

# "Green" infrastructure as a factor in ensuring sustainable urban development

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**Abstract.** At present, the sustainable development of city is an actual and most dynamically developing trend in management systems as well as functioning of megacities. The concept "sustainable development" is one of the most important and most dynamically developing tendencies in managed systems for all kinds of cities, primarily megacities. Aims to improve the quality of life, creating comfortable living conditions for citizens and attract investments in urban development through preservation of ecosystems. The development is aimed at improving the quality of life, creating comfortable living conditions for the population and attracting investment in the urban economy through the preservation of ecosystems and the development of "green" infrastructure. A sustainable development is an example of the kinds of economic activity, in that it has been considered as such development. In this way there are different interests from different groups of people whose interests have come together to achieve its goal: protecting the environment and business sector with social space; at the same time creating balance for three main interests of life: economic, sociocultural and environmental. It is worth noting that the concept of sustainable development, in addition to obtaining economic preferences, makes it possible to reduce conflict situations in the city and provide social stability.

## 1 Introduction

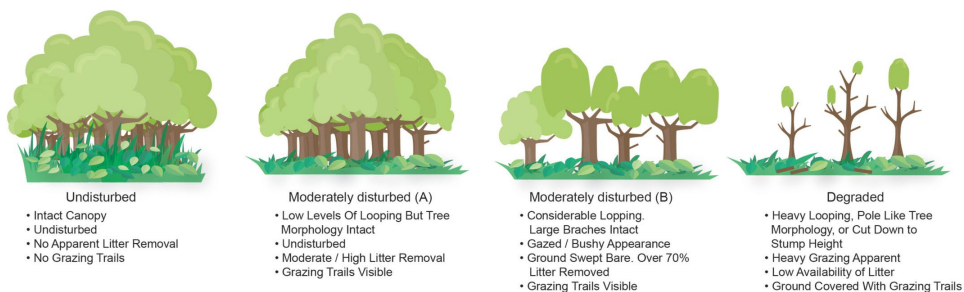
In the nature of many ecosystem services, their "dispersion" between consumers and the traditional economic system, they are largely considered as free, but in fact it is underestimated that their value is not so much. They are degraded (fig.1). This leads to their degradation (fig.1). For example, pollution of the air and water basins in urban areas exceeds its assimilation potential. This leads to an uptake into harmful substances from environmentally toxic substances, which is consequently causing an increase in the level of health risk for people living in the local population. Health consequences from the deterioration of forest ecosystems and losses in their functions for using different kinds de pollution lead to similar health consequences. The same health consequences are caused by the degradation of forest ecosystems and losses in their functions for using different kinds de pollution. The nature of ecosystem services and health are difficult to identify or

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quantify such a relationship. The conservation (or degradation) of Ecosystems Services And Health is difficult to identify and quantify such a relationship. An important task for the economy is to monetize ecosystem services or "internalization" and accounting for latent positive externalities / beneficial effects from ecosystems. As well as, it is important to "internalize" the damage/costs from destruction of ecosystems and services in order to implementing The Violator-Polluter Pay's Principles. In addition, it is necessary to "internalize" the damage/costs from destruction of ecosystems and services in order for implementing the "violation/polluter pays" principle.

The flows of ecosystem services act as "dividends" received by society from natural capital. Sustainable future flows of ecosystem services and human well-being are possible through the preservation of natural capital. As an example, green spaces in the city are wealthy in terms of the services they provide. For example, green space in a city is wealth in terms of the services they provide.



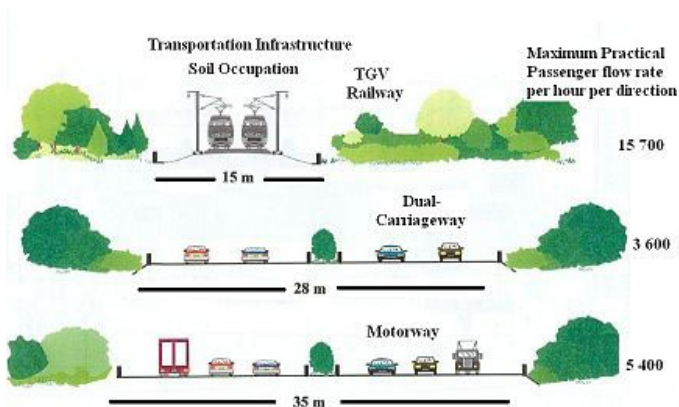
**Fig. 1.** Forest degradation impacts on carbon stocks.

The economic efficiency of ecosystems, which include urban green areas, is not only the budget for the construction and operation of "green" facilities, but also the impact on financial performance across the city. The value generated by a landscape park, public space, rooftop garden can be measured using a range of social, economic, cultural and other indicators. In many modern projects, "environmental friendliness" becomes the main characteristic, "green" standards are introduced, on the basis of which green urban areas are assessed. The "green" standard is "a tool to protect the environment for future generations" [5], which has a positive impact on environmental safety and the comfort of the living environment. To illustrate the real economic importance of the environmental factor in Russia, consider the market value of apartments in Moscow, which ranges on average from 2,500 to 6,500 US dollars per square meter. In the worst-performing neighborhoods in the southeast of the city, the market value of typical housing averages \$2,500-\$3,000 per square meter. In the western and southwestern parts of the city with better environmental conditions and at the same distance from the center, the cost per square meter is already about 3600-3700 US dollars. Accordingly, the difference due to Muscovites' ideas about the comfort of living in a particular area and the state of the environment is 600-1200 US dollars per square meter. Tentatively, the economic benefits created by the "green" infrastructure of cities are estimated by international experts as follows: a reduction of 8–9% in operating costs in the field of real estate; increase in occupancy of commercial premises by 3–5%; 6.6% increase in return on investment; increase by 7.5-30% of the market value of real estate.

## 2 Research Methodology

The main tool for the implementation of sustainable urban development is the preservation of urban landscapes that perform ecosystem functions and create the most favorable living

environment (fig.2). A feature of cities is the limited territories in which they are located. Therefore, the conservation of urban ecosystems that are located predominantly in undeveloped urban areas (for example, urban forests, parks, forest parks, household plots, farmland, etc.) and generate zero or low commercial income per unit area, constantly competes with other uses of urban land [6].



**Fig. 2.** Sustainable urban infrastructure

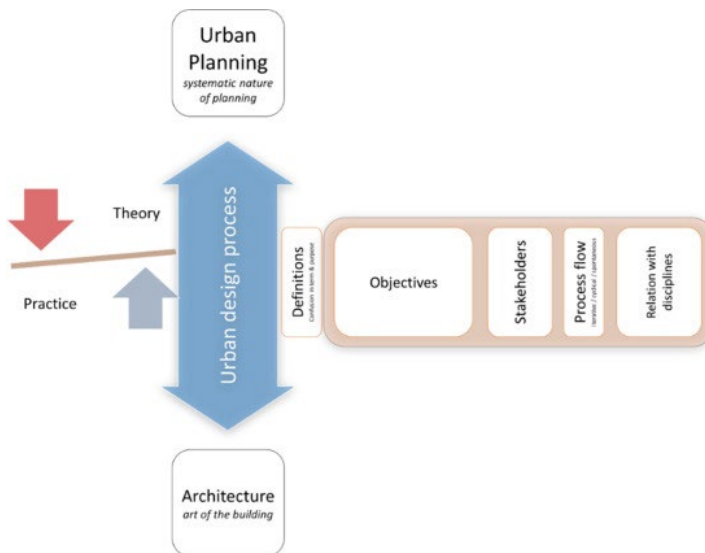
At the same time, if the commercial benefit from other types of land use is quite clear and manifests itself in market trading (income from the purchase or sale of real property), then it can be seen in market transactions (income from trade, etc.) The benefits of ecosystem services, that are produced by such territories, have not been monetized due to its universality and unprecedented access. (these include: protection from burning in forest fires, air purification, creating anti-noise screens, the construction of aesthetically pleasing urban landscapes, production of oxygen, phytoncides, absorbing CO2 visual environment), then it is possible to obtain public recreation in nature, improving the value of real property) To make economically motivated urban planning decisions, there are need for valuations of such public goods and the results that can be obtained from them in terms of its value and to select the most appropriate and expedient projects for development of the territory. These methods make it possible to solve the problem and provide decision-makers with cost criteria for determining the use of urban land. The Kyoto protocol was the first global attempt to include ecosystem services, payments for them and compensation to individual countries in international and national economic mechanisms to combat climate change. It was the first global attempt by the world community to include ecosystem services, payments for them and compensation to individual countries in international and national economic mechanisms to combat climate change. As a result of this, attempts to implement the mechanism of payments for ecosystem services within individual countries are expanding.

### 3 Results and Discussions

The main directions of urban development of the city should take into account the requirements of sustainable development with the priority of ensuring environmental safety and the need to preserve and develop the system of natural and green areas. These territories perform not only ecosystem, but also cultural functions. Green areas in a metropolis play an important role in the formation of a healthy environment, creating comfortable living conditions for the population [10]. The problem is exacerbated by

amendments to the law “On Specially Protected Natural Territories”, which simplifies construction procedures, including “priority infrastructure projects”, on the lands of specially protected natural territories and in their protected zones. Therefore, two groups of recommendations can be formulated for local authorities on the use of green areas to ensure a favorable environmental situation in a particular area, which is the key to the sustainable development of the city as a whole. Urban planning recommendations (fig.3) [8]:

- Do not reduce the existing areas of effective green spaces (efficient plantings: good plant condition, optimal structure and species composition of plantings adapted to specific conditions, ensuring their most optimal functioning).
- Where possible, increase effective green spaces.
- Provide a scientifically substantiated optimal spatial structure of plantings in the area, taking into account the wind rose, the nature of development, relief and other factors in order to form the most favorable habitat for humans, primarily a comfortable micro- and mesoclimate in a particular yard, district, city as a whole.



**Fig. 3.** Urban design and urban planning

• At the level of investment contracts for the construction of real estate adjacent to park facilities (historical or under construction), provide for regular tax deductions to city and local budgets, which would subsequently be distributed to cover the costs of maintaining and operating parks. Ecological recommendations One of the main functions of green spaces in the city is the formation of an aesthetically comfortable environment through the implementation of various gardening techniques, the creation of various objects, compositions, and the use of ornamental plant species. However, the formation of an ecologically favorable environment for sustainable development requires the fullest possible use of the physiological characteristics of plants, which were discussed earlier.

• In each district, it is necessary to form plant communities that are as close as possible to natural ones (species composition, horizontal, vertical and age structure), which are the most effective in ecological terms and therefore important for the city.

• The maintenance of natural communities is much cheaper than artificially created ones, but requires scientifically based measures to monitor and provide conditions for their functioning in the city, where there are no necessary environmental factors that are characteristic of natural nature outside the city.

- It is necessary to use in landscaping species that are maximally adapted to the conditions of a particular territory, taking into account the climate, topography, soils, urban planning situation, existing environmental problems (pollution with certain pollutants, exposure to erosion and landslides, the presence of closed low areas, where, under conditions of negative atmospheric stratification, anticyclones, an increased content of pollutants in the lower layer is possible).
- All green spaces of the city, regardless of the legal form of ownership and departmental affiliation, must be inventoried [11].
- it is necessary to determine the additional income received from the sale of real estate near the "green" zones, and provide for the possibility of transferring part of the income to the city budget for the maintenance of "green" objects.

## 4 Conclusions

To achieve sustainability, the Sustainable Development Goals were developed and ESG (environmental, social and public governance in the context of sustainable development) as part of a corporate culture that makes the company more competitive and relevant to international standards. In addition, the very understanding of development has changed, the purpose of which was not investment, but responsible use, which required businesses to change their own approach, since ESG is now perceived as a metric for assessing the investment attractiveness of a company, and companies that do not pay attention to environmental and sustainable development issues, automatically go down to the next level.

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