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Influence of Territorial Ecological Load Factors on Social and Economic Well-Being of Population: Methodology Development and Econometric Model Construction

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Abstract: The article provides insights into the methodological approaches to the complex evaluation of the people quality of life associated with the analysis of the interaction between social and economic well-being and environmental quality. The study offers the results of the mathematical calculations which demonstrate the relation between the level of well-being of the population and the level of the ecological environment's development based on the cases of the municipal areas of the Republic Tatarstan, Russia. The key policy recommendations aiming at the improvement of the people quality of life vis-à-vis the features of the municipal development are postulated

Key words: Population well-being, environment · Environmental load · Social and economic development

INTRODUCTION

Modern stage of interaction between nature and society is characterized by aggravating ecological problems, which threaten life quality and human existence itself. The remaining acuity and importance of present-day ecological problems calls forth the necessity to review social and ecological discourse, including complex processes, which are related to economic and social life and affect population well-being.

Minimisation of ecological risks and development of an ideology based on sustainable society's development concept require a complex solution, which implies not only scientific-and-technical and normative-and-legislative base improvement, but also sociocultural and economic contradictions overcoming.

In this connection, the problem consisting in estimation of influence exerted by ecological load on population well-being faced the scientific community in the most acute way in the 21st century. The problem of improvement of a stable regional system is conditioned by ecological difficulties of economic development and deterioration of labour-power reproduction conditions. This fact can be explained, in the first place, by growth of aggregate labour inputs into getting natural environment elements used in production; in the second place, social labour losses are observed as a result of misallocation of resources representing elements of natural environment; in the third place, there arises a necessity to allocate significant funds for liquidation of negative consequences of man-caused impact on natural environment. The existence of necessity to perfect a mechanism of economic, ecological and political decision-making with respect to infrastructure development in regions with highly developed industry doesn't give rise to doubt. Under the existing economic conditions efficiency of such a mechanism is determined by the ability to harmonize objectives of functioning and development of the two main links of the territorial-and-production complex – that is, the enterprise and region.

Economic-and-ecological programming becomes more and more important, as far as it has proved to play a role of an effective factor of economy transition to sustainable development in many countries. Unfortunately, attention to economic-and-ecological programming weakened in our country during the years of economic reforms due to liberalism ideas domination.

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It is important to note that the existing interregional distinctions affect economic development of the country as a common economic space.

A review of the relevant literature demonstrates that the problems of interregional inequality study, in which these matters are usually considered within the context of the following indices: the index of gross regional product (GRP) per capita, life expectancy, unemployment level, poverty level along with different factors what influence ecological and social and economic well-being of the population [1-7].

MATERIALS AND METHODS

However, inequality in life quality, which is determined by ecological characteristics of the territory, to a large degree, and can be quantitatively measured with the help of ecological load indices, is the aspect of no less importance, as well. These factors become the prime cause of inequality in population health and migration indices. One more essential circumstance is also worth mentioning: habitat quality deterioration often lowers opportunities the regions have with respect to economy diversification. Namely for that reason we have set the following task – to estimate population well-being level within the context of ecological load experienced by territories on the basis of econometric model construction and findings of a representative social opinion poll held among population of the Republic by a stratified quota sample (n = 1600, 2012). Interdisciplinary approach permitted us to make a comprehensive comparison of objective indices of territorial ecological load with subjective perception of surrounding environment quality by the population.

RESULTS AND DISCUSSION

To analyse influence that ecological situation exerts on life quality of population residing in separate administrative districts and regions of the Republic of Tatarstan, at first we individually estimated the level of population well-being and ecological load experienced by territories. The consolidated index forming methodology has been taken as a basis. As a result we obtained integral indices of habitat quality (KSO) and population well-being (IBN). Furthermore, we simultaneously analysed findings of a representative social opinion poll held among the population of Tatarstan.

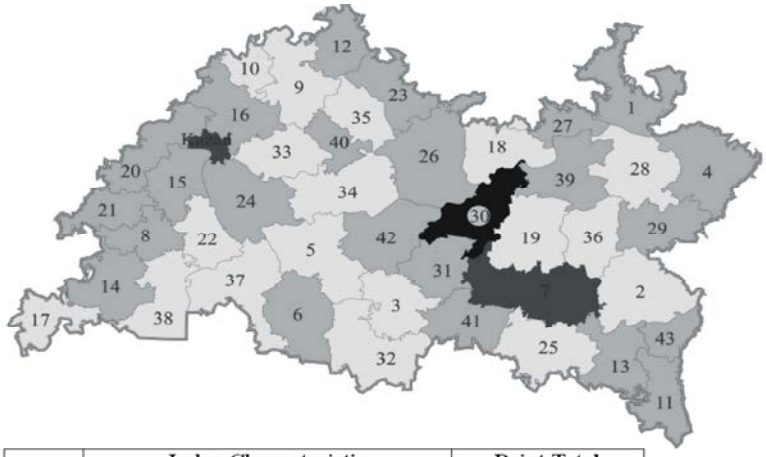
Simulation of the system of interaction between ecological environment and population well-being level has demonstrated direct relation between the factors under consideration. Population welfare level in the respective municipal district or city is higher in the areas where ecological environment level has maximum negative values.

In this connection a multi-factor model determining dependence between IBN and ecological parameters testifies direct relation existence. This fact doesn't permit to develop a system of state influence on ecological environment in the Republic of Tatarstan [3].

In this connection it has been offered to introduce a new index demonstrating correlation between IBN and KSO. The IP index plays the role of such an index. The IP index demonstrates correlation between the population well-being level and ecological environment development level IP = IBN/KSO [4]. Lower IP index value is the evidence of a higher welfare level with respect to the level of ecological load experienced by the territory being analysed. This relative indicator shows the degree of repercussion of ecological pollution of a certain territory, in other words: it shows, which population well-being level compensates ecological load. The higher IP index value is, the more positive the situation in the region is (Figure 1).

For instance, in spite of high values of life quality, income level and social-and-economic development indices in whole, the IP value for Kazan makes 2,03 points, while for Baltasinskiy district IP = 12,9 points. Therefrom one can draw the following conclusion: large value of ecological pollution level significantly reduces return on funds and efforts invested in the district development, and consequently, it is necessary, above all, to exert influence upon those territories of the Republic of Tatarstan, in which IP index has the lowest values. Decrease in KSO level will permit to increase IP level for this or that municipal district, provided that the population well-being index remains invariable.

The hypothesis of necessity to determine the level of ecological influence on ecological potential return index of the territory (IP) has been taken as a basis for a new multi-factor model. At the same time, this model permits to establish the degree of influence that the respective factor characterizing ecological situation exerts on IP. Such an advantage of the described method determines the direct opportunity to develop a system of measures of governmental influence on ecological environment with the purpose of IP optimization (Figure 2).



	Index Characteristic	Point Total
	High (sufficient)	23 and higher
	Satisfactory	10 to 23
	Insufficient	7 to 10
	Low (arousing anxiety)	Less than 7

Fig. 1: Forming of a mapping environment, reflecting municipal district and city zoning in the Republic of Tatarstan by the level of influence that ecological environment produces on population well-being level (IP Index)

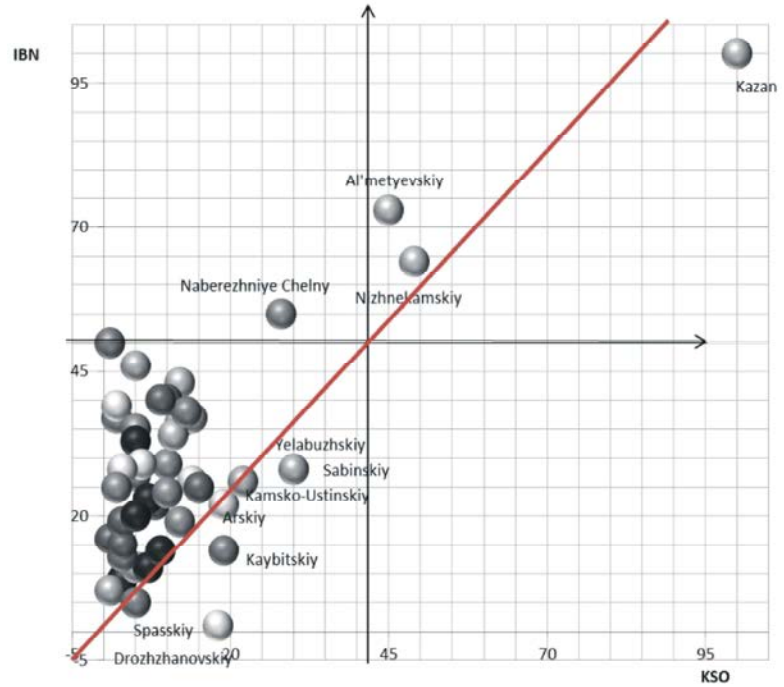


Fig. 2: Correlation integral indices of habitat quality and population well-being

The considered approach permits to group municipal districts of the Republic of Tatarstan by the degree of optimal or, oppositely, nonoptimal correlation between the population well-being index and ecological pollution index. And namely in those areas where this ratio (IP index) has minimal value one has to exert influence upon ecological situation, in the first place. At the same time, the degree of such influence will be determined on the basis of a model establishing interaction between the IP index and ecological factors [3].

The essence of the IP-index can be graphically depicted by means of drawing a bubble diagram, reflecting the KSO value along the x-axis for municipal entities and IBN values – a long the y-axis. As we can see, the area

formed in the coordinate system can be divided into 4 conditional quadrants, characterizing different degrees of a favourable social-and-economic development of the population under the existing ecological load conditions. It's obvious that regions located in the I quadrant are in the best state, because, in addition to a high development level typical to it, it is also the leader by ecological situation indices (KSO point value is lower than an average point value). In contrast to the I quadrant, regions being in the worst state both in social-and-economic sphere and in the ecological situation aspect are concentrated within the bounds of the IV quadrant (for example, Sabinskiy district). Regions characterized by sustainable development were depicted in the II and III quadrants (above the diagonal line, plotted with red colour) (and besides, the farther the region is from the origin of coordinates, the higher is social-and-economic development rate). Special attention should be paid to regions located in these quadrants, but below the diagonal line. In our opinion, a plan of measures, which will permit to improve ecological conditions and stabilize the existing situation, should be developed namely in these regions. It is so because real ecological indices characterizing the above indicated regions are not justified by the current population well-being level.

Sociological study demonstrates the following tendency: population of large Republican cities, who are active in economic respect and have relatively high living standards and population well-being level, are the groups characterized by the highest ecological concern. Thus, the results of an opinion poll held in 2012 showed that people living in the cities (82,1%) were concerned about environmental conditions deterioration to a greater extent, than villagers (72,6%). Citizens of Kazan (92%), Nizhnekamskiy (83%) and Al'metyevskiy (78%) districts felt ecological risks more strongly than people living in other areas.

These data are consistent with our econometric model. Sociologists register post-material values to be strongly depended on economic welfare. This tendency is especially relevant for the postsocialist Russia [8, 9].

In this connection, many scientists have been observing changes in environmental behavior of the population of Europe and the USA since 1988. According to R. Inglehart [10], within the period from 1970 to 1988 a "cultural shift" occurred in western societies. The aforesaid shift caused in changes in consciousness and value orientations of population and was directed at post-material values domination over material ones. Such values as self-expression, self-perfection, living standards enhancement (including surrounding environment sphere) became leading.

Correspondingly, while villagers are concerned about fundamental material and social problem solving, townspeople articulate post-material values, including favourable environment, to a greater extent. On the other hand, this disproportion can also be explained from the point of view of articulation of townspeople's self-preservative behavior, caused by "visible" ecological risks faced by megalopolises – air pollution with gases, increased noise level, small share of green areas within territories of cities. In this way, according to findings of the opinion poll held by us in December, 2012 among Kazan citizens (n=400), the most pressing problem for Kazan citizens was connected with water quality: it was mentioned by about three fourth of respondents (73,8%). The problems of territory improvement and planting of trees and shrubs in yards and recreation areas were marked out in the pressing city problem list by less than one third of respondents (30%); a bit less than one fifth of them (19,8%) named late garbage removal. Young people from other age groups were concerned about trees cutting down and park areas destruction within the city boundaries (22,3%), while villagers and townspeople could be subjected to high ecological risks, still not feeling ecological load directly on themselves (for instance, during subterranean water pollution, radiation level increase etc.).

In this way, the developed toolset, destined to estimate population well-being relative to ecological load experienced by the given region, permits to pick out special risk zones (from the point of view of the ecological component), for which one should develop measures on ambient environment condition improvement and balanced social-and-economic development provision.

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