

Towards an urban atlas

Assessment of spatial data on
25 European cities and urban areas

Prepared by:

Carlo Lavallo, Luca Demicheli, Marjo Kasanko, Niall McCormick,
Jose Barredo, Maddalena Turchini
European Commission — Directorate General Joint Research Centre
Institute for Environment and Sustainability — Land Management Unit
Urban and Regional Development Sector, Ispra, Italy

Maria da Graça Saraiva, Fernando Nunes da Silva,
Isabel Loupa Ramos, Filipa Pinto Monteiro
CESUR, Centre for Urban and Regional Studies, IST,
Technical University of Lisbon, Portugal
Mário Caetano
CNIG, National Centre for Geographical Information, Portugal

Project Manager:
Ivone Pereira Martins
European Environment Agency

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Layout: Brandenburg a/s

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European Environment Agency
Kongens Nytorv 6
DK-1050 Copenhagen K
Tel.: (45) 33 36 71 00
Fax: (45) 33 36 71 99
E-mail: eea@eea.eu.int
Internet: <http://www.eea.eu.int>

Foreword

Ancient Rome was the rehearsal for what cities would become later. It took another 17 centuries or more before another western city came to rival classical Rome. At the beginning of the 20th century there were just 16 cities in the world with more than a million people.

Cities have always been characterised as allowing for a critical mass in many socio-economic activities — as centres of political power both national and international; centres of trade, banking, insurance and related financial services; centres of higher learning, advanced professional activities, information gathering, consumption; business, tourism and real estate functions; transport hubs; centres of arts, culture and entertainment. They evolve as they take on new functions, but also and mainly by acting as a magnet or alternative to rural areas with decaying functions and opportunities.

The consequences of these processes and functions can be seen in a national and European or international perspective from a 'competition' point of view (following the central place theory of Walter Christaller in the 1930s), and from the impacts on activities and land use patterns within and around each urban area. The contemporary city has many layers, forming a composite landscape, superimposed by the passing of time. In this context the integration of the urban dimension into the environmental arena is a *sine qua non* for the 21st century. But for the moment we only started to scratch the surface of how to achieve this integration, bearing in mind the need for a vertical integration of scales and a horizontal integration of issues.

In order to understand the dynamics of the European urban system we need to understand what Peter Hall calls the mega-urban regions. In the last 40–50 years deconcentration, first of residences and later also of employment has become a universal, complex phenomenon extending over wide areas in a dynamic process, in a Europe with a highly polycentric metropolitan system. From the 1960s, European residential suburbanisation occurred outside the limits of effective public transport, stimulating

private car use. Employment also started to decentralise in search of spacious premises close to highway systems, forming a dispersed pattern across the neighboring regions and rural areas. This outward trend, both for population and employment, is general. The utopianism of the urban spatial form that predominated in the 1960s contained some problems that need to be addressed. The movement, called the new urbanism, offered something positive and nostalgic, first considering the city region as a whole, but then materialising in greenfield developments for the affluent. They helped making the suburb a 'better place to live', fostering sprawl, and did nothing to revitalise degenerating urban cores, bringing a decay that now, as we move full cycle, leads to a 'renaissance' towards more compact cities, reinforcing the 'nutshell' that was typical (historically for defence reasons) of southern Mediterranean cities.

Huge debate has raged concerning the consequences of urban sprawl on travel and transport patterns, but also on general cultural patterns, and thus for sustainable urbanisation and development. Following the European Commission's Green Paper of 1990 (European Commission, 1990), there has been a new call for urban compaction or consolidation, a crusade, which is confronted by the growth of single-person households.

Many proposals have been put on the table concerning sustainable urban development: many of them mention the regional scale, clustering of smaller settlements and compaction, and a more harmonious balance between urban and rural development. But to achieve sustainable urban development attention has to be given to different scales and geographical contexts. An integrated approach encompassing traffic and transport policy, environmental policy and physical planning policy appears to be the way to cope with growth pressures, using as a reference the sustainable use and management of the territory and natural resources as a way to bring a higher quality of life following principles of equality. In this respect the Netherlands has taken a lead in integrating land use and transport planning within an overall national environmental strategy.

According to Agenda 21's Chapter 28 on local authorities, 'because so many of the problems and solutions being addressed by Agenda 21 have their roots in local activities, the participation and cooperation of local authorities will be a determining factor in fulfilling sustainable development objectives'. Having this principle in mind and from the point of view of an institution dealing with data and information exchange to support action and policy-making we stress the importance of exchanging data, information and knowledge not only among local authorities, but between the different levels of management and planning. In a world where globalisation is a message used and abused, it is never redundant to claim the importance of each level of the exercise of power — enforcing a right level of action — as well as highlighting the requirements and the urgency for an interchange of information between all levels.

European local authorities have widely varying responsibilities, competencies, capacities, organisation and power, reflecting different state structures. Nevertheless, as the level of governance closest to the people, and the ones using — effectively — an array of planning and management tools, and with their monitoring and reporting capabilities, they play a vital role in implementing measures leading to and promoting sustainable development, not to mention their role in educating, mobilising and responding to the public.

It is my belief that if cities use indicators and progressively introduce targets to improve land use planning and management, related

urban life quality will improve and will encompass more sustainable development. Cooperation and exchange of experiences are key concepts. The present report is an example of these concepts, as it was prepared with the contribution of several bodies at European, national and local level.

The epitome of old style spatial analysis, the bound atlas, is rapidly being superseded by digital maps and networked databases. A new urban atlas at European scale is still in its embryonic phase, but this is an attempt to work on it, in the context of European wide initiatives such as INSPIRE (Infrastructure for Spatial Information in Europe) — formerly known as the Environmental European Spatial Data Infrastructure (E-ESDI).

It is also my belief that while spatial technologies are an important step towards integrating data at various levels of analysis and from different epistemologies, they cannot relieve the researcher and policy-maker from the task of determining which social, economic, environmental and political factors impact human-environment relations and lead to sustainable development. Even in the age of the Internet, cyber space and virtual reality, there is room for space, as space matters. Let me finally congratulate the team that directly produced the report, as well as recognising the contribution from DG Environment, for this work towards urban sustainable development.

Domingo Jiménez-Beltrán
EEA Executive Director

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Executive summary

The present report — a joint publication of the European Environment Agency (EEA) and the Directorate General Joint Research Centre (DG JRC) of the European Commission (EC) — describes the work developed by the Murbandy/Moland project (Monitoring Urban Dynamics/ Monitoring Land Use Changes). The aim of the report is to disseminate the first results of this research project dedicated to measure and assess urban dynamics through the creation of land use databases for various cities and urban areas within Europe. These databases combine environmental, economic and social data in order to better understand the characteristics and dynamics of urban growth and related land use changes, such as transport and energy infrastructures and changes in agricultural and natural areas. Its results show the spatial evolution of a selected set of urban areas with the aim of proposing a methodology for strategic monitoring of the impact of urban development on the environment.

Urban growth and sprawl is a pertinent topic for analysis and assessment today. The environmental impacts of urban sprawl and the extent of urban problems have been growing in complexity and relevance, generating strong imbalances between the city and its hinterland. The need to address this complexity in assessing and monitoring urban planning and management processes and practices is strongly felt.

The city's health and well-being is a major concern for the local population and local authorities and a new effort is envisaged towards a more sustainable urban planning and management system. In this new effort, territorial and spatial issues play an increasing role, as they contribute to an integrated approach to urban planning.

The contribution of urban issues and territorial approaches to a broader, long-term vision of sustainable development is one of the major issues in environmental and economic policies. It is recognised that in the long term, economic growth, social cohesion and environmental protection must go hand in hand as a result of the development of an EU sustainable development strategy (COM

(2001) 264 final). This requires that economic growth supports social progress and respects the environment, decoupling environmental degradation and resource consumption. Therefore, a sustainable development strategy should focus on major problems that pose severe or irreversible threats to the future well-being of the society. Indicators are one of the tools to evaluate and monitor the impacts of these threats and to assess progress towards quality of life and societal well-being.

The proposed sixth environmental action programme (6EAP) stresses the need to spread and promote best practices for decision-making in land use planning and management as one of its main goals to meet environmental objectives and priorities. This programme recognises the crucial role of sustainable land use planning and management, at both local and regional levels. The territorial dimension of planning and environment is acknowledged, as well as the need to encourage best practices in terms of urban planning and to promote the development of sustainable cities. Additionally the thematic strategy on urban environment proposed by 6EAP pledges the use of indicators to monitor and assess urban issues.

Assessing and monitoring urban growth is thus an essential and strategic aim. This requires the construction and validation of spatially based indicators. The Murbandy/Moland project is an attempt to fulfil this objective, through the methodology developed and tested in around forty distinct urban areas in Europe. This report presents the results of the preliminary set of 25 urban areas.

Nowadays, urban areas are experiencing serious growth. In Europe, this growth is mostly felt in the areas of space, infrastructure, energy and natural resources; population increase is relatively small. This leads to unsuitable land use, traffic congestion, pollution, depletion of natural resources and other environmental nuisances. The relationship of the city with its global hinterland is also disturbed.

The need to recognise, anticipate, measure and understand urban dynamics and related problems is essential to integrated development of the planning process. The complexity of urban systems is usually a strong impediment to measurement and understanding, and territorial diversity introduces problems of different scales and dimensions. Planning for urban areas is a difficult task, requiring knowledge and skills adapted to complexity, and a strong commitment to achieving sustainability. European local authorities have widely varying responsibilities, competencies, capacities, organisation and power, reflecting different state structures. Nevertheless, as the level of governance closest to the people, and the ones using — effectively — an array of planning and management tools, and with their monitoring and reporting capabilities, they play a vital role in implementing measures leading to and promoting sustainable development, not to mention their role in educating, mobilising and responding to the public.

Chapter 28 of Agenda 21 calls on local authorities to promote sustainable development at the local level. Recommendations, special programmes and city networks all around the world have been implemented to develop and adopt 'local Agenda 21' processes. This movement towards the search for common ways to address the complexity of urban environmental problems has led to several approaches and campaigns to promote more sustainable urban planning and management. The Aalborg Charter, the Sustainable Cities and Towns Campaign and the Lisbon Action Plan, for instance, are important steps in this process. Other initiatives of the European Commission, such as the ESDP (European Spatial Development Perspective) and ESPON/ORATE (European Spatial Planning Observatory Network), call for a spatial dimension for better integration with sectoral policies and for improving knowledge, research and information on territorial developments.

The need to assess progress towards more sustainable development for urban areas has required a special commitment towards the urban environment by local managers and decision-makers. Local Agenda 21s have been implemented and a search for indicators to monitor and assess the state of the environment has been proposed.

An urban area is a very complex system with specific environmental, economic, social and institutional characteristics, requiring integrated approaches for policy-making and management. Indicators are used to supply information on environmental problems, to support policy measures, and to monitor the effects of policy measures and responses.

Several systems of indicators have been developed for specific purposes, such as assessment of economic development and social well-being. With an awareness of the limits and pressures resulting from human activities, many international and national agencies developed sets of environmental indicators. Environmental indicators generally reflect the relationships between human and environmental systems. This leads to the establishment of system models, based on the pressures human development exerts on the environment that change its state and lead to environmental impacts. The so-called PSR (pressure-state-response) model was developed to express these relationships. The EEA extended this model, considering the economic and social driving forces upstream of this process and all the interactions between all these steps. The DPSIR (driving forces, pressure, state, impact, response) model was considered an adequate framework for assessing environmental issues.

The Murbandy/Moland project attempts to fill the gap in the existing lack of reliable spatial data and offers new points of view. Through this project, a Europe-wide data set for urban areas was created based on natural and artificial land cover characteristics. Its methodology is based on the creation of an accurate database of land use types and transport networks, specifically designed for urban areas. Data were derived from satellite imagery and aerial photography, using remote sensing and GIS technologies. The database is the basis for combining environmental, economic and social data in order better to understand the dynamics and characteristics of urban growth processes. The databases have been produced for four dates over the past 50 years, thereby enabling time series analysis and a multi-temporal dimension. The process of collecting data has been followed in different cities and urban areas, which facilitates comparative analysis and data standardisation over approximately the same time span.

The methodology is implemented in three phases: Change, in which changes in the spatial extent of urban areas have been measured, over a period of approximately 50 years; Understand, in which a number of indicators to measure the evolution of urban and peri-urban areas have been identified and tested; and finally, Forecast, to develop urban growth scenarios for some cities, using state-of-the-art urban dynamics models.

For the database construction, an extended version of the Corine land cover nomenclature has been applied. After data processing, a validation of each data set was carried out in order to guarantee a high quality of land use classification products.

Assessment of data derived from the Murbandy/Moland databases is progressing, allowing us to investigate the potential use of spatial data and indicators to characterise and monitor urban growth. Some important issues have been investigated, including the build-up of new urban areas on formerly productive agricultural and environmentally sensitive areas, accessibility to collective transport networks, and the availability of public facilities and green areas per capita.

Several indicators can be directly derived without any further elaboration, but more complex assessments can be carried out according to the needs of users. Analysis of urban sprawl and land consumption, transport network or growth of artificial areas can be derived for the cities considered. Socio-economic data can be associated with spatial data in order to perform more complex analyses. Another contribution is the support for the computation of sustainability indicators, namely those proposed by the European Common Indicators Initiative of the EC Expert Group on Urban Environment, lead by DG Environment, which will enable and support better monitoring practices and enhance comparability among cities.

Spatial data and territorial information and their frequent updating are substantial tools for monitoring policy responses. The Murbandy/Moland project can contribute to these requirements, and its methodology can be applied to other urban areas inside or outside Europe. Dissemination of the information obtained is an important task, in order to spread its results and capabilities to all potential users, as well as to enable the design of other indicators or assessment methodologies for and by diverse users.

This report is an attempt to present and disseminate this information, which will be and has already been useful for EEA assessment and reporting activities. Ways to foster this dissemination task, discussion of new indicators and applications, and the enrolment of other local authorities in such exercises should be foreseen, having in mind the newly established European Topic Centre on Terrestrial Environment, the core set of indicators for the terrestrial environment currently under discussion, and the role of the EEA national focal points and national reference centres on urban environment.

To prevent duplication, increase availability, create added value services, share geographic information and establish reference requirements for spatial information are all aims shared by the EEA, INSPIRE (formerly known as E-ESDI) and by the Murbandy/Moland project. They should be seen as converging tools to be used in the implementation and monitoring of the upcoming thematic urban strategy under the 6EAP.

Development of a new urban atlas, stimulating the use and broad dissemination of networked databases (anchored on indicator development) and digital maps, is seen as a cooperative long-term project.