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Assessment of the Influence of Municipal Economy Infrastructure on the Quality of Life of the Population

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ABSTRACT

The aim of this study is to evaluate the effect of the development level of urban infrastructure on the quality of life of the population of the municipality. The study proposed an evaluation system formed on the basis of socio-economic indicators that characterize the quality of life. The relationship between quality of life and level of development of certain types of municipal services infrastructure is revealed. The paper concludes that the dependence models of the quality of life and types of municipal services infrastructure show that on average the quality of life is by 90% depends on the level of development of social, productive and household infrastructure.

Keywords: Municipal Infrastructure, Correlation Analysis, Municipal Economy, Urban Development
JEL Classifications: H41, R23, R31

1. INTRODUCTION

Urban infrastructure changes significantly under the influence of a market economy, and the current line of research is to study the impact of municipal services infrastructure on the quality of life. Urban infrastructure must constantly evolve, otherwise, at a time the city would be unable to perform its function of providing improved quality of life.

Quality of life is a total systemic characterization of a number of socio-economic factors, such as the infrastructure factor that determines the conditions of life, work and human development. Infrastructural factor that mainly provides needs of the population, is a combination of factors (social, industrial, household and others), affecting the functioning of society and has a direct impact on the provision and improvement of population well-being.

Currently, the special relevance for Russia is the significant differentiation in living standards of the population, the cause of which lies, above all, in the state of municipal infrastructure, because of its efficiency depends on the quality of life.

Under the term of municipal infrastructure (or the infrastructure of municipal economy) we understand the complex of property objects, which performs socio-economic functions in urban areas to ensure the conditions for the functioning of social production and public life.

In this context, the aim of the present study is to evaluate the effect of the level of municipal infrastructure on the quality of life of the population of the municipality. The study is based on an evaluation system formed on the basis of socio-economic indicators that characterize the quality of life, and reveal the

relationship between quality of life and level of development of certain types of municipal infrastructure.

2. THE ECONOMY OF CITIES: LITERATURE REVIEW

Certain aspects of formation, functioning and development of urban infrastructure facilities, as well as research and evaluation of quality of life, the development of quality of life indicators' system have been studied by many Russian and foreign scholars.

Early studies on municipal economy and the role of the cities in regional development date back to the XX century. Investigation of the role of cities in the development of socio-economic relations was done by Max Weber, which was later published in the book "The City" (Weber, 1921). Jane Jacobs highlighted and explained the basic principles of economic functioning of cities, which were made public in the work of "The economy of cities" (Jacobs, 1969). In 1983, Richard Ullmann published his work "Redefining security," which states that the greatest threat to national security are the actions that are fraught with a sharp decline in the quality of life of a certain state in a relatively short period of time (Ullman, 1983). The role of infrastructure in the social development of society is well studied by Kochetov, Kharitonov et al. (Kochetov, 2000).

Trends and prospects of development of social infrastructure are laid by Grebennikov and Suvorov (1989). Toshchenko (1980) in his writings, states that "with the development of the productive forces and increasing complexity of the system of human and industrial needs, the role of social infrastructure increases and intensifies." Wide ranges of scientists (Krivonosova, 2005; Malikov, 2002; Krupnov, 2003; etc.) indicate two aspects of life quality: Objective and subjective. At the same time, it is stated that the evaluation of the subjective side of life quality makes it possible not only to study but also to assess the degree of comfort a person living in this society. In 2004 Drobysheva and Gerasimov (2004) developed an integrated assessment of the quality of life. While Ayvazyan (2000) proposed the integral indicators of life quality, pointing out not only the building, but also its use in the socio-economic governance.

Thus, the theoretical and practical issues on the development of urban infrastructure are the subject of research for many scholars worldwide. However, the issues of the current research problem cannot be considered as solved, as an integrated methodological approach to assess the impact of municipal infrastructure on the quality of life is not fully formed.

3. METHODOLOGICAL APPROACHES IN ASSESSING THE LEVEL OF URBAN INFRASTRUCTURE DEVELOPMENT

Since the level of urban infrastructure development and the efficiency of its functioning have a significant impact on the socio-economic sphere, which ultimately determines the level of life quality of citizens, let us consider the basic approaches to its assessment.

International Institute for Management Development suggests using four groups of factors in order to assess the socio-economic development of the area: The economic situation, the effectiveness of state regulation, the business efficiency, and the infrastructure. Each group includes a large number of indicators, for example the infrastructure assessment is based on 95 indicators. International organizations estimate the degree of regional development using integrated indicators that can be taken to assess the level of development of social infrastructure in the region, being substantively inter-connected. One such indicator is the human development index, developed in the framework of the United Nations' "Development Programme." It ranks countries by rising from zero to one. The calculation uses three indicators of economic development: Life expectancy at birth, intellectual potential, and the value of the per capita income in purchasing power of currency and reduction in the marginal utility of income (Canning and Bennathan, 2000; Zhigang, 2005; Mishra, 2008).

Jochimsen (1996), Zotov et al. (2008), Krasovsky (1980), Toshchenko (1980) contain the classification of the basic infrastructure elements. The authors identify the transport sector, information communications technology (ICT) complex, consumer market, socio-cultural complex, housing and communal complex.

Animitsa et al. (2009) suggest to use a typological approach in the evaluation of the infrastructure. Evaluation involves the division of regions into several homogeneous groups, selected on the basis of the most significant features and criteria of qualitative and quantitative nature, for the purpose of identification, description and benchmarking.

Burianov and Maksimov (2008. p. 104) apply the potential analysis method based for the evaluation of infrastructure based on "a comprehensive and feature-based assessment. A comprehensive assessment is carried out for inter-municipal comparisons on the basis of the rating on the main indicators of socio-economic development." The proposed methodological tools substantiates the estimate of infrastructural potential of the territory, as well as the degree of favorability with respect to life quality. Feature-based evaluation is used for a detailed study of the municipality and is based on a broader set of indicators and indicators. The technique is simple enough to use, but a comparative evaluation of infrastructural components of regions does not enable to develop an acceptable mechanism for the formation and development of the infrastructure complex of a particular municipality.

Both Burak (2009) and Zotov et al. (2008) agree with the statement that the "methods of regulation of socio-economic relations in large cities must be based on a set of scientific research, considering the urban economy as a complex socio-economic system" (Zotov et al., 2008. p. 265). The proposed approach is best suited to assess the effectiveness of infrastructure development of the city.

Suslova and Alyoshina (2015) suggest using a generic indicator to assess the impact of the quality of the region's infrastructure

on the lives of people, which gives the most accurate assessment of the conditions of life of the population. The proposed system of indicators and assessment methodology allows for a comparative analysis of the different municipalities in the context of time, and also allows to generate the level of quality of life in general. Indicators are formed on the basis of "objectives tree" of municipalities, which include the following performance indicators: Demographics, employment, income and expenditure, the state of education, health, social protection, culture and recreation, the consumer market and services, housing economy, economic development, environment and public safety.

4. CASE STUDY: THE CITY OF TOMSK

Quality of life is an integral backbone characteristic of a number of factors, including infrastructure that determines the conditions of life, work and human development. Infrastructural factor that mainly provides the needs of the population, is a combination of factors (social, industrial, household and others) affecting the functioning of society and has a direct impact on the provision and improvement of human wellbeing. In other words, the quality of life is a complex indicator of assessing the status and development process of urban infrastructure. We shall analyze the relationship of the quality of life and infrastructure (by type) of municipal economy. Establish the relationship between the levels of life quality and the development of urban infrastructure. Then, depending upon the availability, we select the types of municipal infrastructure that have the greatest impact on the quality of life of the population, as well as, respectively, on the contrary, some of the factors of quality of life of the population that have the greatest or the least impact on the level of development of urban infrastructure.

The basis of the proposed evaluation system are the socio-economic indicators characterizing the quality of life. As the test of the municipality stands Tomsk city. The study is based on the analytical methods of comparative analysis, correlation analysis, and the method of peer review. Horizon of analysis covers the 6-year period - 2011-2015, with a forecast for 2016.

The research involves calculations of the correlation coefficient (R) in the models of relationship between indicators of life quality and level of development of urban infrastructure with an indication of the accuracy of the trend model (R^2). The degree of dependence between variables on the results of correlation and regression analysis are set. The set of indicators selected in research are shown in Table 1. The selection is based on the presence and availability of statistical database.

The study established both direct and reverse dependencies of varying degrees of relation: Strong, medium, and weak Table 2. Concretizes the direct relationship that has a strong interrelations.

Based on the results of the correlation coefficient (R) calculations of the relationship models between indicators of life quality and the development level of municipal infrastructure (by type) with accuracy indication of the trend model (R^2) we can conclude that the average quality of life of the population is 90% dependent on the level of social, productive, and household infrastructure.

Table 1: Indicators of the quality of life and urban infrastructure

Category	Indicators
Life quality	Unemployment rate
	Employment rate
	Average per capita household income
	Migratory population growth
	Satisfaction of residents with the quality of municipal services
Education infrastructure	Provision of children aged 3-7 years with preschool education
	Coverage of children aged 5-18 years with educational programs of additional education
	Ratio of actual and normative capacity of preschool institutions
Physical culture and sports infrastructure	The proportion of population regularly engaged in physical culture and sports
	The proportion of children aged 5-18 years covered by sports orientation services
	Provision of the population with gyms per 10 thousand people
Culture and art infrastructure	Availability of public cultural and leisure institutions
	Provision of population with public libraries
Healthcare infrastructure	Average life expectancy
	Mortality due to diseases
Residential infrastructure	Share of dilapidated housing in the total area of the housing stock
	Share of emergency housing in the total area of the housing stock
Public safety infrastructure	Share of pollutants released into water bodies with wastewater
	Air pollution index
Public utility infrastructure	Share of utilities in need of replacement, including: Water supply, sewerage, electricity, heating, gas supply network
Beautification and landscaping infrastructure	Share of public green spaces in the total of the urban area
	Proportion of houses adjoining areas, which comply with regulations
Transport infrastructure	Average time spent by citizens on a daily basis to travel on public transport
	Average waiting time of public transport
ICT infrastructure	Share of municipal services provided by the municipal bodies in electronic form
	Total capacity of telephone exchanges

ICT: Information communications technology

5. FINDINGS AND DISCUSSION

Thus, in the analysis of the transport infrastructure and the beautification and landscaping infrastructure, a strong link can be traced between the studied infrastructure factors, and all indicators of life quality. Analysis of the residential infrastructure has revealed a strong association between the studied infrastructural factors and three indicators of life quality (e.g., unemployment, migration growth, satisfaction of residents with the quality of municipal services).

Table 2: The fact of the relationship between the independent variables

Interrelations	Approximation coefficient (R^2) (%)	The proportion of unaccounted factors in the presented models (%)
Education infrastructure/quality of life		
Ratio of actual and normative capacity of preschool institutions/unemployment rate	90	10
Provision of children aged 3-7 years with preschool education/satisfaction of residents with the quality of municipal services; migratory population growth; average per capita household income	87.5	12.5
Physical culture and sports infrastructure/quality of life		
The proportion of population regularly engaged in physical culture and sports/average per capita household income; migratory population growth	85.2	14.8
Culture and art infrastructure/quality of life		
Availability of public cultural and leisure institutions/unemployment rate; employment rate; migratory population growth	78.1	21.9
Healthcare infrastructure/quality of life		
Mortality due to diseases/unemployment rate; employment rate	87.1	12.9
Average life expectancy/average per capita household income; migratory population growth; satisfaction of residents with the quality of municipal services	95.2	4.8
Residential infrastructure/quality of life		
Share of dilapidated housing in the total area of the housing stock/unemployment rate; employment rate	100	0
Share of emergency housing in the total area of the housing stock/unemployment rate	100	0
Public safety infrastructure/quality of life		
Air pollution index/unemployment rate; employment rate	81.9	18.1
Share of pollutants released into water bodies with wastewater/satisfaction of residents with the quality of municipal services	100	0
Public utility infrastructure/quality of life		
Share of utilities in need of replacement: Including: Water supply, sewerage, electricity, heating, gas supply network/unemployment rate; employment rate	100	0
Share of gas supply network in need of replacement/unemployment rate; employment rate	89	11
Beautification and landscaping infrastructure/quality of life		
Share of public green spaces in the total of the urban area/average per capita household income; migratory population growth; satisfaction of residents with the quality of municipal services	80	20
Proportion of houses adjoining areas, which comply with regulations/average per capita household income; migratory population growth; satisfaction of residents with the quality of municipal services	96.8	3.2
Transport infrastructure/quality of life		
Average waiting time of public transport/employment rate; unemployment rate	80	20
Average time spent by citizens on a daily basis to travel on public transport/employment rate; unemployment rate	60	40
ICT infrastructure/quality of life		
Total capacity of telephone exchanges/average per capita household income	76.6	23.4
Share of municipal services provided by the municipal bodies in electronic form/average per capita household income; migratory population growth; Satisfaction of residents with the quality of municipal services	97.5	2.5

ICT: Information communications technology

The strongest correlation between the studied infrastructure factors and the two indicators of life quality is observed in the analysis of educational infrastructure (average per capita household income, satisfaction of residents with the quality of municipal services); the infrastructure of culture, public health, and public security (employment, satisfaction of residents with the quality of municipal services); public utility and ICT infrastructure (level of employment and average per capita household income).

When analyzing the infrastructure of physical culture and sports a strong link observed between the studied infrastructure factors and the degree of satisfaction of residents with the quality of municipal services.

In this regard, according to the results of the analysis, we note that the level of the analyzed infrastructure significantly affect the quality of life and living environment. However, the correlation pairs is variable. Over time, under the influence of events in the economic, social and political spheres the pairs can begin to correlate with each other differently. Thus, it is also necessary to take into account and track before these features can be used in decision making processes.

6. CONCLUDING REMARKS

Summarizing the main provisions of the study, the following concluding remarks can be made:

1. In our opinion, despite a significant amount of research on urban infrastructure development, the investigated the problem cannot be considered as solved, as an integrated methodological approach to assess the impact of municipal services infrastructure on the quality of life is not fully formed.
2. The performed correlation analysis revealed that on average the quality of life of the population of the municipality is by 90% dependent on the level of development of social and production, and household infrastructure.
3. Having a strong direct relationship between the independent variables shows that if one of these pairs moves up, the other, with a high probability, will increase, which means that the potential changes on both pairs are simultaneously associated with an increased risk.
4. Having a strong inverse relationship between the independent variables indicates that these pairs move in opposite directions-practically mirror wise, i.e., if one strives up, the other pair moves down (or vice versa). This dependence is necessary to keep track of, and information to be taken into account and used to hedge risks.
5. Note that the correlation in the current study pairs is variable. Over time, under the influence of events in the economic, social and political spheres the pairs can begin to correlate with each other differently.
6. The proposed assessment of the impact of municipal services infrastructure on the quality of life will allow for more accurate planning of joint activities of the subjects of municipal infrastructure management as well as provide a comprehensive socio-economic analysis of the development of these infrastructures and the city as a whole.

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