

2. Context and background

2.1. Synthesis of the conceptual evolution on urban sustainability

Since it was first expressed in the United Nations report *Our common future*, also known as the Brundtland report, in 1987 (Brundtland, 1987), the concept of sustainable development has become a relevant issue in international and European discussions on the environment. As stressed in this report, the concept of sustainable development is intended to mean not only environmental or economic development that preserves present resources for use by future generations, but also balanced spatial development.

Currently, environmental policy is integrating the concept of sustainable development and so influencing urban planning and management. At international, European, national and local levels, a number of reports, conferences and programmes on urban environment and spatial planning express common issues and recommendations towards sustainability, the future of cities, and how to contribute locally and globally to this aim.

An integrated approach to urban environment at the European scale was introduced in the fourth environmental action programme (1987–92). The first step towards debate and research on the urban environment and quality of life was the European Commission (EC) *Green paper on urban environment* (European Commission, 1990). In this report, the main urban problems were pointed out, as well as the need for an integrated approach to urban planning and management. This report also states the need to assess and monitor environmental conditions within cities.

Following the publication of the Green paper in 1990, the EC established the Expert Group on the Urban Environment in 1991. This group is composed of national representatives and independent experts, and it was created to consider how future town and land use planning strategies could incorporate environmental objectives.

Since then, the European Union (EU) has been developing a strategy to achieve progress towards sustainability in European cities. The priority issues were urban and regional land use planning, growth management, mobility and urban transport, and protection and enhancement of city heritage and green spaces.

The United Nations Conference on Environment and development (UNCED), held in Rio de Janeiro in 1992 and popularly known as the Earth Summit, contributed significantly to a new spread of sustainable development concepts and policies. One of the five official documents which resulted from this conference — Agenda 21, a global action plan for sustainable development — established the link between the city and the environment. Since then, the EC has committed itself to the promotion of Agenda 21, in which local governments have a crucial role to play, following the objectives stated in its Chapter 28.

Following this step towards sustainable development, the Fifth Environmental Action Programme (1992–2000), introduced a more coherent EU response on this issue, and made environmental policies an integral component of EU policy. Within this programme, the urban environment within Europe gained a new focus as an issue with particular importance, and this has been reinforced as one of the objectives of the EU throughout the years. In fact, since the Treaty on European Union — the Maastricht Treaty — and more recently in the Amsterdam Treaty, sustainable development is seen, in operational terms, as being the challenge for economic growth of the EU.

Since then, a wide range of initiatives, actions and programmes, contributing to the establishment of guidelines towards the development of a sustainable urban environment, has been promoted. In this process, initiatives capable of improving the quality of urban areas have been included, in order to guarantee coherence of environmental policies for European cities and sustainability. Within this context, measuring urban activity impacts and monitoring urban growth can have a

significant role to assess the progress towards sustainability. A detailed analysis of the state of the environment in 50 European urban areas was produced in 1993 by the European Environment Agency report, *Europe's environment — The DOBRIS assessment* (EEA, 1993). In this report and its update, *Europe's Environment: The Second Assessment* (EEA, 1998), the main pan-European environmental problems were identified, demonstrating the urgent need for action.

The majority of environmental problems have particular relevance at local and regional levels, which are striving for policy coherence and follow-up of the Rio Agenda 21 statements. The formulation of the principles of Local Agenda 21 was established in the first European conference on sustainable cities and towns, Aalborg 1994. As an outcome, a political commitment to work towards sustainability, the Aalborg Charter, was produced. The Aalborg Charter focuses on the role of European cities and municipalities by setting guidelines to achieve sustainability and emphasises the need for indicators for policy-making and target-monitoring efforts. To encourage and support cities to work towards sustainability the Aalborg Charter also promotes the European sustainable cities and towns campaign. This campaign is an international initiative and an evaluation of 'achievements on the ground', i.e. the progress participants have made in response to their commitment to the Aalborg Charter. The main goal is to encourage and support cities and towns in working towards sustainability by developing and implementing long-term strategic actions for sustainable development through local Agenda 21 processes (Löfler and Payne, 1999).

Following this campaign, Local Agenda 21 has been implemented all around Europe, showing the growing awareness of environmental problems, and adopting policies for cooperation between local governments and civil society, to engage in partnership projects and long-term action plans on a local scale.

These objectives towards sustainable development at local and regional level have been reinforced by the second European conference on sustainable cities and towns, through the Lisbon action plan. This plan stresses the importance of increasing local and regional actions towards the campaign's objectives and the need for indicators to

describe the present environmental state and to measure the performance of the signatory cities of the Aalborg Charter.

Four regional conferences followed the Lisbon Conference, where specific issues were discussed according to regional and cultural contexts: Turku (1998) for the Baltic region; Sofia (1998) for central and eastern Europe; Seville (1999) for the Mediterranean region; and The Hague (1999) for north-west Europe. The resulting charters show the progress attained, as they involved an enlarged arena and widespread communication.

The integration of Community policies relevant to urban development and the recognition that sustainability requires the participation of public authorities and key actors at all levels led to the publication of the Commission's urban action plan in the 1998 Vienna Urban Forum. Having by official title *Sustainable urban development in the European Union: A framework for action*, this document stresses the importance of strategic assessment and management as a path towards sustainability in urban areas.

Over the years, the concept of sustainable urban development, beyond being considered fundamental for policy-making, has also acquired a spatial dimension. It has been recognised that policies and funding programmes adopted and implemented by the EU have a significant impact on the territory by modifying the spatial structure and thus creating new directions in the economy, leading to a change of land use patterns and landscapes. The implications of these territorial changes, together with land consumption associated with urban sprawl over the EU territory, require a spatial approach.

The next step towards sustainable development in the EU territory will be achieved with the implementation of 'regional and national spatial sustainable development, a balanced polycentric system of cities and with a new urban-rural development' (European Commission, 1999). The European spatial development perspective (ESDP), initiated in 1997 and approved in 1999 at Potsdam, points out the importance and implications of spatial dimension development and conveys a vision of the future territory of the EU. ESDP establishes a major challenge for European policies and countries, to promote

sustainable land use. The spatial dimensions should be taken into account for balanced urban development, which has to integrate nature and culture as assets in territorial development.

The ESDP first official draft (European Commission, 1997) pointed out that, while market forces operate increasingly at European level, spatial development policies are still often devised at national level. This risks creating a discrepancy that might lead to unsustainable growth. The ESDP final draft (European Commission, 1999) extends this concept: 'The European Spatial Development Perspective is based on the EU aim of achieving a balanced and sustainable development, in particular by strengthening economic and social cohesion. In accordance with the definition laid down in the United Nations Brundtland report, sustainable development covers not only environmentally sound economic development, which preserves present resources for use by future generations but also includes a balanced spatial development. This means, in particular, reconciling the social and economic claims on land use with the area's ecological and cultural functions and, hence, contributing to a sustainable spatial development that is balanced at regional level' (European Commission, 1999).

In 2000, the Hannover Conference, the third European conference on sustainable cities and towns, took place, approving the Hannover Call. This was the time to assess the path followed since Aalborg. Strong emphasis was given to policy commitment to achieve sustainability at all levels of government and especially for local actions. Managing, monitoring and evaluating sustainability was one of the main topics of the conference. Evaluation and assessment were then considered essential tools, and the need to develop a coherent system of sustainability indicators was emphasised. Indicators are essential means to continuously benchmark evolution, progress and alternatives. Table 2.1 summarises the evolution and content of the main reports, documents and action plans established since 1987.

The conceptual evolution on urban sustainability shows the need to improve knowledge, research and information on territorial development, and to develop the concept for territorial impact assessment to support spatial development policy. A spatial approach to land use planning and management has rarely been emphasised. An essential tool in this process is the creation of spatial databases that can establish the framework for spatial analysis, management and monitoring of the territorial processes. These databases can play an important role as the initial steps towards an urban atlas.

Table 2.1

Evolution and content of the main reports, documents or action plans addressing sustainable development

Date	Title	Responsibility	Author/editor	Applicability domain*					Document type	Framework/description
				I	EU	N	R	L		
1987	Brundtland report: <i>Our common future</i>	United Nations	World Commission on Environment and Development						Report	Introduces the concept of sustainable development as: 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.
1987	Fourth environmental action programme	European Union							Programme	Introduces for the first time an integrated approach to urban environment at European scale.
1990	Green paper on urban environment	European Commission	European Commission						Communication	This paper was a landmark on urban environment.

Date	Title	Responsibility	Author/editor	Applicability domain*				Document type	Framework/description
				I	EU	N	R		
1991	European Commission Expert Group on the Urban Environment	European Commission						Advisory group	Created to consider how future town and land use planning strategies could incorporate environmental objectives, and how the European Commission could develop the urban environment within the Community environmental policy. Recently it has evolved with the creation of specific working groups.
1992	Treaty on European Union (Maastricht Treaty)	European Union						Treaty	Refers to sustainable development in Article B under general conditions and in Article 2 under principles. The treaty refers to environmental protection in instrumental terms as being necessary for economic growth.
1992	UNCED — United Nations Conference on Environment and Development (the Earth Summit)	United Nations						Conference	The result of the conference consisted of five official documents: (1) Rio Declaration; (2) Agenda 21; (3) Biodiversity Convention; (4) Climate Convention; (5) Forest principles. Emphasis must be given to the content of Article 28 of Agenda 21, which is the one relating to local authorities and the basis for the subsequent process of the sustainable cities and towns Campaign. Through Chapter 28 of Agenda 21, local activities should play a vital role in educating, mobilising and responding to the public in order to promote sustainable development.
1992	Fifth environmental action programme	European Union						Programme	Sets the environmental agenda for the period 1993–2000 introducing the EU policy for sustainability and requiring an integrated approach.
1993	Global strategy for health and environment	Healthy Cities project	World Health Organization (WHO)					Publication	Publication based on the connection between health, environment and urban development. It also places a strong emphasis on the involvement and participation of the population.
1993	The DOBRIS assessment: Europe's environment	European Environment Agency	EEA					Report	Report on the state of the environment in Europe prepared for the Sofia Conference. Contains a detailed analysis of the state of the environment in Europe's urban areas.
1994	Aalborg Charter	ICLEI	Conference organised by ICLEI					Charter	The charter states a consensus declaration towards urban sustainability among cities and initiates the sustainable cities and towns campaign, proposing the engagement of urban communities in the Local Agenda 21 process.

Date	Title	Respon- sibility	Author/ editor	Applica- bility domain*					Document type	Framework/description
				I	EU	N	R	L		
1996	Lisbon action plan	ICLEI	Conference organised by ICLEI						Action plan	The Lisbon action plan states the need to prepare local governments for the Local Agenda 21 process and establish strategies to involve local communities and encourage the use of sustainability tools such as the application of environmental management and audit schemes.
1996	Sustainable cities report	EC Expert Group							Communication	Promotes the use of indicators to measure the progress towards sustainability.
1997	Habitat II (the City Summit)	United Nations on Human Settle- ments	UN						Conference	Second UN conference on human settlements in Istanbul. It was organised to raise public awareness about the problems of human settlements, and seek commitment from the world's governments to make all places of human habitation healthy, safe, just and sustainable.
1997	Amsterdam Treaty	European Union	European Union							Stresses the importance of environmental issues and the need to integrate environmental protection requirements into the implementation of Community policies and activities with particular attention paid to the promotion of sustainable development. For the first time it integrates sustainable development as one of the objectives of the Community.
1997	Towards an urban agenda	European Commis- sion	European Commission						Policy paper	This paper sets out the key challenges which affect cities, in general, and reviews existing EU policies which have direct or indirect impacts on cities. It also proposes directions for future actions and approaches for urban policies in Europe, namely those which promote sustainable development and the quality of life in cities.
1998	DOBRIS+3	European Environ- ment Agency	EEA						Report	Report on the pan-European state of the environment. It was prepared for the Aarhus Conference of European Ministers supporting the 'Environment for Europe' process.
1998	Urban Forum	European Commis- sion	European Commission						Conference/ Forum	Publication of the Commission's urban action plan which aimed to adopt European policies for the sustainable development of urban areas and launched the URBAN initiative.
1998	Sustainable develop- ment in the European Union: A framework for action	European Commis- sion	European Commission						EC Communication	Communication COM (98) 605 underlined the importance of evaluating existing and planned activities to support local sustainability and the need to explore methods to monitor progress on Local Agenda 21.

Date	Title	Responsibility	Author/editor	Applicability domain*					Document type	Framework/description
				I	EU	N	R	L		
1998	Urban audit	European Commission							Programme	It was launched as an attempt to gather comparable information and data at city, wider territorial unit and sub-city levels. Promotes the use of reference indicators intended to cover five fields such as: (1) socio-economic aspects; (2) participation in civic life; (3) training and education; (4) environment; (5) culture and leisure.
1999	European spatial development perspective (ESDP)	European Commission	European Commission						Document	The ESDP conveys a vision of the future of the EU territory. In its aims and guidelines, it provides a general source of reference for actions with spatial impact. The ESDP major aim is to work towards a balanced and sustainable development of the territory of the European Union.
2000	Hannover Call	Sustainable Cities Campaign	Conference						Charter	The Hannover Call emphasises the priority of local sustainable development as the basis for a sustainable society, creating a clear responsibility for urban sustainable development issues.
2001	Sixth environment action programme	European Commission							Programme	This programme provides the environmental component of the Community's forthcoming strategy for sustainable development.
2001	A sustainable Europe for a better world: A European Union strategy for sustainable development	Commission of the European Communities	Commission of the European Communities						Communication from the Commission	Communication COM (2001) 264 is the Commission's proposal to the Gothenburg European Council, for a long-term strategy dovetailing policies for economically, socially and ecologically sustainable development.

* I — International level EU — European Union level N — National level R — Regional level L — Local level

2.2. A European urban atlas?

Sustainability implies an interaction of environmental and socio-economic issues. Thus, an integrated multidisciplinary approach appears to be the most appropriate tool for a comprehensive understanding of urban issues. Nevertheless, at international level, such an approach is often missing. The majority of the studies addressing urban issues have, until now, almost ignored the spatial dimension, while urban planning studies very seldom take into account impacts on the hinterland in terms of resource use and loss of biodiversity, among other issues.

'Socio-economic development analyses deal with three dimensions: thematic, temporal and territorial.. Yet only limited attention has been paid to the territorial dimension.. If

structures or structural changes are assessed, conventional analyses only exceptionally extend to territorial structures, such as urban centres.. (von Meyer, 1998). The need therefore exists to better integrate spatial policies into socio-economic and environmental ones.

Europe has four main types of landscapes — urban, rural, coastal and mountainous. The ESDP describing the spatial issues of European significance, stresses that these European landscapes will be affected by:

- changes in urban structure;
- the changing role and function of rural areas;
- changes in transport, communication and knowledge;

- continuing pressure on Europe's natural and cultural heritage.

Changes in the European urban structure will determine changes in other landscapes. Rural, agricultural and natural areas, transport network, and natural and cultural heritage will be modified and/or affected according to urban development. The global process of urbanisation and city growth, with all its consequences of migration, traffic, pollution and natural hazards, must be regarded as an aggregation of forces and components. Land values, migration patterns, planning policies and economy need to be carefully monitored, controlled and studied. Isolating one component from the others could lead to misunderstandings, lack of information and failing to achieve sustainability targets. Warnings concerning landscape planning are usually given less consideration, due to lack of data.

Such data has to be provided in a standard format all over the EU. The massive volume of information offered by existing data sets for urban studies, environment and planning issues cannot be easily and consistently processed. Even if socio-economic as well as physical data are collected in very fine detail, they are often aggregated using different methods and are not suitable for comparison and assessment at continental level. It is therefore imperative to develop common methodologies and processes to produce and compare data in order to achieve a more holistic view of European urban landscapes patterns and evolution.

The assessment of urban dynamics and its territorial impact in Europe is an important goal. Land use databases are an essential tool to monitor the extent and relevance of these processes.

The support of a land use database may help to supply answers and thoughts about the following questions:

- Can urban growth be sustainable?
- Can a spatial approach contribute to a more sustainable planning and management process?
- Can land use databases contribute to more integrated spatial development?
- Can land use databases contribute to deriving spatially based indicators and to assessing sustainability in the planning and management process?

In view of the above, an important European project for assessing and monitoring urban dynamics called Murbandy (Monitoring Urban Dynamics)/Moland (Monitoring Land Use Changes), has been undertaken by the European Commission's JRC (Directorate General Joint Research Centre). It aims to provide a methodological tool to measure change in Europe's urban areas and to improve the understanding of local, regional and global transformations (Lavallo *et al.*, 1999). This project is being carried out by the Institute for Environment and Sustainability (having started in the ex-Space Application Institute) of the Joint Research Centre, in the context of the JRC's mission to provide scientific and technical support for the definition and implementation of European Union policies.

Murbandy/Moland aims to define and validate a methodology in support of sectoral policies with territorial and environmental impacts. The reference framework is provided by, for example, the European Spatial Development Perspective (ESDP), the strategic environmental assessment of the trans-European network for transport (TEN), and the environmental evaluation of the impacts of EU structural and cohesion fund programmes.

A land use database has been developed for 25 European cities and urban areas. For these areas, an evaluation of the validation, utility and potential of the collected data for land use planning and an assessment of land use changes have been made. These data sets can contribute to understanding the driving forces that underpin land use dynamics around urban areas and to assessing the territorial dimension of their impact on the environment.

In the context of the Murbandy/Moland project, remote sensing from space as well as aerial photographs, have been identified as the required assessment tools to meet the above-mentioned requirements. In particular, data and images collected from sensors and instruments on board satellites are independent of physical, administrative and political borders and furnish homogeneity and consistency well suited for continental studies. The methodology adopted allows for the first time the creation of a database on cities' territorial evolution. A second important feature is the possibility of linking the territorial information to other parameters in order to produce indicators

for assessing the sustainable development of urban areas. Another important feature is the capability of generating new outputs and developing scenarios for urban development, based on the modification of parameters or indicators representing spatial planning or management alternatives.

Indicators can help in measuring the progress towards sustainability, and in

reflecting the integration between environmental, economic and social aspects. Spatial indicators can contribute towards progressing within this important field of research. We should, however, first reconstruct the history of indicators, from their origin to their adoption for urban issues, and analyse the framework within which spatial indicators are developed.