use becomes the basic standard for evaluating SUD and how it can sustain a quality of life in the cities, and in particular the districts, neighbourhoods, estates and buildings where this process of urban (re)development manifests itself as sustainable communities.

The highly integrative and multi-scalar nature of these evaluations is also noticeable because they not only offer the opportunity to link sustainability issues to the quality of life but demonstrate the need to be systematic, principled and disciplined about how these connections are made and related back to the statutory instruments of environmental assessment; not to mention the stakeholders (planners, property developers, designers and contractors) responsible for such evaluations. This is useful not just for assessing how the environment impacts upon the quality of life but for qualifying SUD in terms of the environmental, economic and social values this institutes. In this way it becomes possible to capture the complexity of the situation under examination, along with the critical nature of the sustainability issues being considered.

This shows the vision and methodology of SUD as a framework, set of protocols and assessment methods, whose highly integrated and multi-scalar nature embeds itself at the most basic level of analysis (the simple assessment of land use). Planners can use this as a platform for visioning and scenario-building exercises, and in turn such prospective analyses are used as the means (as the complex, advanced and very advanced evaluations) to allow property developers and urban designers to programme the building construction projects to institute this as part of their operation and use. In this way the integration is progressive, expanding outwardly through the extension and intensification of the assessments in an upward direction, from basic up to very advanced, offering a much higher level of assessment, and deeper evaluation of the estates, neighbourhoods and districts of cities.

Table 14.1 shows how the contributions making up Volume 3 use the post-Brundtland directory of assessment methods to support decision-makers in evaluating the sustainability of SUD. In contrast to Volume 2, it does not list the environmental evaluations, the instruments, or systems-based approaches of the assessment methods. This is because the strategic and operational impact distinctions between the first and second rows of the illustration are the same.

From the case-study examples set out in this volume, it is also evident there is no environmental evaluation *per se*, and only cost–benefit analysis and multi-criteria analysis techniques figure in the environmental, economic and social evaluations presented here. This provides evidence to suggest the preoccupation of using environmental assessment methods to evaluate ecological integrity has been superseded, and the focus of attention is not just on ecological integrity but on this dimension of SUD, along with equity, participation and futurity. For, while Volume 2's examination of the various levels of evaluation (simple, complex, advanced and very advanced) managed only to provide examples of how SEA is being used to assess the ecological integrity and equity of SUD, Volume 3 clearly shows strategic concern with the need to meet the participation and futurity requirement of the evaluations.

Table 14.1 Post-Brundtland directory of assessment methods

Environmental, economic and social assessments					*Evaluating SUD*
Simple	*Complex*	*Advanced*	*Very advanced*	*Scale*	
AHP Compatibility matrix Eco-profiling **Ecological footprint** Environmental auditing **Flag method** ***Scenario analysis*** ***Spider analysis***		Meta-analysis (Pentagon method)	ASSIPAC MASTER Framework **SPARTACUS** ***SMARTNET***	Urban landscapes	Ecological integrity and equity
Compatibility matrix Eco-profiling	Community impact analysis			Land use	**Ecological integrity (intra-generational),**
Ecological footprint	***Mixed/compact analysis*** **Multi-functional analysis**				**equity**
	PROPOLIS	BEES **BREEAM** ***Building passport*** **Eco-points** **Eco-prop** **Eco-quantity** **ENVEST** **Green Building Code** **LCA** ***NAR model*** **PIMWAQ**		Building	**Ecological integrity (inter-generational), equity**
AHP ***Scenario analysis*** ***SWOT analysis*** ***Spider analysis***			**AUSTIME** ***CSR*** ***H2QR*** **Quantifiable City model** ***REGEN*** ***Sustainable communities*** Sustainable city model Transit-oriented settlement	Estate, neighbourhood and district and city	**Ecological integrity (inter-generational), equity, participation and futurity**

Note: the environmental assessments methods highlighted in bold are those reported in Volume 2. The assessment methods appearing in this volume are shown in bold italics.

In this volume, the contribution multi-criteria analysis makes to such evaluations is particularly marked by the technique's presence in Part I. This is even more pronounced in the examples of its influence on the use of the analytical hierarchy process (AHP) in Part II. Volume 3 provides examples of these assessment methods being used as simple evaluations. However, what Table 14.1 fails to demonstrate is the fact that AHP-based scenario analysis forms the foundation for many of the more complex, advanced and very advanced evaluations illustrated in that table. Also noticeable is the representation of AHP-based scenario evaluations at both SEA and EIA levels of assessment, an example of the former appearing in terms of SMARTNET. This development, in turn, is also reflected in the use of AHP as the foundation for scenario-based decision-making in the building passport, HQ2R, REGEN, CSR and Sustainable communities case studies, presented as examples of advanced and very advanced evaluations. Less noticeable is the contribution of cost–benefit analysis. For, while it provides the technical basis of the mixed/compact and NAR models, its limitations are noted; and the augmentation of the analysis into an MCA-type exercise also works to highlight the assessment method's shortcomings when dealing with complexity at the advanced and very advanced levels of evaluation.

THE EXTENSION AND INTENSIFICATION OF THE EVALUATIONS

The significance of the aforesaid also becomes apparent when considering the science and technology developed to support the extension and intensification of the evaluations. For, it is evident that each stage of the development needs progressively more science and technology, because we can no longer rely on the ecology of bio-physical sciences, or use this to hide behind when evaluating SUD. This is because the ecology of bio-physical sciences will no longer shelter us from the economic and social content of SUD (i.e., built landscape, estates, neighbourhoods and districts of cities). The economic and social structure of SUD, whose logic needs to be brought firmly into the equation, also needs to be given equal weighting in the assessment of SUD. Thus, it becomes clear that the vision and methodology, framework, protocols and assessment methods are not just about the ecological integrity and equity of resource distribution, but participation of the public in the economics of socially inclusive decision-making.

What is noticeable is that all the contributions develop their assessments to allow for such participation, but those focusing on the ecological integrity and equity of the resource distributions leave the matter of what form this should take open to question. They appear to leave this to be prescribed by the instrument of the law

governing the environmental impact of urban development, be it in the forms of SEA or EIA, or the more recent addition of sustainability assessment. However, those contributions unwilling to limit their assessments to the ecological integrity and equity of resource distributions, and willing to include the participation of the public in future-based decision-making, appear to be more prescriptive, advancing the notion of CSR assessment and public reporting mechanisms to encourage the inclusion of a greater number and diversity of stakeholders in the evaluations. This tends to have the effect of taking the assessment of ecological integrity and equity to a higher level and broader constituency of stakeholders who, in turn, use this deepening interest in participation and futurity to balance the ecological with the economic and social issues underlying the equity of SUD.

As such, the contributions set out in this volume provide examples of not just how to meet the call for triple-bottom line (environmental, economic and social) assessments but how it is possible to cut deeper than this, into the very institutional structure of decision-making. The institutional structure that has developed post-Brundtland has brought into question the baseline of environmental law because of the way buildings, estates and districts have tended to threaten ecological integrity and produce an inequitable distribution of resources. This has been met with a call for the development of environmental assessment methods, able to restore ecological integrity and produce a more equitable distribution of resources. This is not only based on the environmental need or the economic requirements of buildings, estates, neighbourhoods and districts, but on the capital of socially inclusive decision-making, which gives the public the power in terms of entitlement, statutory right and opportunity, under the rule of law, to participate in matters concerning the future of cities.

Also clear is the need for any such civic engagement to set new norms, rules and standards of environmental assessment; for, without them, environmental assessment, however integrated and scalar, will remain divided along the lines of SEA and EIA and locked within the confines of the specialist experts in planning, property development and construction, unable to reach matters of public concern in the operation and use of buildings.

INTEGRATION OF ASSESSMENT

This institutionalisation of SUD provides another approach to the issues that go beyond simply relating the underlying environmental issues to the economic and social, but it also seeks to connect them. By digging deeper into the nature of these connections, it becomes possible not only to consolidate the work done on understanding how to assess SUD, but to go beyond them and make the highly

integrative and multi-scalar logic of the advanced and very advanced evaluations emerging from this knowledge base reveal more about the subject. What is revealed is the need for the assessment methods (irrespective of whether they are simple, complex, advanced or very advanced) to be networked in such a way that the vision and methodology, framework and protocols of environmental assessment are so integrated and multi-scalar that they become strung together as something greater than the sum of the parts. This is what the BEQUEST toolkit does.

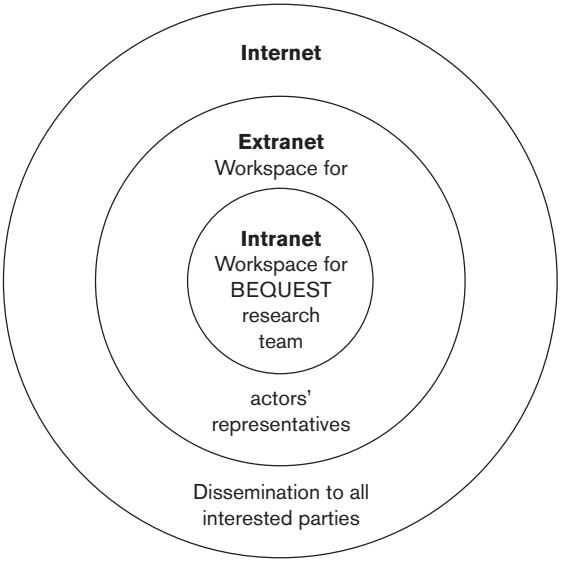
THE TOOLKIT FOR INTEGRATED ASSESSMENT

The toolkit connects the networked vision, methodology, framework and protocols of environmental assessment in such a highly integrated and multi-scalar way that they become part of a whole, which begins to provide the integrated knowledge base offering critical insight to the evaluation of SUD. This is not just environmental, economic and social but institutionally grounded, and, because of this, able to support decisions taken about how to assess the planning, property development, design, construction, operation and use stages of SUD as part of a highly integrated and multi-scalar set of evaluations.

A NEW BODY OF KNOWLEDGE

In this respect, the toolkit can also be said to offer a new body of knowledge; new in the sense that the networked community and virtual organisation known as BEQUEST is an internet-based toolkit and available only as a set of online web services. This set of online web services is built by a networked research community not just in accordance with the needs of the professionally qualified bodies interested in scoping and procuring the services required to evaluate SUD but in line with the public's expectations about the sustainability of urban development. Figure 14.1 clearly shows these relationships and workspaces BEQUEST has used to develop the toolkit as a set of freely available online services 'available to all'.

While Volume 1 presented the logic of the framework and protocols for environmental assessment and Volume 2 the relation with the extranet of professional advisors, Volume 3 describes the toolkit that is freely available on the internet as a set of web services for evaluating the sustainability of urban development, together with examples of the application of more integrated SUD evaluations. This cyberspace-based institutionalisation of SUD provides much deeper insights into the underlying issues by connecting the environmental, the economic and the social to one another.



Intranet: In the initial stages of the project an intranet will be set up to facilitate immediate communication between members of the research team. The intranet will be a discussion forum and will also hold documents in the process of production; it will thus be a means of collaborative working. Access will be limited to researchers, who will be able to air embryonic or partially formed ideas within a closed community.
Extranet: The extranet will be a forum for actors' representatives. They will also use the extranet to test the products of research in conjunction with the BEQUEST research team.
Internet: When the toolkit is fully developed and tested it will be published on the internet.

14.1 Communication and workspaces

This consolidates the work done in Volumes 1 and 2 to understand how to assess SUD, but also serves to intensify the efforts to make the highly integrative and multi-scalar logic of the complex, advanced and very advanced evaluations emerging from this knowledge base reveal greater critical insight into the nature of SUD. In doing this, it becomes clear that under these circumstances it is not just the knowledge base that is changing but the institutionalisation itself. This is because the toolkit provides not just a networked community set up as virtual organisations, but the basis for a whole new polity, one whose body also takes this politicisation of SUD to be represented beyond concerns about environmental quality, economic competition or the cohesion of civil society into the public arena of debates about the effects community and governance have on the quality of life. The significance of this is that the extension of SUD into the civic domain is uncharted territory and something which needs not only engagement with citizens, businesses and non-government organisations but the establishment of partnerships to empower such communities and sustain their development as programmes of good governance.

While this extension of SUD into the civic domain can in many ways be seen to consolidate the research already undertaken by BEQUEST and presented in Volumes 1–3, it also calls for a redoubling of efforts and intensification of the work, so as to allow the vision and methodology of an integrated SUD already in place to

capture these issues. This, in turn, means reworking not only the framework and protocols for environmental assessment but the highly integrated and multi-scalar assessment methods. It means recasting them in line with the needs of citizenship and the corporate social responsibility requirements of both the business sector and NGOs. The needs and requirements of both are crying out to be met, because they are seen as key to working out what this community of stakeholders contributes to SUD; the SUD of the land use to be found in the buildings, estates, neighbourhoods and districts of cities developed as sustainable communities subject to good governance.

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