An Information System for Sustainable Settlement Development

- Abstract -

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Scope of the paper

One of the key issues of sustainable settlement development – especially in urban areas – is the reutilization of disused area in order to reduce the ongoing consumption of open space for settlement and traffic purposes and the protection of green areas. In Germany more than 125 ha open space are transformed per day into sealed area. This causes not only fundamental environmental problems, like a decrease of groundwater rechargement and increasing inner-city temperatures, but is also responsible for an increasing social segregation because of suburbanization and spatial dispersion. Since the UN-Conference on Human Settlements 1996 in Istanbul (HABITAT II) these problems build a core question of an environmental sound development and a reduced consumption of natural.

Focus

According to different authors the problem described as above should be solved by completing existing spatial planning instruments by using economical and fiscal instruments as well as improved information instruments. Both types can be seen as supporting instruments in order to strengthen the impact of existing planning instruments.

As a contribution to this debate, the information system "Sustainable Settlement Development" has been developed. The overall objective of this system is to provide information on the current and further development of land use in urban areas. Therefore it can be used as a decision support system (DSS) for different local planning tasks. Guiding principle for the assessment of land use patterns is the equivalence of the three dimensions of sustainable development, environmental, social and economical sustainability.

The main methodological aspect while developing the information system is based on the integration of general principles and indicators of sustainable development and functions of modern GIS-based data-preparation and analysis. The information system is developed for the city of Bochum, a major town in the Ruhr-Area with about 400.000 inhabitants.

Components and functions of the information system

The information system for sustainable settlement development consists of six main components:

- a hierarchically structured **system of objectives** that operationalizes the general principles of sustainable development for the local administrative level and on the focus of land use;

- a **set of indicators** to measure the degree, to which the above mentioned local objectives are fulfilled;
- a **spatial classification** for the city of Bochum into homogeneous quarters as a basis, on which the indicators are measured;
- an extensive **base of data- and methods** for analyses in order to retrieve relevant information;
- a **set of values,** that functions as quantitative objectives for different indicators and types of quarters;
- different **applications,** that are able to support the demands of different local planning tasks.

Results of the development

Constructing a multi-level **set of objectives** the general principles of sustainability are fully operationalized for a mono-thematic approach on the local level. The set of objectives considers the three main dimension of sustainable development, and translates their overall objectives into "objectives for a sustainable development of urban land use".

Seven different **Indicators** are developed, which are measurable on a small spatial level and which are able to depict the different aspects of sustainable development of land use patterns. Interlinkages between the different indicators are also identified.

The spatial classification of land use patterns by means of clusters analysis provides a suitable differentiation of the city of Bochum into homogeneous quarters. By detecting a typical distribution of different land use pattern six **land use types** can be identified. Based on the analyses of the current situation and considering research results from other cities, specific **quantitative values** for the different indicators and types of land use are formulated.

Application of the information system

Two applications have been developed to support typical tasks in different phases of the spatial planning process in urban areas:

As a spatially small-scaled "**Planning Information System"** it can be used to optimize the settlement structure in terms of a sustainable development. In this case, the system delivers information on the impact of concrete planning measures on the level of city quarters, for example on the potential of inner-city development and on possibilities to install function mixed zones.

The **"Scenario-Manager"** provides the possibility to construct different scenarios of the settlement structure on an annual basis by defining different growth rates for the indicators. By developing different scenarios the impact of quantitative objectives can be tested and the scope of necessary measures, to reach the overall objective of a sustainable settlement development, can be estimated.