GREEN SPACES AND PUBLIC HEALTH IN URBAN AREAS

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Abstract

Quality of life in cities depends largely on the availability of attractive and accessible green spaces. It is generally agreed that urban green spaces are essential for the health and well-being of citizens. This paper aims to broach the issue of urban green spaces, emphasizing their importance (embodied in at least three categories of benefits: environmental, economic and social) and focusing on the idea that the existence of green spaces may contribute to obtaining savings or income in a city's treasury. Therefore, it takes shape the belief that the effects gained from investing in planning and protecting urban green infrastructure, could turn into economic effects. Last decade, researchers have shown a real interest in finding ways to quantify what is called today the economic value brought by the existence of green areas in cities.

Keywords: green spaces, human health, social benefits, hedonic value.

1. INTRODUCTION

The cities are considered to be the most complex non-natural ecosystems. Their viability and their sustainability depend clearly on nature, both around and inside urban structure. The importance of urban green area for human life and welfare can be followed up and analyzed in various aspects: biological, ecological, social, technical, structural and psychological.

This paper highlights the importance of green areas for sustainable urban development. The general notion of sustainable development represents a paradigm in urban planning because a large proportion of world production, consumption and waste generation, is concentrated in cities. The interest for "greening" cities appeared together with this notion and it develops as people feel more and more negative effects of restricting green spaces, with repercussions on quality of life and human health.

"Europe is the most urbanized continent on the planet with about 75% of the population living in the urban area" says the European Environment Agency in 2006 report *Urban sprawl in Europe.*

In Romania areas occupied by green spaces have a fluctuating trend from year to year and they can not ensure the necessary green area per capita. Moreover, the phenomenon of accelerated degradation of green spaces is felt, together with the declining of its surface, these hovering below the requirements and provisions of regulations.

It is necessary people to understand the effort in urban green infrastructure conservation is not just an expense but an investment that will generate a series of important, unexpectedly economic benefits in the future.

Therefore, the authors wanted to bring arguments supporting the idea mentioned before, in order to convince the reader of the importance of preserving green area in cities and planning new ones where the minimum requirement for green space per capita is not reached. The absence of green spaces can affect our future life and certainly we can not talk about sustainable development anymore.

2. BENEFITS OFFERED BY GREEN SPACES

Under Article 3 of Law 24/2007 on the regulation and management of green spaces in buildable urban, republished in 2009, green areas consist of the following types of land within built up-area:

a) public green spaces with unlimited access: parks, gardens, squares, planted strips;

b) public green spaces with specialized use:

   1. botanical and zoological gardens, outdoor museums, exhibition park, environmental and recreational areas for animals trained in circus performance;

   2. those related with public facilities: nurseries, kindergartens, schools, hospitals or social protection institutions, buildings of worship, cemeteries

   3. bases or sports parks for practicing performance sports.

c) green spaces for recreation: recreation basis, centers of recreation and sports complexes;

d) green spaces to protect lakes and rivers ways;

e) protection passages for the technical infrastructure;

f) recreational forests.

This law does not include a clear definition of the green space term. So it leaves place for interpretations and the possibility of using vacant land for construction.

We considered appropriate to present the following classification of the many benefits green spaces are bringing in urban environment: ecological, social and economic benefits (Chiriac et al. 2009).

From an ecological perspective, green spaces contribute to:

- a chemical treatment of the atmosphere by consuming carbon dioxide in the process of photosynthesis;
- a natural cleansing of the atmosphere by retaining dust;
- a bacteriological purification of the atmosphere, destroying much of microorganisms through the releasing of oxygen and ozone;
- moderating urban climate through shade effect and humidity;
- noise mitigation;
- preservation and perpetuation of indigenous natural vegetation.

Among social benefits given by the existence of urban green spaces, are counted:

- increase social inclusion by facilitating social contact between people of all ages, both informally and through participation in social and cultural events (local festivals, civic celebrations or doing some theater work, film etc.).
- promotion of urban health by encouraging a more active lifestyle (by walking, running, exercise, cycling, etc.), while relaxation and stress reduction;
- human needs for recreation and leisure;
- mitigate the impression of rigidity and aridity of any built environment through aesthetic function that green spaces are meeting.

Regarding economic life in cities, green spaces come with some important benefits, such as: creating a favorable image of urban centers, with results in increasing attractiveness for investment; increase in value of urban areas; increasing the quality of housing, when properly maintained; the development of tourism and so on.

Over the past two decades, researchers have shown a growing interest to find out to what extent, urban green infrastructure contributes to the economic well-being of cities, or rather if the benefits listed can be measured and whether any kind, they generate economic value to cities. In support of this idea comes the thesis that, "sooner or later, any effect, whatever its nature, will become economic effect" (Stoian, 2002).

3. ECONOMIC VALUE OF GREEN SPACES

Many experts and researchers have concluded that the seven elements embodied in the benefits of urban green spaces (Harnik and Welle, 2008), can be measured and therefore may facilitate the calculus of direct revenue to the state budget or of the savings made up. Among these are included: increase in property value near green spaces, tourism development, health promotion, increased social

inclusion, reduced air pollution, reduced storm water management costs, benefits from the direct use of recreational facilities.

For a better understanding of how these benefits are able to determine savings or income, we present further details on each of them.

3.1. Property value

Measuring the effect the green spaces have on the adjacent properties, has become a common practice. Numerous studies have shown that housing and land value, which are adjacent to green spaces, may increase by 8% to 20%. For example, it is known that most people that want to buy a new place to live, are willing to pay more if they close a park, a school, a police station and any other facility of its kind.Therefore, urban green infrastructure can help increase revenue in real estate. It is believed that the image of an area can be improved as a result of high property prices. Cities abound with green spaces, attract more visitors, which means revenue from retail and leisure arrangements, and employment and rental opportunities.

Property value is called by economists "hedonic value". It is considered that this may be influenced by many characteristics (Choumert et al., 2008). The central charactyeristic is accessibility, measured as the distance to the green or the percentage of green areas in a given perimeter;

To determine in what way green spaces lead to increased revenue for the state budget, U.S. researchers took first the value of properties in a certain perimeter beside an area with green spaces, such as parks, over which they applied average value benefit brought by the park, resulting so, the property value influenced by the proximity to the park. Knowing the annual rate of property tax, it can be determined the amount of annual state tax levied for property adjacent green spaces in the area of interest.

Without support to ensure the data on property value, quality parks (if they favor or not the hedonic value), the growth rate of property value due to green, it becomes difficult to quantify earnings due to green spaces.

3.2. Tourism

In order to support the idea that green infrastructure plays a key role in tourism, representing in the same time a great opportunity to increase a region's Gross Value Added, we further enumerate some ... that green infrastructure influences:

- helps support urban tourism, shopping;

- makes city centers more attractive;

- softens extremes of weather;

- incorporates visitor attractions, preserving attractive landscapes;

- generates economic activity in sectors such as agriculture, forestry, public services and hotels and catering.

Most times, the parks are those that attract tourists, either because of their beauty or grace of festivals and cultural events, art.

To calculate the contribution of parks to boost tourism and consequently the revenues for the state budget, it is necessary to estimate the number of tourists visiting the park but for the park itself and the expenses incurred by them during the visit, whereas there may be so called overnight visitors (who spend more, because they should be lodging in the area) and day visitors (who spend less).

Some will spend more on transportation if they do not live near the park or come from another city, others will do so shopping in that area. To find the necessary data for economic calculations, surveys on users and their visit to the park are useful.

The total costs of visiting the park is multiplied with the value added tax, thereby the net profit due to the park is achieved.

3.3. Human health

Health benefits quantified in economic terms, refers primarily to savings achieved in the health budget as a result of reducing the costs of various diseases, reducing compensations for sick leave and absenteeism from work burden for employers.

It is known that lack of exercise, high stress and high levels of pollution are associated with development of obesity and heart disease, asthma, diabetes and some cancers. Investing in and protecting urban green spaces, means a boost for physical activity and recreational pursuit as necessary to prevent such health problems. Medical expenses for one person performing regular physical activity are lower than for those who are sedentary and don't exercise. Also, „an investment of $1 in physical activity (time and equipment) leads to $3.20 in medical cost savings".

Thus, savings in health budget may be determined as follows:

- a breakdown by age of adults (residents) is found, adults that exercise regularly (at least 30 minutes of physical activity at least five times per week) in any place considered green space,

which enables to practice their physical activities; for example: adult visitors aged under 65 and adult visitors aged 65 and over.

- the difference between the average cost of medical services for active people who do sports or any kind of physical activity and inactive people, which are those not so doing. Following studies in several countries, U.S. researchers have found that for adults under 65, this difference is 250 dollars, while for those 65 or older, the difference amounts to 500 dollars. This may be explained by the fact that older adults often bear two or more health care costs of young adults.

- finally, by multiplying the two values, a total is obtained, total on which should be applied a coefficient, named regional cost multiplier (based on statewide health care costs). For instance, for health services, this multiplier is calculated at 0.60 euro for Kansas City and is different for different regions. After applying the multiplier, health budget savings (due to the existence of green areas and sports activities, recreation and leisure, held in their perimeter) are obtained.

3.4. Direct use of green spaces

Activities such as walking or cycling, going to picnics, visiting a garden, playing a sport team, skateboarding etc. are included all in the category of activities resulting from the direct use of green spaces, for which, most times people don't have to pay. However, economists calculate the value of such activity taking into account the cost of similar activities in a private recreational area. Thus it appears the notion of "willingness to pay." Therefore, taking advantage of free recreation opportunities or at a lower cost, people realize significant savings.

Opinions are divided as these savings are not made directly, in comparison to the fees or revenues from tourism, they are included indirectly in society.

If they had to pay for any activity in areas with green spaces for leisure and recreation, in time, city residents would waive some of their favorite activities, which would lead to dissatisfaction.

To determine the economic value of using green spaces for various activities and facilities, we need to divide them into three categories namely:

- general activities / facilities (for example: the use of playgrounds, going to picnics, walking animals, the development of trails, etc.);

- sporting activities (such as skating, swimming, cycling, tennis, soccer, etc.);

- special facilities / activities (golf, gardening, conducting festivals, concerts and other cultural events).

After having achieved this classification, the next step, which is to estimate the number of people visiting the park or recreation space within a year, appraisal of activities strictly related to the facilities mentioned. Most visits are made for general activities, something not hard to guess.

Each visit is assigned with an average value and by multiplying it with the number of visits, are obtain values for each category of activities / facilities, that if we sum up, we get the economic value of green spaces from direct use.

3.5. Social inclusion

Human needs to integrate into society, to make as many contacts in the area where they live, to live together in a safe environment, are facilitated by the existence of green areas, which often represent the appropriate place to meet them.

Through socialization are transmitted fundamental rules of social life: rules, prohibitions, customs, beliefs, mindsets etc., from the simplest and most basic skills to complex and sophisticated skills involved in research, innovation, scientific discovery or the creative act. (Carcea, 2001)

Considering that the activities or facilities that we have listed above to *Direct use of green spaces*, are leading to social cohesion, it appears the problem of measuring the economic value of what Jane Jacobs called "social capital", a concept that actually describes the relationship that are set in a community as a result of human interaction in these activities. The idea was first formulated by Lyda Hanifan in 1916, who wanted to promote „good will, fellowship, sympathy and social intercourse among those that 'make up a social unit" (INFED, 2008).

„Social capital" is also being used by the World Bank as a useful organizing idea. They are aware that „increasing evidence shows that social cohesion is critical for societies to prosper economically and for development to be sustainable" (The World Bank, 1999). „Social capital is not just the sum of the institutions which underpin a society – it is the glue that holds them together." (World Bank, 2007)

Therefore, to determine the economic value of social cohesion, it was considered important to follow the extent to which people allocate time and money for maintenance and planning urban green infrastructure. For this, U.S. researchers have decided to consider the work of various environmental organizations, which often are based on volunteering and that are performing garbage collection of green spaces, are planting trees and flowers, organizing seminars informing citizens and so on.

For each of these organizations, the number of hours of volunteer charged was calculated and then a value has been assigned to a volunteer hour. For example value of one hour of volunteer labor in Pennsylvania as determined by Independent Sector in 2005 was 18.77 dollars. In this way the value of volunteer hours worked resulted, at which contributions were added in the form of donations or sponsorships, as finally to obtain the economic value of social cohesion influenced and stimulated by the existence of green areas.

3.6. Clean air

In the fight against climate change, we have the most important assets, which are green spaces. The most common greenhouse gas removed from the atmosphere, thanks to green areas, is carbon dioxide. Trees remove this gas and store it for generations. „Forests account for almost 60% of the carbon that exists in the Earth's vegetation and soils" reveals an australian report in 2008.

Tree leaves absorb pollutants and stabilize dust, acting this way as a naturally filter. In addition to this they are said to be the "green lungs" of cities. To support this idea, the next example comes: a United States study estimated that dust levels in an urban park in Georgia were 60% lower than outside the park.

For finding out in what way green areas are cutting down air pollution costs, we need to know about the area of interest, the next two things: tons of pollutant removed by green and the money saved per tone removed, each of them for each category of pollutant. Usually, the pollutants which are monitored are: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), particulate matter (PM_{10}). In our country, the National Network of Air Quality Monitoring has more than 100 stations all over Romania, which monitors air quality parameters.

The money saved per tone removed represents what is called "the externality value". The idea functions on the principle of deferred costs. It is all about thinking how much would have cost to prevent a unit of a pollutant from entering the atmosphere, if it weren't for trees. Many scientists use calculators which determine the pollutant flow through an area within a given time period, hourly pollution concentration data from the Environmental Protection Agency and data regarding characteristics of different types of trees and other vegetation and seasonal leaf variation.

Total pollutant removal value is obtained by multiplying tons of pollutant removed by money saved per tone removed.

3.7. Clean water

The most important arguments when talking about the influence of vegetation on reducing the costs of managing urban stormwater are:

- a surface area of vegetation retains considerable quantity of rainwater and mostly a part of that same water never reaches the ground because is being evaporated;

- by capturing rainwater, its runoff is being slowed;

- vegetation cleans water and acts as a filter, intercepting sediments and recycling nutrients;

- allow a better drainage;

- decreases the risk of flooding;

To find out the value of savings in managing stormwater, due to urban green, it is necessary to have data related to land cover (forested area, open grassy area, water surface), estimate annual runoff, rainfall on impervious surface, annual expenditure on water treatment, cost per cubic meter.

A model for calculating the cost savings due to runoff reduction (regarding only parks) should contain:

- Annual rainfall over an entire city;

- Amount of actual runoff from parks;

- Runoff if parks didn't exist and if that acreage were of the same permeability as rest of city;

By making the difference between the last two, Reduction in runoff due to parkland's permeability is obtained. Multiplying this last value with estimated stormwater costs per cubic meter, we should be able to get the Total savings due to park runoff reduction.

4. CONCLUSIONS

Determining the economic value of green spaces, especially urban green infrastructure, is a science that barely takes shape, retaining the attention of many researchers, representing several disciplines and different geographic areas. A decade ago, few were those who were thinking at the worth of a city's parks or any green area. Now, we realize that in cities (about one can say that they are home for many citizens and a place for the largest consumption of resources), green areas are both habitats and ecosystems, and they create and develop a connection between residents and environment, while supporting some services. Investigators reveal that urban green spaces have essential contributions to

local and regional economies. People need green spaces, we can say that their needs are visible, and that's how the economic returns of green infrastructure should become "visible".

The ways of assessing urban green areas, described above, demonstrate that important steps have been made and that budget holders, policy makers, foundations and other organizations implied in environment actions, should be aware of them, in order to evaluate green infrastructure, find its economic value and subordinate it to economic development. This means a broader view and an increased attention to urban green spaces as "assets" in a community (Walker, 2004). As any other assets, green spaces must be maintained, otherwise they will deteriorate. In the same time, this approach comes as a loud and strong call for investing, managing and promoting the greening of cities.

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