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## THE ROLE OF GREEN SPACES IN THE SUSTAINABLE DEVELOPMENT OF TOWNS

### 1. Introduction

One of the conceptions in planning of spatial-functional systems, *i.e.* towns and regions, is that of sustainable, or balanced, development. It derives straight from the general theory of equilibrium that has been developed in economy, and its specificity lies in the fact that economic equilibrium has been transferred to man's ecological system, if we define as such all kinds of spatial structural-functional set-ups, in which he lives and carries out his activities. The popularity of the concept of sustainable development stems from the conviction that it is only in balanced spatial-functional set-ups where the relations among man, nature and the economy can be molded most effectively in the times of highly dynamic urbanization processes, ones of a great variety of controls of economic development and social change, as well as of ecological threats.

The aim of the present article is to discuss the role of green spaces in the sustainable development of towns and the functions they perform for their inhabitants and the entire urban socio-ecological system.

### 2. Functions of green spaces in towns

Green spaces play a variety of functions in an urban system, primarily ecological, technical and aesthetic, as well as social, didactic, pedagogical, recreational, and economic. The best-known ecological functions of a town's green spaces are those of modifying and regulating its ecological conditions [Czerwieniec, Lewińska, 1996]. The state and quality of the urban environ-

ment are modified by one of the basic purposes of green spaces, *viz.* the production of oxygen and the absorption of carbon dioxide.

Greenery affects a town's thermal conditions through its heat absorption and accumulative properties, which are different from those of built-up spaces. Vegetation causes a decrease in temperature by  $0.4^{\circ}\text{C}$  at a distance of about 100 m from a park's edge, with the cooling effect being the stronger, the larger the park's area. The fall in temperature in parks and the surrounding areas brings about a simultaneous increase in air humidity by 3–8% in a cool season and by 5–20% in a warm season in comparison with areas devoid of vegetative cover. All kinds of biologically active spaces perform the role of "hydrological windows" for towns by limiting overland flow in favor of infiltration. Vegetation, especially tall, affects air movement in the town, thus producing thermal differences during summer heat, which result in a pleasant, cool breeze. It also reduces wind velocity, which leads to a drop in the concentrations of particulates and gas pollution in the ambient air, although the effects of the latter on plants, especially conifers, are not indifferent. Many plant species exude the so-called phytoncides, *i.e.*, essential oils with medicinal and even bactericidal, fungicidal and insecticidal properties. Some have a calming effect on humans (*e.g.*, the phytoncides of coniferous shrubs and trees), while others stimulate the nervous system, intensify activity, raise the blood pressure, and remove tiredness (those of broadleaved trees). Most phytoncides contribute to the negative ionization of the air, which has a beneficial influence on the human psyche. Unfortunately, there are plants which cause a positive ionization of the air, or which are a nuisance in the town, owing to their seasonally allergenic effect (*e.g.* poplars).

Apart from their ecological functions, green spaces also perform technical functions consisting in the amelioration of the detrimental effect of an advanced civilization on humans. Plants absorb and scatter acoustic waves. Tree trunks cause them to diffract, while twigs and leaves act as resonators. The noise suppression capacity grows with the total area of leaves and their density. Vegetation planted along roads can, moreover, enhance traffic safety by shielding them from snowdrifts, while that planted on the median strip between the carriageways is a protection against glare.

Greenery enhances a town's aesthetics; it can emphasize architectonic features of objects or hide their more ugly fragments. It performs a variety of functions: social (as a meeting place of the town's residents it facilitates the establishment of social contacts), economic (municipal woods, allotment gardens), and recreational. These multiple functions, extremely important ecologically and socially, are enough to make obvious the necessity of introducing the biggest possible green spaces into the urban spatial-functional layout, in accordance with city-planning standards.

### 3. Man's attitude to nature as a determinant of his planning activities

Nature, as a component of an urban socio-ecological system, can be viewed in a variety of ways. The perception of nature, especially the awareness of how human life depends on the properties of the environment, is defined by man's attitude towards nature. The perception of nature and the attitude towards it are the resultant of many factors, the most important of which are the cultural sphere, recognized systems of values, ethical norms, and worldviews [von der Wurff, 1992]. In seeking harmony in the coexistence of man and the environment, or nature, religious or even purely theological considerations are invoked [Root, 1985; Mierzejewska, Parysek, 2001].

Four attitudes towards the natural environment can be distinguished, in which one can find religious inspiration (cf. Table 1):

1) a "dominion-over-nature" attitude, which in Lynn White's extreme opinion is the main element of the Judeo-Christian tradition responsible for the present environmental crisis;

2) a "stewardship" attitude, defined by White's critics, rests on the same denominational assumptions, but interprets them in a different way;

3) a participatory attitude, introduced by Achterberg [1986], who is also the author of this classification; and

4) a "unity-with-nature" attitude, another extreme in the classification, represented by proponents of "deep ecology".

In the observed reality, two approaches seem to predominate: the dominion-over-nature approach, especially in towns and urbanized areas, and the stewardship approach, which can be found in the type of physical planning based on the sustainable development, or eco-development, model. The participatory approach can also be connected with sustainable development, but in areas developed less intensively, while unity with nature is an approach adopted primarily in the case of legally protected areas. These approaches mark a moderately active attitude of man towards nature in which, on the one hand, natural elements (green spaces) will be introduced into an urban system and on the other one, the existing greenery will be used, but also protected.

These general principles should be the guidelines for the construction of a general model of urban spatial development which should accommodate mutual relations between natural and man-made elements of spatial development. Poznań, one of the biggest Polish cities, has worked out such a model in which the surrounding woodland forms green wedges penetrating into built-up areas and converging on the city centre. The wedge conception is still valid, but the city's modest budget prevents its full implementation.

**Table 1.** Man's attitudes towards the natural environment.

Orientations	Dominion over nature	Stewardship	Participatory	Unity with nature
Attitude towards nature	Often absolute gap metaphysical discontinuity) between man and nature. Related to dualistic and/or rationalistic philosophies, or inspired by religion.	Man connected with, or even dependent on, nature, mainly because of its potential and significance for socioeconomic life. May also be inspired by religion.	Man essentially connected with other life-forms in ecosystem, which is perceived as community of vulnerable and autonomous partners. Differences between man and other life-forms not absolute (though important) and form a continuum	Differences between man and non-human nature are not absolute, and are sometimes even perceived as minimal or irrelevant.
Evaluation of worth of nature	Nature has no intrinsic value	Nature has more value than mere utility value	Life-forms, characterized by autonomy and vulnerability, have intrinsic value	Nature has intrinsic value
Ethical-moral attitude towards nature	Nature only as resource to be exploited. No moral respect for nature	Respectful and responsible treatment of nature is man's duty towards himself or God	Moral respect for natural life-forms	Moral respect for nature

Source: adapted from Achterberg (1986).

#### 4. The importance of green spaces for town residents

Green spaces in towns are a necessity not only in terms of ensuring a measure of equilibrium between natural elements and built-up areas, but also in terms of social needs that can find fulfillment by contact with nature. The fulfillment is a condition of equilibrium involving the third, most important, component of the urban system, *viz.* its residents (a local community).

A survey research carried out among Poznań citizens showed that green spaces were considered an important element of the city's spatial-functional structure. The literature also confirms that residential preferences tend to favor the vicinity, or even better, immediate neighborhood, of greenery. This is shown in big city dwellers moving from their high-rise estates to smaller housing estates built on the periphery, among the greenery surrounding the city.

Out of the several categories of green spaces listed for Poznań residents to choose from, the most important for the latter were woods, followed by parks and gardens, and the least – squares with lawns and playgrounds. However, preferences tended to change with age: young persons preferred green spaces

changed by man only to a very small extent (woods, fields and meadows on the city margins), while older people favored well-kept and trimmed parks and gardens situated near their places of residence.

Almost 40% of the respondents visited green spaces once in a week or several times in a month, presumably this being weekend recreation. The youth were the most frequent, almost daily, visitors, while adults and the elderly relaxed on the bosom of nature much more rarely. The frequency of visits was also connected with the time of journey to a green area. Generally, the longer the time, the lower the frequency.

There are many criteria of green space selection. For Poznań residents the most important were: peace and quiet, and the beauty of nature. Another major factor, already mentioned, was the distance that had to be traveled. Of lesser importance were the area of a green space, although in fact the area is crucial for the quality of recreation, landscape diversity, the possibility of renting tourist equipment, and the presence of children's playgrounds. The research showed the criteria of green space selection to be strongly correlated with the gender of the respondents. Women favored peace and quiet, the beauty of nature, and the presence of children's playgrounds, while what counted for men were the size of the green space and landscape diversity.

In the survey research, Poznań residents were to give their opinions about the number of green spaces in the city. Almost three-fourths decided there were too few of those, and the assessment was similar for those near the respondents' places of residence. On the point of greenery in the city, the inhabitants of all the city quarters and of all ages were in full agreement. Presumably, the respondents judged the general amount of greenery in the city on the basis of the situation near their own homes. Still, an important conclusion is that Poznań citizens understand the role that green spaces perform both for the city and for themselves, and the need to enlarge their area.

The respondents also evaluated the level of development of the Poznań greenery. Their opinion was not too favorable. They thought there were too few litterbins, benches, flower-beds, flower carpets and playgrounds in the Poznań parks and gardens, and enough paved walkways and quick-eating places. This opinion was gender-related to some extent: women tended to notice the scarcity of flower-beds, flower carpets and playgrounds, while men were much more concerned about the shortage of quick-eating places.

The respondents also gave their opinions on some proposals for the development of public open spaces designed to improve their functionality and the quality of recreation in them. All were declared to be important. The most important ones, however, were "improvement of cleanliness" in green spaces, which usually does not require major financial outlays, but merely better manners, "planting of trees and shrubs on wasteland", and "development of

greenery on housing estates". Also important were "improvement in security", "delimitation of walkways", and "creation of new green spaces". "Improvement in accessibility" was considered to be of lesser weight, which shows the Poznań mass-transit system to be well-developed, and so was "improvement in the information about green spaces".

In the literature of the subject, one can often find the statement that the desire to live in neighborhoods with green spaces is what affects the choice of a home. The survey research carried out in Poznań seems to corroborate it. Among the proposed criteria for the choice of a potential residential place, "nearness of green spaces" and "nearness of municipal transport" were top-ranked. "Price of a flat only ranked third, followed by "neighborhood" and "accessibility to shops and services". These criteria changed considerably with the age of the respondents. Young people were more often guided by the price and transport accessibility, adults valued the nearness of shops and green spaces, while elderly people preferred places with ready access to mass transit.

The research shows that the Poznań residents appreciate the importance of green spaces in their city's spatial-functional layout. This is manifested in their desire to live near such spaces and in their emphasis on developing them further.

## 5. Conclusion

In the light of the study reported, it can be stated that green areas, which perform a variety of ecological, social and economic functions, are an important element of the spatial structure of towns. Greenery, apart from its aesthetic value, has the ability to alleviate the detrimental effects of civilization-related development on humans. The poll among Poznań residents has shown that they value green spaces very highly. They think the best residential places are those in the vicinity of such spaces. Generally, they are for their conservation, enlargement, organization of new ones, and further development of the existing parks and gardens.

Unfortunately, in many towns, the growing competition between open and built-up spaces leads to a gradual elimination of natural elements from the town's space. That is why the concept that is gaining ground recently is one of urban development in harmony with nature. Man in the city should adopt the "stewardship" or nature-oriented approach and manage the urban economy in such a way as to enhance economic growth, which gives citizens their wealth, but at the same time to protect the existing green spaces and organize new ones, thus satisfying their other, no less important needs. This is what sustainable development seems to promise.

## Literature

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## THE LOCATION AND ENVIRONMENT OF ADVANCED TECHNOLOGIES IN BERLIN

### 1. Introduction. Berlin as an innovation-friendly place

After decades of functioning as two separate cities (the eastern part as the capital city of the German Democratic Republic and the western one as an isolated enclave – the former occupation zone of the Western Allied Forces), processes of Berlin's unification reached a controversial level. The divergence between social and spatial-economic aspects are still visible. Despite those problems, the city is developing, not only endeavoring to be the capital for the German nation, but also aspiring to become the most important urban area of the whole uniting Europe. Modern way of development, by favoring the most promising branches of industry – medical engineering, whole life Sciences sector and telecommunication technologies, should transfer Berlin into a high-technology centre of international importance, comparable not only with European cities, but also with global players. Berlin, as a model type of region (Drozdowski 2004) dominates the surrounding space – also with new industry location, which probably will rise the whole region's competitiveness.

High technologies as signs of the level of economic development are nowadays often main goals for local and regional policy (Hansen, 1994). Probably, even a more important thing is that they can be perceived as indication of how modern and globalized city's (in this case Berlin's) or region's economy is (Gaessler, 1999, 2000). Life Sciences, optical technologies, medical engineering or other advanced technologies are common branches existing within Berlin's boundaries. In this place the main question and research objective of this article is what causes Berlin's popularity as a high-tech location place and how advanced technologies are distributed within its urban area.