The assessment of socio-economic efficiency of urban planning in modern conditions

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Urban environment produced by urban planning is an impression of socio-economic phenomena occurring in society on the one hand, and on the other hand, it creates living conditions for urban population, the quality of which has a direct impact on city residents' health and life expectancy. Great importance of urban planning for urban population calls for an assessment of its socio-economic efficiency, which is virtually not performed at present.

One should note that whereas cost efficiency usually means productivity of the economic system expressed by the ratio of the useful final results of its operation and development to consumed resources, the notion of socio-economic efficiency does not have a generally recognized definition. Therefore, in our opinion, it necessary to proceed from the fact that, from city residents' point of view, most efficient is the socio-economic system of a big city that best provides for their needs, guarantees the highest standard of life at the lowest costs.

In today's context, the problem of assessing socio-economic efficiency of urban planning acquires special significance.

Whereas the XX c. was the age of economic globalization, the first half of the XXI c. is considered the age of urbanization. The world has reached an inconspicuous but crucial milestone in 2006, when the UN formally recognized that for the first time in human history over 3.0 billion people, i.e. half of the planet's population, lived in cities (see Fig. 1). In the XX c. the world's urban population increased rapidly (from 220 million to 2.8 billion people). Moreover, an unprecedented spike of urban population is expected within the next several decades in developing countries, especially in Africa and Asia, where urban population will double between 2000 and 2030. According to the United Nations Population Fund (the UN Fund working on the issues of population), in the developing countries 80% of the planet's urban population will have lived in cities by 2030.

Dynamic urban growth aggravates socio-economic problems characteristic of cities, and makes it necessary to work out new mechanisms of urban area management. Thus, according to the UN Human Settlements Programme (UN-HABITAT), the most urgent socio-economic urban problems are the following:

- uncertain future conditions of urban development (caused by the global financial crisis);
- fundamental doubts concerning market driven approaches in economics;
- social and spatial inequality;
- urban growth;
- uncontrolled urbanization of suburban territories;
- increase of spatial dimensions of cities.

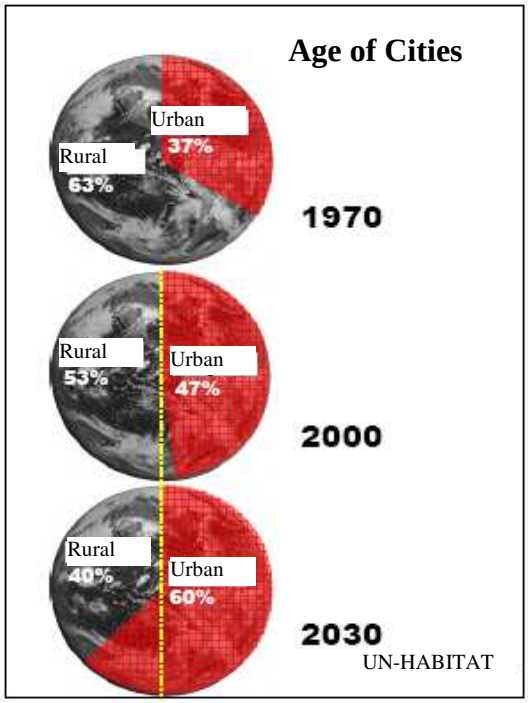

Fig. 1. *Growth Dynamics of the Planet's Urban Population*

The predominant urban growth factor here was investments in transport infrastructure:

Table 1

Significance of Urban Growth Factors

(according to UN-HABITAT research in 256 cities worldwide)

No.	Urban Growth Factors	Factor Signinficance, %
1.	Economic factors, such as:	78
1.1.	- investments in transport infrastructure	41
1.2.	- investments in civil engineering infrastructure	16
1.3.	- building trade zones	21
2.	Change in city status	12
3.	Improvement in quality of life	10

Table 1 shows that economic factors are determinative for urban growth; however, the process of area urbanization is also noticeably influenced upon by a better quality of city residents' life.

It is believed that a country becomes more urbanized if both the number of its cities and the size of urban population grow. Urbanization degree varies in different countries, but on the whole it reflects the wealth of individual states[1]. Rich, industrially advanced countries are more urbanized. For example, in the Netherlands, 89% of the population live in cities, whereas, in Ethiopia (one of the poorest countries in the world) only 13% of the population live in cities.

Data on the rate of world urbanization and growth factors indicates the importance and necessity of assessment of socio-economic efficiency of urban planning, forecasting and assessment of its effects for the entire urban population of the world.

[1] Batten, F. (1995). Network Cities: creative urban agglomerations for the 21st century / F.Batten. – Urban Studies, 32, pp. 361-378.

Due to the integration of the Russian Federation into the global community, especially in the Post-Soviet period, we can in all certainty extend the reviewed tendencies to its territory as well.

The results of urbanization in Russia in the XX–XXI cc. are also very impressive. Since 1926 the number of cities with a population of 100,000 people or more rose from 20 in 1926 to 167 in 2007, wherein the number of million cities increased from two in 1926 to eleven in 2007. In 1926 only 18% of the country's population lived in Russian cities, in 1939 — 33%, and in 2007 — as many as 73%.

Urban development in Russia is accompanied by socio-economic problems, the more critical of which are listed below.

1. Integrity of economic and social space is lost. Regional problems of resettlement become more acute; they are related to slower urban development of Siberia, the North, and the Far East — as compared to the regions of the European part of the country — regarding availability of housing, engineering and social infrastructure, weakness of economic base, and housing and public utilities, especially in smaller towns.

2. In the largest cities, new housing development and job creation are significantly higher than reconstruction and remodeling of production and other facilities, which causes inefficient use of urban and suburban areas, rise in the cost of housing construction, complications in solving transport, engineering, and environmental problems.

3. Central areas of cities are intensively developed with pinpoint precision by means of urban densification, which causes acute social contradictions between local executive authorities and residents.

4. The area in the suburbs of big cities is used inefficiently, suburban green belts, recreational zones, and agricultural lands are developed.

To sum up, the present condition can be described as a systemic crisis of urban planning, occurring not only in Russia, but also in many other countries of the world.

The reviewed problems have negative socio-economic effects, including the following:

- impoverishment of large sections of population (higher crime rates in society, lower birth rates, shortage of funds for home buying, etc.);

- disadvantageous environment condition, especially in big cities (there is steady deterioration of environment, first of all of air basin, due to the drastic increase of motor transport).

Complexity and depth of the above mentioned problems calls for a system approach to urban development management, including assessment of socio-economic efficiency of urban planning. Without a system approach it is difficult to make an adequate assessment of the socio-economic situation, urban development course, and efficiency of urban planning policy.

The author of the present paper has developed a system dynamic model of urban development that allows for a complex assessment and forecast of urban development efficiency based on a system dynamic approach [3].

Unlike the model of J. Forrester, the American scientist who built a mathematical dynamic model of a typical American city in the 1970's [2], and others similar to it [1], the proposed model of urban development ensures system estimation of the following parameters:

- economic (revenues and expenses on maintenance and development of a city, the cost of urban growth, gross regional product);
- social (a group of parameters assessing city residents' standard of life);
- environmental (parameters indicating the environment status).

The distinguishing feature of this system dynamic model of big city development is its consideration of social, environmental, and economic factors of development.

The presented urban development model was tested on Saint Petersburg. The estimation results revealed that the contemporary socio-economic development of Saint Petersburg occurs on the verge of running at a loss, i.e. given today's distribution structure of the city's GRP, the actual size of its population is close to the value where the cost of urban maintenance and development is higher than revenues spent on their compensation.

Furthermore, predictive estimates based on the model indicate gradual increase in the standard of life of Saint Petersburg residents in future. However, instability of modern socio-economic conditions caused first of all by the global economic crisis casts a doubt on growth of standard of city residents' life in nearest future [4].

Assessment of socio-economic efficiency is also critical at the local level of decision-making on urban planning. Its results can affect the location of an object, its characteristics, the sequence of implementation of urban planning projects.

Examples can be drawn from the author's efficiency assessment of the procedure versions of surface run-off disposal from the territory of Kurortniy District of Saint Petersburg. The assessment was part of land planning and surveying plans made by the State Institution "Scientific, Research and Project Center of Saint-Petersburg's Master Plan" for the settlements of Kurortniy District (Solnechnoye, Repino, Komarovo, Zelenogorsk, Ushkovo, Serovo, Molodyozhnoye, Smolyachkovo municipal settlements) in 2007 – 2008.

At present, there is no treatment of run-off from the territory of those municipal settlements. The project offers two versions of run-off disposal:

- run-off treatment at local run-off treatment facilities and discharge in water;
- run-off disposal to combined sewage system.

To choose the better of the two options, they were assessed by economic, social, environmental, and technological criteria. The economic criterion was a minimization of capital

investments in the implementation of the version. That criterion is best applicable to socially important projects, which include the drainage system of the settlements. Technical possibilities of setting up a storm water drain and environmental requirements to the position of sewage treatment facilities were factored in the assessment.

The estimation results revealed that the choice of the version of run-off disposal from the territory of the Kurortniy Disctrict settlements depends on the run-off volume that need treating (see Fig. 2). With low run-off volumes to be treated, the least costly is their treatment at local waste treatment facilities and subsequent discharge of the treated run-off in water. With considerable run-off volumes to be treated, their disposal to combined sewage system of Kurortniy District is advisable.

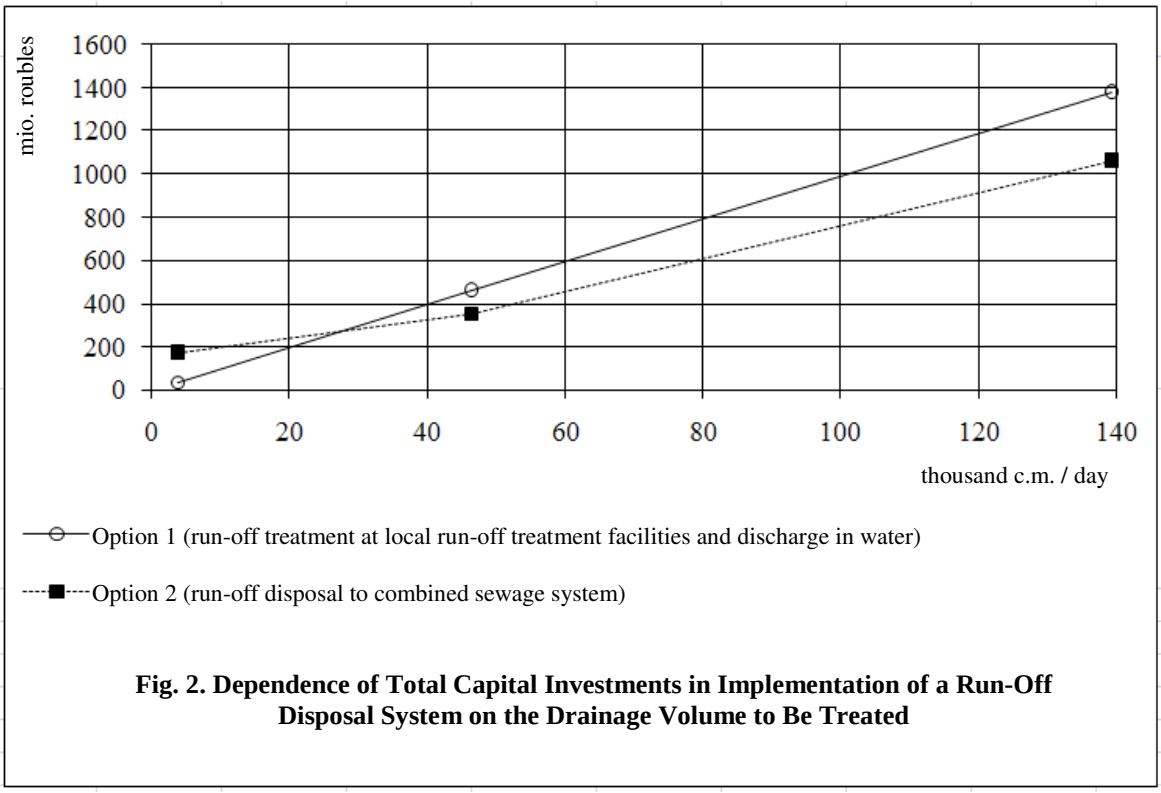

Fig. 2. Dependence of Total Capital Investments in Implementation of a Run-Off Disposal System on the Drainage Volume to Be Treated

Considering the values of technical and economic project, the conclusion was drawn that, for treating run-off coming primarily from the street-road network, the choice between treatment at local run-off treatment facilities and disposal to the combined sewage system is not important for such volumes of surface flow.

Thus, the determinative factor in making the urban planning decision in this instance was the choice of the parameter of standard of life i.e. determination of area from which run-off has to be collected and treated before being discharged to the Gulf of Finland.

Another example of how important assessment of socio-economic efficiency of urban planning decisions is at the local level is the substantiation of demand for a snow melting plant.

In 2008, the State Institution "Scientific, Research and Project Center of Saint-Petersburg's Master Plan" carried out the land planning and surveying plan for the territory bounded by ul. Barochnaya, ul. Professora Popova, ul. Dalya, nab. Karpovki in Petrogradsky District of Saint Petersburg, which included a snow disposal center.

The center can operate with or without using snow melting technology. The choice of technology influences the center's performance, the area of the plot of land allocated to it, and its key technical and economic parameters, including economic efficiency.

Today in Saint Petersburg, snow is stored on special grounds, as a rule it melts naturally and takes until July. Artificial melting of snow using drainage and snow melting plants significantly increases performance of snow disposal centers, prevents formation of large snow deposits, saves the city's scarce spacial resources, which makes snow melting technology in the center of the city especially relevant. On the other hand, artificial snow melting increases capital investments in construction of the snow disposal center and its operational costs.

By technical criteria, two technologies were selected for this territory:

1) natural melting of snow deposits;

2) using a snow melting plant powered by gas or residual fuel oil.

Since a snow disposal center is a socially significant facility, and brings minimal returns, the economical criterion for selecting the technology was the principle of cost minimization of construction and operation of the facility.

The performed estimations showed that using a snow melting plant on the territory under consideraiton is cost-efficient (provided the land prices remain at the current level), its cost not exceeding 160 mio. roubles (see Fig. 3). Today the cost of snow melting plants with the required capacity for snow (1,000 thousand cu m per year) is approximately 60–80 mil. roubles. The tendency of land prices towards significant increase observed at the current stage of development of the Saint Petersburg land market raises the bar for efficiency of a snow melting plant to a higher level, especially in the central districts of the city.

The second option proved the least costly — construction of a snow disposal center with a snow melting plant. In spite of additional costs of purchase and assembly of the equipment, in spite of the necessity of constant fuel purchases, artificial snow melting is economically expedient, first of all due to high capacity of the plant, and considerable savings of the city's spatial resources.

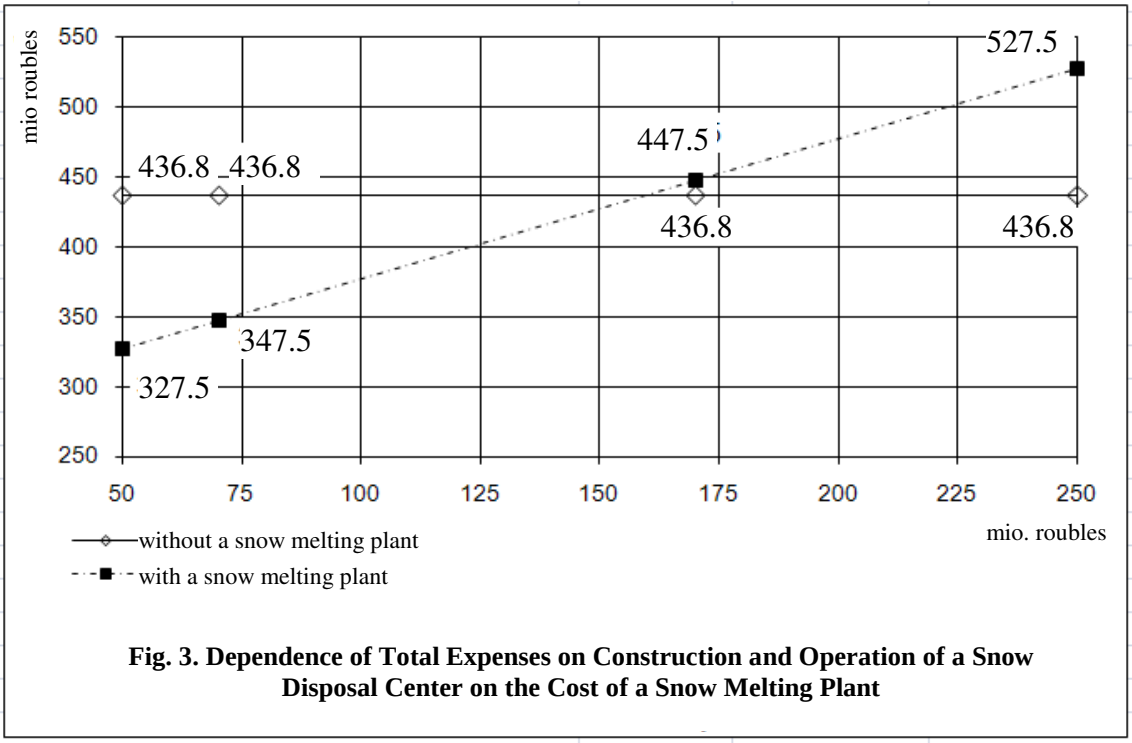

Fig. 3. Dependence of Total Expenses on Construction and Operation of a Snow Disposal Center on the Cost of a Snow Melting Plant

Thus, by socio-economic criteria, installation of a snow melting plant in the central districts of the city, namely, in Petrogradsky District is cost-effective. At the same time, the standard of city residents' life is set by the area of the territory cleaned from snow. Large area of the territory cleaned from snow required high capacity of the snow disposal center. Launching a snow disposal center without a snow melting plant, without involving more scarce space in the center of the city would deteriorate the urban environment quality: there would be nowhere to recycle the large amounts of snow.

In conclusion, one can note that the assessment of socio-economic efficiency of urban planning not only requires estimating individual and integral parameters, but also calls for a system approach. Without a system approach at all levels of urban planning, there is no solution for the current problems of urban development.

An urban planner has to have a system-oriented vision; managing only one process without consideration of its connections with others is not enough today, otherwise that decision improve one element of the socio-economic system improve while deteriorating others. For it may turn out that efficiency by all criteria will be completely canceled out by the consequences of that decision. Yet, today such consequences are given no attention, although they are one of the main ways to socialization of managerial process. The decisions made today are often profit-based, and their effects on the population are nearly catastrophic.