Study of Life Quality and Urban Environment Quality in Russian Megapolises

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Abstract. The article deals with the study of the social infrastructure development and the quality of life in megapolises. The purpose of the study is ranking Russian cities on a combination of indicators of life quality and indicators of urban environment quality, taking into account current trends of shifting priorities in the development of Russian cities to the formation of favorable conditions of life, complex and sustainable development of territories. The authors analyzed the most significant indicators of success and significance of the city. To assess the quality of life, the authors used the indicators of average monthly income, minimum subsistence level, employment rate, life expectancy, infant mortality rate, population with incomes above, below and equal to minimum subsistence level, employment index and ratio of average per capita income to minimum subsistence level, and human development index. To analyze the quality of urban environment, the authors used indicator of housing provision as a target for planning development of city, age of megapolises, permanent population size, area and population density of city. Ranking of megacities was carried out on the basis of the results of integrated assessment based on the method of conjugate analysis of the life quality and the urban environment quality. The Authors formed the groups of megapolises with methods of comparative analysis and cluster analysis. According to the results of the study, in accordance with the integrated assessment, 4 groups of megapolises were identified on the severity of the problems of urban environment development.

1. Introduction

The starting point of the study was a strong need for rethinking some processes related to making a list of the indicators for assessing strategic development of cities, which could be used not only as targets for the socio-economic forecasting but also applied to spatial planning as the indicators of the life quality and the quality of urban environment. Despite the global economic crisis and the difficulties of cooperation in some global economic relations, the issues of positioning Russian cities in the global networks, assessing the level of social infrastructure development and planning socio-economic development in the future remain actual. With a general trend of population growth in megapolises and key trends of global urbanization – "suburbanization and rurbanization" [1], criterion of success...
2. Problem definition
The authors of many studies [3,4] noted the need to invest in human capital, as one of the most conscious and important goals of strategic development of Russian cities. The interest in comparing certain indicators of the life quality, in the competition with the world cities, is justified, because it allows assessing the level of living comfort, identifying the degree of inequality in comparison with the world leading cities and Russian megapolises, forming a strategy for city development with updated positions and indicators. To study the quality of life researches use various indicators, including the indicators of the life quality and the urban quality, and also human development index. In the integral assessment of the life quality index, a number of authors relate an indicator of provision of dwellings to population to indicators of the life quality index. However, this indicator is also a target for city development planning, because it has a significant impact on the quality of urban environment, forming a basis for creating favorable living conditions and planning development of social infrastructure. Indicators of social infrastructure development (provision of education, health, sport objects per 1,000 inhabitants), are one of the important indicators of favorable living conditions. They seem to us quite weighty in the system of indicators characterizing competitive advantages of megapolises, and the importance of their impact on urban environment is indisputable. In most studies, the quality of urban environment includes such indicators as population, area of city and population density and do not take into account historical age of city, which, in our opinion, distorts a real picture of attractiveness and identity of urban environment. Therefore, it is necessary to use this indicator to assess the urban quality of life.

The objectives of the study comes to monitoring of the life quality and development of urban environment in Russian megapolises for ranking them on the basis of urban environment development.

3. Materials and methods
The scientific basis of the study are the works of leading Russian and foreign scientists in the field of the life quality and the urban environment [5,6,7,8,9,10,11,12]. The authors use information and statistical database of the Federal State Statistics Service (Rosstat) on socio-economic indicators of Russian regions [13,14,15,16,17]; data on the universal indicator used for comparison of Russian regions – the human development index, published in the Human Development Report in the Russian Federation by Analytical center for the Government of the Russian Federation [18]. Methods of conjugate analysis of the life quality and the urban quality of life, methods of comparative and cluster analysis are used in the work.

4. The research result and discussion
Russian megapolises are not only the core of the urban system of regions and macro-regions that executes the functions of "centrality as a source of social and economic well-being" or "nodes" of various networks, which significance extends far beyond the space under city control"[4], but also possess distinctive features and internal potential, which is the source of their further development. In the work of Animitsa EG and Vlasova NG [19], this duality peculiar to the largest cities is considered as a phenomenon of "glocalization", that is simultaneously the significance of internal, so-called local factors, and global processes for the successful development of megapolises. The combination of these factors influences the inequality of social and economic development of Russian cities, increases or reduces the resulting disparities. The analysis of modern research on the state of megapolises, the causes of their inequality and disparities in development [20], allows us to state that the results of the
study still largely depend on the selected indicators and methods of data processing [3]. Differentiations of Russian megapolises on the quality of life is represented by the composite quality of life index (hereinafter – the QOLI), calculated on the basis of Rosstat's data on the average per capita monthly income of the population, the minimum subsistence level, the employment rate, the life expectancy, the infant mortality rate, the population with incomes higher, lower and equal to the minimum subsistence level, the indexes of employment rate and the ratio of average per capita monetary incomes to minimum subsistence level, and the human development index according to the data of Analytical center for the Government of the Russian Federation [18]. The methodology proposed by the authors for assessing the current quality of life is based on the use of comparative and cluster analysis tools. On the base of qualitative analysis the indicators for each of the selected groups are ranked by the criterion - min value – for better indicator, max – for the worst, then they are summed. According to the authors, the aggregated indicator assesses objectively the level of megapolis development.

The urban quality of life index (hereinafter – UQOLI) is calculated on the basis of Rosstat's data on the indicators of dwellings provision (the indicator of average living floor space per one inhabitant, sq. m), the calculated indicators of the population's provision by pre-school institutions, general educational institutions, hospitals, polyclinics, gyms and swimming pools, the population size, the area of city, the city's historic age according to the websites of the cities administrations [21], and the population density. The methodology of megapolises differentiation by the quality of the urban environment is similar to the methodology for calculating the QOLI.

The results of calculating the QOLI and the UQOLI are given in Table 1.

Table 1. Ranking Russian megapolises on the QOLI\(^a\) and the UQOLI\(^b\)

| City          | QOLI \(^a\) | City          | UQOLI \(^b\) |
|---------------|-------------|---------------|--------------|
| Moscow        | 15          | St. Petersburg| 68           |
| St. Petersburg| 17          | Nizhny Novgorod| 69           |
| Kazan         | 42          | Yekaterinburg | 71           |
| Yekaterinburg | 53          | Ufa           | 72           |
| Voronezh      | 56          | Krasnoyarsk   | 83           |
| Nizhny Novgorod | 69      | Voronezh      | 86           |
| Samara        | 75          | Moscow        | 87           |
| Rostov-na-Donu| 81          | Kazan         | 89           |
| Novosibirsk   | 81          | Chelyabinsk   | 90           |
| Ufa           | 80          | Omsk          | 94           |
| Chelyabinsk   | 82          | Samara        | 96           |
| Omsk          | 81          | Rostov-na-Donu| 101          |
| Perm          | 80          | Novosibirsk   | 102          |
| Krasnoyarsk   | 77          | Volgograd     | 103          |
| Volgograd     | 93          | Perm          | 109          |

\(^a\) Compiled by [13, 15, 18].

\(^b\) Compiled by [13, 14, 15, 16, 17, 21].

Ranking Russian megapolises by the QOLI: 1) the leader is Moscow (QOLI ≤ 15); 2) St. Petersburg (QOLI 15 <30); 3) Kazan (QOLI 30 <45); 4) Voronezh, Samara, Yekaterinburg (QOLI 45 <60); 5) Nizhny Novgorod, Rostov-na-Donu (QOLI 60 <75); 6) Novosibirsk, Chelyabinsk, Ufa, Omsk, Perm, Krasnoyarsk (QOLI 75 <90); 7) Volgograd (QOLI of St. 90).

Ranking Russian megapolises by the UQOLI: 1) the leaders are St. Petersburg, Nizhny Novgorod (UQOLI <70); 2) Ekaterinburg, Ufa, Krasnoyarsk (UQOLI 70 <85); 3) Voronezh, Moscow, Kazan, Chelyabinsk, Omsk, Samara UQOLI 85 <100); 4) Rostov-on-Don, Novosibirsk, Volgograd, Perm (UQOLI > 100).

By estimating megapolises influence on various components of the economy, culture, social sphere, first of all, through assessing the internal potential of megapolises, which elements are the components of the city's socio-economic development strategy and its territorial development plans,
the integral characteristics of Russian megapolises can be made. This approach allows simultaneously forming the targets and programs of strategic development of urban territory.

Since preparing a city development strategy requires the balance of the external economic orientation of the world economic relations and the orientation towards the development of the city's internal potential, it is obvious that the sign of the success of the megapolis is the formed comfortable living conditions of population, determining the degree of its attractiveness and significance. The conjugate analysis of the quality of life index and the urban quality of life index confirms the relationship between the level of urbanization achieved, the living comfort and the favorable living conditions of the population (Table 2).

| QOLI  | 0÷15 | 15÷30 | 30÷45 | 45÷60 | 60÷75 | 75÷90 | More 90 |
|-------|------|-------|-------|-------|-------|-------|---------|
|       |      |       |       |       |       |       | Moscow |
| 0÷15  | Moscow |       |       |       |       |       | 1       |
| 15÷30 | St. Petersburg |       |       |       |       |       | 1       |
| 30÷45 | Kazan | Yekaterinburg | Voronezh, Samara, |       |       |       | 3       |
| 45÷60 | Nizhny Novgorod | Chelyabinsk, | Perm, Novosibirsk, | Rostov-na-Donu |       | 2       |
| 60÷75 | Ufa, Krasnoyarsk | Omsk | Volgograd |       |       |       | 6       |
| 75÷90 |       |       |       |       |       |       |         |
| More 90 |       |       |       |       |       |       |         |
| Total | 2     | 3     | 6     | 4     | 15    |

5. Summary

Based on the results of the conjugate analysis of the life quality and the quality of urban environment, Moscow and St. Petersburg should be separated into certain categories.

St. Petersburg ranks first in terms of the urban environment quality, but in terms of the life quality of the population slightly lags behind Moscow.

Moscow is an absolute leader in terms of the life quality of the population, but at the same time, the quality of the urban environment significantly losses to a number of other cities, among them: St. Petersburg, Ekaterinburg, Nizhny Novgorod, Ufa, Krasnoyarsk.

It’s worthy to note Kazan which is superior to Moscow and St. Petersburg by the group of indicators (ratio of average per capita monthly income and the minimum subsistence level index, historical age of the city).

Yekaterinburg, Voronezh, Samara, Nizhny Novgorod, Ufa, Krasnoyarsk are differ in the quality of the urban environment but have approximately similar quality of life and should be separated into a certain group.

The group of megapolises, which includes Rostov-na-Donu, Chelyabinsk, Omsk, Perm, Novosibirsk, Volgograd, have the low indicators of the life quality and the low quality of the urban environment. This group should focus on reducing the number of people with incomes below the minimum subsistence level, and increasing the provision of the population with social infrastructure facilities.

6. References

[1] Aleshkovsky I A and Bolatov M O and Sluka NA 2017 Horizons of urban growth in the context of globalization J. The age of glob. no (21) pp 33-45
[2] Krugman P R 1991 Geography and Trade (Cambridge (Mass.); MIT Press) p 156
[3] Zubarevich N V and Safronov S G 2013 Inequality of socio-economic development of regions and cities of Russia in the 2000s: growth or decline? J. Soc. sciences and mod. times no 6 pp 15-26
[4] Vendina O 2006 Strategies for the development of the cities in Russia: the search for conceptual solutions J. Dem. Weekly (The popul. and soc.) no 247-248 Available at: http://www.demoscope.ru/weekly/2006/0247/analiit01.php (accessed 20.04.2018)

[5] Humanitarian technologies Available at: http://gtmarket.ru/ratings/global-cities-index/global-cities-index-info (accessed 20.04.2018)

[6] Clark D 2004 Urban world / Global city (Taylor & Francis e-Library) p 211

[7] Sassen S 2001 The global city: New York, London, Tokyo (Princeton University Press) p 480

[8] Taylor P 2004 World city network: A global urban analysis (London: Routledge) p 254

[9] Russia: principles of spatial development Available at: http://www.glazychev.ru/projects/2004_ProstRazv/2004_DocladProstRazv.htm#8 (accessed 18.04.2018)

[10] Zubarevich N V 2013 Social differentiation of regions and cities J. Dem. Weekly no 551–552 Available at: http://www.demoscope.ru/weekly/2013/0551/index.php (accessed 19.04.2018)

[11] Zubarevich N V 2012 Major Russian cities: leaders and outsiders J. Pro et Contra vol 16 no 4-5 pp 135-152

[12] The digital life of Russian megacities. Model. Dynamics. Examples, ed. E Kaganer, V Korovkin et al Available at: https://iems.skolkovo.ru/.../SKOLKOVO_IEMS_Research_2016-11-30_ru.pdf (accessed 23.04.2018)

[13] Federal State Statistics Service (Rosstat) 2016 Regions of Russia. Socio-economic indicators. 2016: Stat. digest (Moscow: Rosstat) p 352

[14] Federal State Statistics Service (Rosstat) 2016 Regions of Russia. The main socio-economic indicators of cities. 2016: Stat. digest (Moscow: Rosstat) p 442

[15] Federal State Statistics Service (Rosstat) 2017 Regions of Russia. Socio-economic indicators. 2017: Stat. digest (Moscow: Rosstat) 1402 p.

[16] Federal State Statistics Service (Rosstat) 2017 Social status and standard of living of the population of Russia. 2017: Stat. digest (Moscow: Rosstat) p 332

[17] Database of indicators of municipalities Available at: http://www.gks.ru/dbscripts/munst/ (accessed 23.04.2018)

[18] Report on Human Development in the Russian Federation Available at: http://ac.gov.ru/files/publication/a/7198.pdf (accessed 23.04.2018)

[19] Animitsa E G, Vlasova N Yu 2010 Human factor in the development of the cities J. Upravlenets no 7-8 (11-12) pp 13-15

[20] The struggle for citizens: Human potential and the urban environment Available at: 2016.mosurbanforum.ru/files/pdf/analiticheskie_obzory/issledovanie_gorodov.pdf (accessed 23.04.2018)

[21] Websites of administrations of municipalities Available at: https://www.gov.spb.ru, https://www.mos.ru, https://www.kzn.ru, http://www.ekburg.ru, http://www.voronezh-city.ru, http://samadm.ru, http://rostov-gorod.ru, http://novosibirsk.ru, https://ufacity.info, https://cheladmin.ru, http://admomsk.ru, http://www.gorodperm.ru, http://www.admkrsk.ru, http://www.volgadmin.ru (accessed 23.04.2018)