

PROJECT

BUGS

Benefits of Urban Green Space

Funding: European (5th RTD Framework Programme)

Duration: Mar 2001 - Apr 2003

Status: Complete with results



Background & policy context:

The inter-related issues of urban sprawl, traffic congestion, noise, and air pollution are major socio-economic problems faced by most European cities. Addressing the impact of green areas on such diverse areas as traffic flows and emissions, air quality, microclimate, noise, accessibility, economic efficiency, and social well-being, this methodology will allow to deduce a set of guidelines regarding the use of green space as a design tool for urban planning, at scales ranging from a street canyon or a park to an entire urban region. Potential end-users are actively involved to help focus and steer the work. Supported by a marketing strategy, the ultimate goal is to turn the methodology into a self-sustaining activity, to be offered as a service to urban and regional authorities in Europe.

Objectives:

In order to achieve the objectives, the project was subdivided into two different phases, each of approximately equal importance in terms of human and financial resources:

- during the first phase the different models and methods were adapted to better suit the project's main goals, i.e., to enhance their capabilities to address issues related to urban green areas and urban shape. While doing so, process studies were also performed by each of the models separately, in order to evaluate the effects of urban green and morphology on specific areas such as noise, air quality. Also, remote sensing and GIS were used to quantify certain aspects of the green urban environment, such as the spatial distribution of green and its accessibility. In parallel to these activities, a particular effort was made to couple the different models and methods involved, in order to be prepared for the second phase;
- in the second phase, the models were applied - in a fully coupled mode - on a test domain located in the German Ruhrgebiet. Whereas in the first phase the focus was on understanding and modelling processes, the second phase was almost entirely devoted to getting the different models work together. Even though the main purpose of this integrated application was to demonstrate the feasibility of the BUGS approach, it also delivered some interesting scientific results.

From the outset, the objective was to assemble a multi-disciplinary, complementary, and task-oriented team. The members of the consortium were brought together based on their expertise and competence in the respective disciplines. Addressing the new agenda of sustainable development requires environmental professionals to broaden their perspective to consider social and economic sustainability issues as well as environmental aspects of land use. On the other hand planning professionals should develop more knowledge about the environmental consideration of specific spatial developments. The principal innovative aspect of BUGS is that it brings together complementary disciplines in a project that aspires to developing a comprehensive view on environmental facets of urban planning. Our project draws its strength from a synergistic approach, combining expertise in the domains of transport, environmental impact assessment, socio-economic analysis, and spatial planning.

Methodology:

From a technological point of view, the main challenge consisted of the coupling of the different participating models into a coherent methodology, allowing to address urban environmental issues and urban planning in an integrated way. A further difficulty was that the methodology ought to be applicable anywhere in Europe, requiring a flexible and general approach. This was considered very important, as the ultimate goal of the BUGS project is to ensure implementation of the methodology

after the discontinuation of the research project, under the form of study contracts or demonstration projects. From the outset, the objective was to assemble a multi-disciplinary, complementary, and task-oriented team. The members of the consortium were brought together based on their expertise and competence in the respective disciplines. Addressing the new agenda of sustainable development requires environmental professionals to broaden their perspective to consider social and economic sustainability issues as well as environmental aspects of land use. On the other hand planning professionals should develop more knowledge about the environmental consideration of specific spatial developments. The principal innovative aspect of BUGS is that it brings together complementary disciplines in a project that aspires to developing a comprehensive view on environmental facets of urban planning. Our project draws its strength from a synergistic approach, combining expertise in the domains of transport, environmental impact assessment, socio-economic analysis, and spatial planning.

Parent Programmes:

[FP5-EESD KA4 - City of Tomorrow and Cultural Heritage](#)

Institute type: Public institution

Institute name: European Commission, Directorate-General for Research (DG Research)

Funding type: Public (EU)

Partners:

Belgium:

Flemish Institute for Technological Research; Eurocities

Czech Republic:

Transport Research Centre

Denmark:

Danish Town Planning Institute

France:

Laboratoire Image et Ville

Germany:

Research Group Climatology; Kommunalverband Ruhrgebiet

Spain:

AAC Centro de Acústica Aplicada

Flemish Institute for Technological Research Remote Sensing and Atmospheric

Organisation: Processes

Zipcode: B-2400 Mol

City: Boeretang 200

Contact country: Belgium

Key Results:

The BUGS was designed to provide insight in the environmental effects of different urban growth strategies, including the effects of green areas. It is based on advanced technologies, including GIS, remote sensing, and computer modelling of environmental processes. Its flexible character, together with the expertise generated during the BUGS project, has turned it into a unique instrument, a virtual laboratory of the urban environment. As a result, almost any situation can be dealt with in BUGS, meaning that long-term scenario studies, with a truly strategic and visionary character, are within its realm.

The communication towards a thematic strategy on the urban environment (COM(2004)60 final) proposes actions in four priority areas for every EU city with 100,000 or more inhabitants. Of these priority areas, the one on sustainable urban design - referring to the pattern and type of land use within an urban area - most closely concerns issues that were addressed in the BUGS project. The way land is used is explicitly recognised as fundamental for the environmental performance of cities, and green space is recognised for its strong influence on the quality of life of urban citizens.

Of the urban design issues, urban sprawl is considered the most urgent.

Technical Implications

Studies carried out in the BUGS project have established that, at the scale of a city quarter or a park, reductions of PM10 concentrations by a few $\mu\text{g m}^{-3}$ can be achieved.

In another study, focusing on the carcinogenic pollutant benzene, it was found that putting a roof (above which one then could create an urban park zone) on top of a very busy urban ring highway could reduce traffic-related benzene concentrations by up to 20 % compared to the background values. Even though benzene ranks less in importance compared to particulate matter when it comes to health impacts, it is representative of other traffic-related pollutants such as CO and volatile organic compounds (VOC), hence provides a representative picture of air pollution originating from traffic. Also, the same study revealed that, even though benzene concentrations remained below the threshold of 5 $\mu\text{g m}^{-3}$ (as set in Directive 2000/69/EC), concentrations in urban areas were systematically higher by a factor of two as compared to rural values, which again is an indication of the effect of traffic on urban air pollution levels.

Policy implications

The core question addressed in the BUGS project was to what extent green areas and settlement patterns affect urban environmental quality. While performing the research, European policy with respect to land use, noise, and air quality was a permanent touchstone against which the spatial planning scenarios and the environmental simulation results were compared.

The favoured vision of high density, mixed use settlements with reuse of brownfield land and empty property, and planned expansions of urban areas rather than ad hoc urban sprawl, has been repeated in each community policy document on the urban environment, e.g., see the European Spatial Development Perspective (ESDP, 1999). The Thematic strategy on the urban environment will endorse this vision as the valid basis for Europe's cities whilst recognising that there are limits to acceptable population densities. In this respect, the BUGS has demonstrated to be a useful tool to assess the effects of urban growth strategies. In the integrated urban/regional scale study carried out on the German Ruhr area, the size of the city as well as patterns of population density were shown to have a significant impact on traffic and air quality. Among other things it was established that the compact city form, even though favoured from many points of view, also has adverse effects when it comes to human exposure to air pollution, owing to the fact that in compact cities people, on average, live closer to pollution sources than outside the city. At first one might feel uncomfortable with such a result. However, it suggests measures to counter the adverse effects of compact cities, in particular making a strong case for the establishment of efficient public transportation schemes.

With respect to noise, Directive 2002/49/EC relating to the assessment and management of noise requires Member States to map exposure to environmental noise and to adopt, at the appropriate administrative level, action plans to manage noise, amongst others for large agglomerations.

The Sixth environment action programme (COM(2001)31 final) states that "In the complex interplay of different forces and pressures which give rise to environmental problems, the role of land-use planning and management is crucial. This covers a widerange of decisions, usually made at local and regional level, determining the character and intensity of land uses and activities which may often have a major impact on environmental conditions. Such impacts may be direct for example by way of

STRIA Roadmaps: Other specified

Transport mode: Multimodal transport

Transport sectors: Passenger transport

Transport policies: Decarbonisation, Societal/Economic issues

Geo-spatial type: Urban