

Methodological approaches to assessing the level of vulnerability of settlements in Kazakhstan

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Abstract. The aim of the research is to study the factors of development and depression of the territory, the development of a methodological approach to assessing cities and rural settlements of Kazakhstan. The main indicators of selection of localities include population density, industrial production per capita, gross output of agricultural products (services rendered) per capita, retail turnover per capita, nominal income per capita, migration balance, distance up to 50 km from the state border of Kazakhstan. The sample will be formed based on the selected criteria from 88 cities and 6322 rural settlements of Kazakhstan. The developed approach can be applied in further data analysis based on secondary statistical data and conducting an empirical study to collect primary data.

1 Introduction

In the modern world in the context of climatic changes, global pandemic and economic crises, the study of the socio-economic vulnerability of the country's territory has become relevant [1-3]. It should be noted that this is relevant for both developed countries and developing regions of the world. Today in Kazakhstan there is an urgent need for the development of depressive settlements, which have their own characteristics associated with the historically formed heterogeneity of the placement of industries and deep differentiation in terms of socio-economic potential. Urban agglomerations, city centres, and regions with raw materials-producing industries, whose products are in demand on the global market, have adapted best to the market economy. As a result, many localities in Kazakhstan were, as a rule, less developed and competitive, and even worse socially vulnerable. In addition, the COVID-19 pandemic has significantly changed the structure and level of their development, and has revealed problems of potential vulnerability, especially in small communities where there are no resources and materials to manage these consequences. The severity of these shocks will be weighed down by the development of effective measures to overcome inequality and the depopulation of strategically important human settlements.

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The tools used in Kazakhstan's practice for the development of territories often do not consider the duration of depressive trends but are mostly based on the analysis of the current situation. This is also typical of the developed mechanisms for supporting settlements that are declining in Kazakhstan, many of which are in a long-term depression. The complexity, mono-profile, and multidimensional nature of the processes occurring in sparsely populated, hard-to-reach, and remote localities requires a deep analysis of the territories that are becoming extinct in Kazakhstan.

Currently, there are many scientific studies aimed at different approaches to the analysis and assessment of the region depression development level. However, depressive, and underdeveloped regions are not clearly separated, although their problems are different. Some studies have noted that underdeveloped regions have always lagged in terms of socio-economic development and infrastructure development of the territory due to unfavourable development factors (peripherality, low human capital). In other scientific works, it was emphasized that depressed regions experienced periods of economic prosperity and once, in a certain technological way, formed the backbone of the economy, but then, because of a decline in a key industry, they became crisis prone. While some papers may claim that their research is objective, in fact, no research is completely objective.

In this regard, it is worth noting that there are very few scientific studies aimed at studying the trends of development and extinction of modern settlements to overcome their depopulation. This study aims to fill this gap. The relevance of the research is because the development of methods for assessing localities, criteria for classifying territories as depressive, methodology for determining the severity of local depression, approaches to developing management decisions for declining localities that are strategically important for the territorial integrity of Kazakhstan is of particular importance.

2 Materials and methods

In this study, it was necessary to consider that information about all localities is not always available, and statistical indicators at the level of small towns and settlements can differ significantly. In the localities of Kazakhstan, it is also difficult, and sometimes impossible, to measure the causal relationships of the mutual influence of various factors. Therefore, it is difficult to analyze the trends and factors of development of such localities, as well as to compare them and determine the rating. All this makes it difficult to develop a methodology for assessing the level of vulnerability of the economy and social sphere of settlements in Kazakhstan.

Methodological approaches of Russian researchers differ in variety. For instance, some of them suggest to apply rating methodology for a set of indicators, which reflect regional product structure, use of fixed assets and etc. [4,5]. However this methodology is not applicable for our study as it is not comprehensive enough and does not cover social aspects.

Other researchers suggest using several indicators, which cannot give a complete picture of the trends in the development or decline of settlements and determine the prospects for their development [6]. In the study of Lewis there is made an assumption about the elasticity of the supply of unskilled labor from rural localities, which affects the industrial development of the territory [7]. Further, in the works of Harris and Todaro, it was observed that migration from rural localities to cities is driven by politically defined minimum wages in cities, and rural-to-urban migration can lead to poor outcomes for migrants if they do not get jobs in the formal sector, but will become unemployed in the informal sector [8].

Some experts when introspecting the state and dynamics of regional development consider mostly financial indicators and gross volume of GRP [9,10]. Methodologies of

Columbia University McKinsey and Tsinghua University, which developed a unique system of indicators and applied it for the analysis of densely populated regions of China with up to 40% of the population of the country and almost half of GDP is produced [11].

The system of criteria and indicators of this methodological approach is shown in table 1.

Table 1. Indicators for assessing the impact on the level of China's territories

Key indicator groups	Subgroups of indicators
Resources	Land plots
	Water resources
	Energy resources
Social sphere	Public services
	Infrastructure
	Transport
	Housing
	The level of fair distribution of the total income of the city
	Public safety
Environment	Environmental conditions
	Environmental protection
	Environmental Management
Economy	Market efficiency
	Labor efficiency
	Production efficiency
Innovation	Education and training
	Science and Technology
	Technological advances

Researchers in China divided all the indicators into 5 large groups, which allowed them to analyze a fairly large number of factors and their impact on the development of many areas of production and life of the population. For the analysis, they selected 32 indicators and used data from official statistics. It is noteworthy that in the absence of the necessary data, they used averaging and smoothing methods.

According to Waly the social vulnerability includes demographic (size, structure, and distribution of populations), socioeconomic (the financial status of individuals and groups: poverty, employment, education, and per capita income) and housing and infrastructure (the percentage of mobile homes, crowding ratio, electricity, and water supply, road networks, public transportation facilities) [2]. In addition to these indicators Fraser measures the social dependence, which covers municipal expenditures on social assistance per capita, the percentage of nursing home residents, the share of the population lacking health insurance, the medical exam rate, and the number of hospitals per capita [3]. Glaeser and Mare studied determinants of variation of the level of inequality between cities. They found that inequality in skills can explain approximately half of city inequality, and reasons of migration from rural localities to cities [12].

In Kazakhstan, there are 88 cities and 6322 rural localities, while in many of them, especially small towns and villages, statistical reporting may not be established at the proper level. Thus, the development of a methodology for assessing the vulnerability of the economy of settlements in Kazakhstan is quite difficult, due to the following circumstances:

- statistics for localities may not be calculated or may not always be available;
- the complexity of analyzing an excessively large number of localities will have to be selected for each group;
- it is necessary to take into account the influence of additional factors – the level of migration, the level of infrastructure security and security of residence, the level of security, the level of distance from transport, and other;
- it is necessary to consider the influence of environmental factors, which, due to climate change and the deterioration of the epidemiological situation, have an increasingly strong impact on the development of cities and villages.

Considering these features, it is proposing an original algorithm for developing a methodology and analyzing the state, the main trends in the development or decline of settlements in Kazakhstan and assessing the impact of the main factors on the vulnerability of their economy and social sphere.

3 Results and discussion

The selection of indicators will not include large cities and agglomerations as the main “growth points” of the national economy, the least vulnerable to the influence of negative factors. The following criteria are proposed for sampling localities by their main groups small towns, single-industry towns, and villages (Table 2).

Table 2. Selection of localities in Kazakhstan according to the main indicators

Indicator	Unit of measurement	Weight
Population density	person/1 sq. km	10%
Industrial production per capita	thousand KZT	15%
Gross output of agricultural products (services rendered) per capita	thousand KZT	15%
Retail trade turnover per capita	thousand KZT	15%
Nominal monetary income (nominal salary) per capita	thousand KZT	10%
Migration balance	person	10%
Distance up to 50 km from the state border of Kazakhstan	km	15%

The weights in the presented estimation algorithm were established by expert means, which considered that the trends and rates of development/decline of a locality are primarily determined by the presence and volume of production of industry, agriculture, and trade turnover. According to experts, the income of the population, the balance of migration and the population density are derived from the level of economic development, the availability of jobs. A special place in the toolkit is occupied by the criterion “Distance up to 50 km from the state border” since this criterion determines the strategically important position of the country's settlements for its national security. To conduct an analysis on the selected composition of localities, it is necessary to determine the system of indicators.

Economic development of communities must be regarded from the perspective of the possibilities of attracting resources (investments), the existing structure of the economy and the level of specialization, resources endowment, transportation capabilities of raw

materials and other resources for production (assessment of transport distance), the availability and mobility of qualified workforce potential.

Infrastructure facilities characteristic can be designated through such indicators as: roads and railways density, availability of road junctions or stations, the distance to the nearest railway station, turnover of cargo and passengers of all types of transport; the level of gas infrastructure and water supply development; level of compliance with drinking water requirements; share of gasified housing stock, housing equipped with sewerage system, central heating, share of emergency housing stock.

The level of cities and rural localities territories ecological friendliness can be characterized by such indicators available in official statistics as: environmental expenses per capita, the volume of pollutant emissions from stationary sources, the amount of removed household solid waste, the air pollution index.

Based on the above mentioned indicators there can be provided state and trend analysis of development /decline of settlements and to define main factors, which influence determines the vulnerability of a particular sphere of socio-economic development.

The advantages of suggested methodological approach are:

- assessment comprehensiveness, which allows to consider the impact of primary factors on all aspects of the development of each settlement;
- taking into account the specifics of statistical reporting in the settlements of Kazakhstan;
- application of suggested methods for assessing socio-economic processes by the bodies of the republican and local authorities for decision-making purposes on improving the management of the development of a settlement
- the results of the research can be used as the basis for decision making tools by government authorities in terms of perceptivity of settlements development and allocation of funds as financial aid.

4 Conclusions

The stabilization of the economies of countries and regions after the COVID-19 determines the urgency of the problems of smoothing inequalities and uneven development. In developing countries, such as Kazakhstan, there is a high degree of differentiation of territories by financial, social, and economic indicators. Such trends can lead to a critical decline in the economy, disruption of social stability and a decrease in the level of competitiveness of many remote territories.

Thus, in this work, various approaches to assessing the country's territory were studied and criteria for choosing cities and rural settlements were identified for further conducting the research on assessing the vulnerability and depression of regions. The main indicators of selection of localities in Kazakhstan are population density, industrial production per capita, gross output of agricultural products (services rendered) per capita, retail turnover per capita, nominal income per capita, migration balance, distance up to 50 km from the state border of Kazakhstan. The sample will be formed based on the selected criteria from cities and rural settlements of Kazakhstan. A limitation of the study may be the lack of statistics for certain rural settlements. In these settlements, it is planned to carry out additional collection of primary data from local government agencies and residents. Thus, this developed approach can be applied in further data analysis based on secondary statistical data and conducting an empirical study to collect primary data.

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