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Department of Economic Geography

Featuring the quality of urban life  
in contemporary cities  
of Eastern and Western Europe

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## Indicators of sustainable development of cities – theory and practice

The majority of the sources of the negative effects of human activity is concentrated in urban areas. This is why alleviating the influence of the social system on the functioning of the natural system within cities belongs to the basic aims and tasks of the implementation of the concept of sustainable development.

In the most general terms sustainable development can be defined as a global development process which minimises the consumption of natural resources and limits the factors that harm the environment, through processes of improving the economy and raising the standard of living. This definition can be further specified for the purposes of analysing the processes of sustainable development in cities. In the case of cities it means limiting 'cities' consumption' of natural resources and production of waste while simultaneously improving their ability to accommodate people, thus better adapting cities to the capacity of the local, regional and global ecosystems. The pursuit of obtaining sustainable development is often represented, following Kołodziejcki (1995), as a harmonisation of the development of four spheres: the natural, the social, the economic and the spatial (Fig. 1). Such an approach to sustainable development also has consequences for the construction of indices concerning cities.

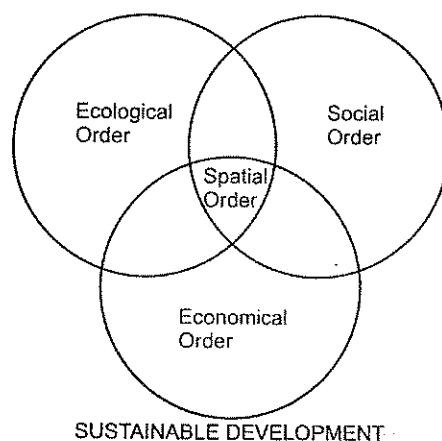


Fig. 1. Sustainable development as the harmonisation of four spheres (Kołodziejcki, 1995)

During the first several years of the evolution of the concept of sustainable development, from the turn of the 1970s to the mid-1980s, global institutions such as the United Nations measured sustainable development in the most general terms, according to state or international standards. Although the aims of ecological development were being defined more fully, there were considerable difficulties with not only determining the specific instruments of their realisation, but also – and even more so – with executing and controlling the implementation of particular goals. The concept of indicators of sustainable development evolving since the 1980s was expected primarily to help monitor the processes of sustainable development while identifying its goals by expressing them in quantitative terms, with the aim of reaching a particular index level (more favourable from the point of view of the criteria of sustainable development) in a given amount of time.

The successive formation of sets of 'urban' indicators made it possible to formulate basic goals to which the application of these indicators was geared. They included:

- determining the main long-term trends of the development of cities (investigating whether the functioning and quality of the city are improving or worsening with respect to the criteria or goals of sustainable development);
- determining the relations between these trends (evaluating how trends in the quality and functioning of cities are related to trends in their spatial structure, their organisation, and the lifestyle of their inhabitants);
- defining the primary goals of the sustainable development of cities.

From a practical point of view the indicators of the sustainable development of cities serve as:

- a systematic way of monitoring changes in the city environment;
- an early warning system for development problems;
- a tool for informing and communicating with society.

The sets of indices of sustainable development concern various levels of analysing problems – from the global to the local. 'Urban' indicators usually concern the local level. Yet, it is sometimes the case that a system of indicators is so universal that it can be used for various levels, e.g. state, regional and local. An urban index may also concern pressure on the environment on a regional or even global scale, which then goes beyond the group of local indicators. Examples of such indicators will be presented later on. Historically, the first and arguably one of the best examples of an indicator system devised specifically for the purposes of a city, are the Sustainable Community Indicators of Seattle. The process of their formulation began in 1991. The 1990s was a period of the development of lists of 'urban' indicators prepared mainly by international institutions. In that period the following sets of indicators were formulated:

- Organisation for Economic Co-operation and Development (OECD) (1991, 1993, 1994);
- Healthy City established by the World Health Organisation (WHO) (1994);
- European Environmental Agency (EEA) (1995);
- United Nations Centre for Human Settlement (UNCHS) (1995);
- United Nations Commission on Sustainable Development (UNCSD) (1996).

From the mid 1990s it became popular to prepare lists of sustainable development indicators for individual cities, for example for British cities, such as Leicester and Bristol (1995), or for American cities, such as Chattanooga, Noblesville, and Pittsburgh (1996). Based on these experiences, it was decided that each city should have its own, specific set of indicators accounting for its specificity, usually partially different from the lists for other cities.

A review of the above-enumerated sets of indicators made it possible to determine the most important criteria of their division. The first criterion – the sphere of sustainable development, which the index concerns – refers to a concept introduced earlier which defines sustainable development as the harmonisation of four spheres. According to this criterion, the indicators may be divided into:

- natural (e.g. percentage of inhabitants obtaining energy from renewable resources);
- social (e.g. percentage of children eating an appropriate quantity of fruit daily);
- economic (e.g. percentage of people employed in the 10 largest companies of the city);
- spatial structure of the city (e.g. part of the city covered with impermeable surfaces);
- infrastructural (access to services) (e.g. density of network and frequency of means of public transport).

The second criterion concerns the phase of influencing the natural and social environment, a set of indicators introduced and applied by the World Bank in the early 1990s. This includes measures of:

- pressure (e.g. quantity of potable water per inhabitant);
- condition or state (e.g. resources of consumer water per inhabitant);
- reaction (e.g. decrease in the use of water for municipal purposes, calculated per inhabitant).

Another general division of indicators can be done according to the scope of influence of processes occurring within the city:

- global (e.g. area of cropland in countries of the Equatorial zone necessary to obtain seed in order to produce the coffee consumed by the inhabitants of the city);
- regional (e.g. percentage of inhabitants buying mostly goods produced in the region);
- local (e.g. percentage of inhabitants regarding transport noise around their homes as a problem).

Other divisions of indicators can concern: age group (new born children, children, adolescents, working-age adults, pensioners); social group (foreigners, invalids, people with low incomes); or the type of data used in calculating indicators (physical-chemical properties of the natural environment, features of the social environment and economic system, public opinion). The division of indicators can also be based on the dimensions of sustaining cities, as suggested by Alberti (1996). Alberti distinguished: municipal systems (structural indicators), municipal flows (functional indicators) and quality of cities (quality indicators) (Fig. 2).

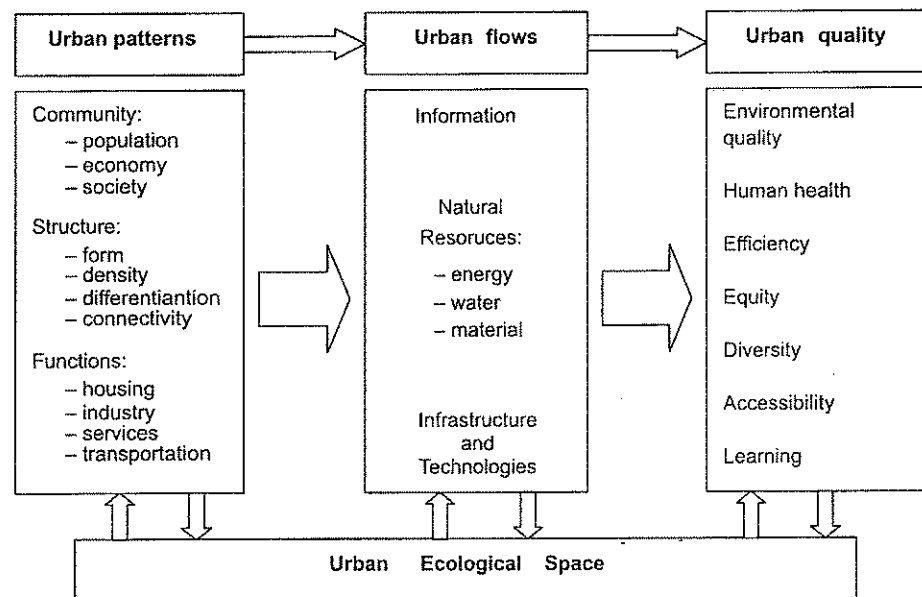


Fig. 2. Urban sustainability dimensions (Alberti, 1996)

As mentioned before, one of the most interesting attempts to formulate lists of 'urban' indicators were the indicators of sustainable community used in Seattle. The procedure for choosing these indicators, which lasted for almost four years after the initiation of the process, is regarded as a model to emulate (Atkinson, 1996). The participants included not only representatives of city authorities and experts on sustainable development, but also a broad representation of the city community organised in the so-called Citizen Panel. Verification of the suggested lists of indices performed six times led to the selection of 40 indices which were deemed crucial to the evaluation of the degree of sustainability of the development of the city (Fig. 3).

The criteria employed in the selection of the indicators assumed that they should:

- reflect the most important trends for the long-term social, economic and environmental quality of the city;
- be statistically measurable, if possible including access to data from the previous 1–2 decades;
- be attractive to local media;
- be clear for the inhabitants.

During the selection of indicators it appeared necessary to solve some dilemmas. These included:

- whether to focus on the local or global character of indicators (it was decided to concentrate on local indicators);
- whether to refer the indicators to 'input' or 'output', i.e. causes and effects of processes taking place in the city system (effect indicators were deemed more important);

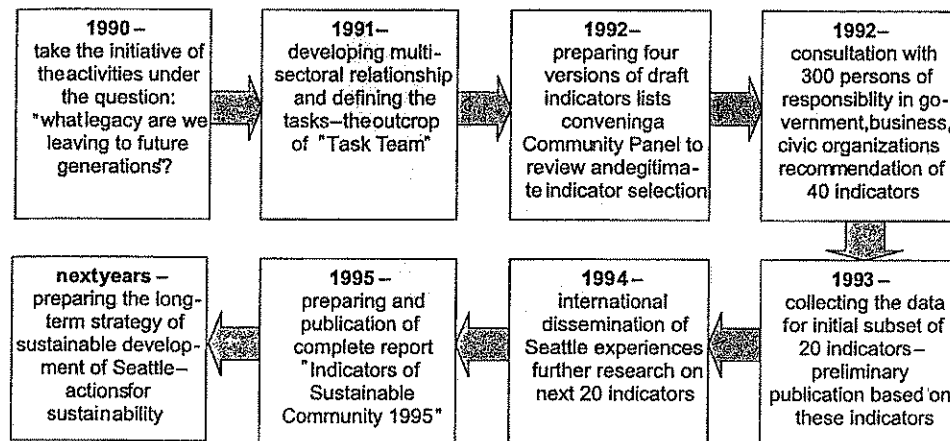


Fig. 3. The summary of the Seattle Sustainable Community Indicators development process (based on Atkinson, 1996)

- whether to express positive or negative trends through the indicators (though an analysis of positive trends is more desirable, it is sometimes necessary to include negative trends).

In the case of Seattle an international promotion of indicators of sustainable development was also included, which enabled these indicators to be quite widely popularised. During the promotion, for example, the spectacular example of relations between poverty among children and the number of salmon in rivers was presented. On the basis of indicators obtained over the course of several years and an analysis of cause and effect relations, it was observed that, due to the increased crime rate among children from poorer city districts, inhabitants of the city prefer travelling by car to riding a bicycle or walking, which causes an increase in the number of sources of pollution in watercourses, which, in turn, increases the death rate of salmon in the rivers. This example not only illustrates the possibility of a considerable broadening of the inference field thanks to the use of index analysis, but also shows the vastness of the disciplines that should be included in the process of determining the indices.

A rich set of interesting indicators was also adopted for British cities (e.g. Bristol), where, since 1995, 40 indicators have been calculated every year for the individual districts of the city. They were divided into five basic groups concerning:

- creating a sustainable municipal environment;
- constructing a thriving local economy;
- reaching a satisfactory level of knowledge;
- promoting health and well-being;
- improving the living conditions of the local community.

The first group is determined by indicators of biological diversity (e.g. percentage of gardens and ponds inhabited by frogs or percentage of respondents expressing the opinion that the number of birds in gardens has increased or remained at the same level for the last three years), or indicators concerning energy conserva-

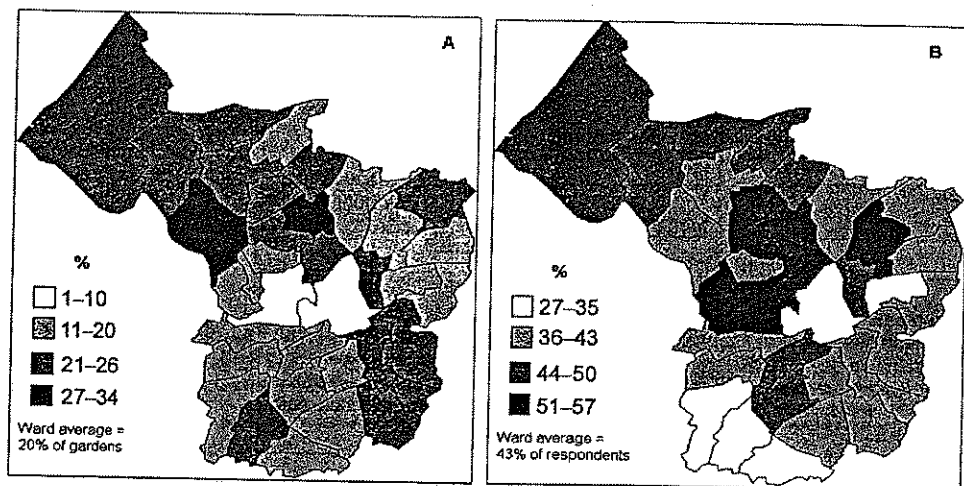


Fig. 4. The examples of spatial distribution of indicators of quality of life in Bristol (2001): A) percentage of gardens and ponds with frogs, B) percentage of respondents who have energy efficient light bulbs (Indicators of..., 2002)

tion (e.g. number of respondents using energy-saving bulbs) (Fig. 4). The last group is determined by indicators of social safety with respect to the crime rate. The period of several years of gathering data concerning indicators of the sustainable development of Bristol makes it possible to perform dynamic analyses of the rate of sustainable development of the city.

I have recently carried out similar attempts to evaluate the values of indicators of sustainable development for selected districts of Gdańsk with reference to the quality of the water supply (Kistowski, 2003). A survey of the local community's level of satisfaction with the quality of potable water revealed that the inhabitants using underground water resources evaluate water quality much more favourably than those using waters tapped from the surface in the Radunia. People from the latter group also consume water from sources other than the municipal pipeline much more frequently (Fig. 5).

The indicators of the sustainable development of cities are also often used to evaluate the degree of advancement of sustaining the development of cities. Such research was conducted in the Dutch city of Maastricht (Rotmans et al., 2000), where it was shown that social-cultural 'capital' was much better sustained than natural 'capital' (Fig. 6).

The above review of indicators shows that the following factors should be included in the selection process:

- the scope of information necessary to take into account all of the most important problems of sustainable development of the city;
- ensuring the reliability of information used in calculating indicators;
- range of entities participating in the process of selection of indicators;
- ensuring mechanisms guaranteeing that the obtained data will be used in the process of decision making.



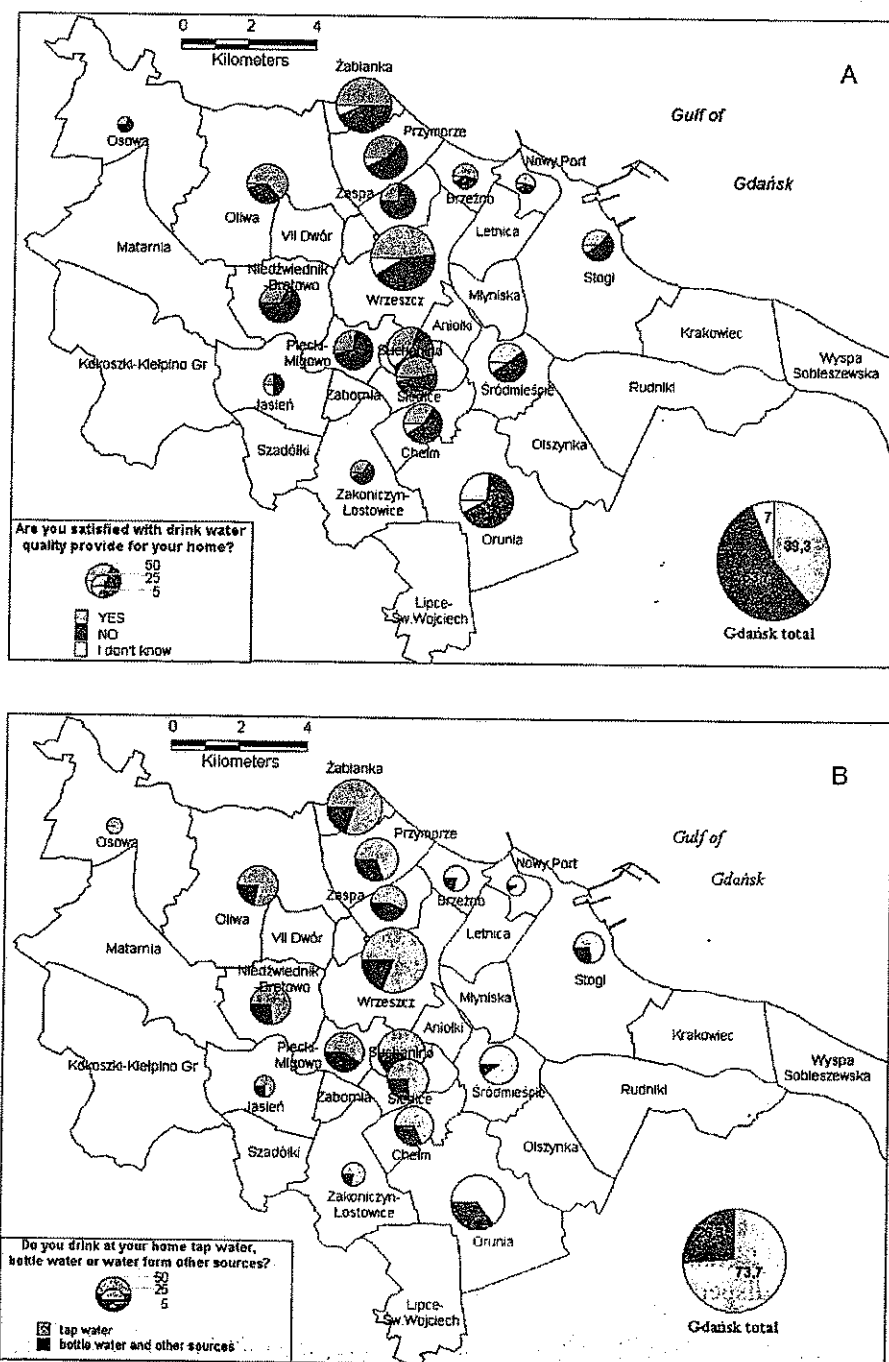


Fig. 5. The opinions of the citizens of Gdańsk concerning: A) level of satisfaction according to the quality of potable water provided to their homes, B) sources of potable water (after Kistowski, 2003)

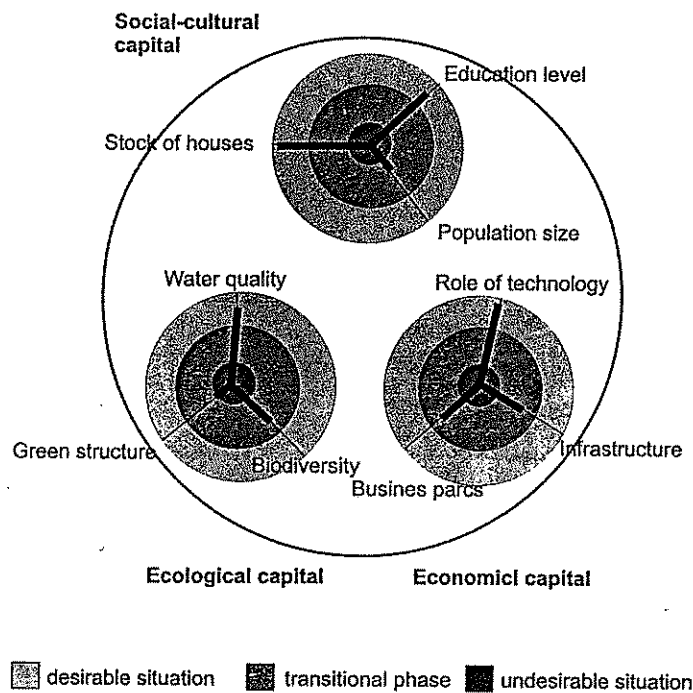


Fig. 6. Advances in the sustainability of Maastricht (Rotmans et al., 2000)

For example, in the case of Seattle it was determined that the key factors ensuring the success of the project were:

- access to an administrative base;
- an appropriate schedule;
- co-operation with competent experts.

Despite the relative popularity of the use of indicators of sustainable development in many cities throughout the world, particularly in highly developed countries, in Poland such indices are rarely used. This situation is unfortunate given the necessity of implementing the constitutional principle of sustainable development. It seems that the basic barriers to the implementation of these indicators in Poland are:

- the low level of mutual acceptance and co-operation between local self governments and local communities;
- a crisis of social activity;
- the lack of strong social structures and institutions which could co-ordinate the process of formulating indices;
- an severe dispersal of competence and sources of data with respect to the problems concerning sustainable development;
- the inability to apply the results of research and social efforts to planning processes;
- the lack of experts with broad knowledge and experience in sustainable development.

These barriers should be overcome successively. The research on the sustainable development of cities, conducted with the use of indicators, is another fascinating area of study carried out by, among others, geographers. This line of inquiry and its practical applications should be extended to more local communities.

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