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# A cluster policy as a fundamental component of regional economic development (the case of the Rostov Region)

The primary objective of a cluster policy is to ensure high rates of economic growth and diversification of regional economies by improving competitive abilities of enterprises, suppliers of equipment, components, providers of specialized production and customer services, R&D and education organizations that comprise geographical clusters. The cluster approach is a key constituent of the socioeconomic strategies in several Russian regions and municipalities, as shown by the project "The Cluster Policy Concept in the Russian Federation", developed by the Ministry of Economic Development of the Russian Federation. This article focuses on a methodology for successful spatial clustering and cluster specialization analysis in the Rostov Region as the subject the Russian Federation. A comprehensive analysis of the spatial development of a subject of the Russian Federation is carried out through generalization and systematization of urban planning documents, together with the analysis of the current state of spatial development in the region. Presently, there is no integrated approach to assessing this territory of the Russian Federation in terms of the cluster policy development. The co-authors suggest customizing the universal assessment methodology for the cluster development of the Russian Federation. A comprehensive analysis of spatial development of the Russian Federation is carried out through generalization and systematization of urban planning documents, together with the analysis of spatial development in the region. A comprehensive assessment of a territory represents an integrated approach to the analysis of the spatial distribution and quality characteristics of all types of resources. A comprehensive assessment of the territory was made using geographic information systems, which are extensively used in the process of managing the spatial development, particularly in the spatial analysis of territories. ArcGIS software package is used as a tool for the comprehensive assessment of the territory. Following the comprehensive assessment, functional specialization maps of the Rostov region were made. The transportation and logistics cluster was indicated on the map, and the rating of the Rostov Region's districts was displayed on the map.

***Keywords:*** *cluster, cluster policy, methodology, comprehensive assessment, functional priority, simulation model, transport infrastructure, transport and logistics cluster*

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## INTRODUCTION

Clusters and cluster policies are becoming increasingly popular in the economic development, since this approach enhances the competitive ability of local industries and the country as a whole by synergizing its production, research, education, and infrastructure potential [1].

Since the establishment of regional industrial clusters is aimed at improving the efficiency of local socioeconomic development, a methodology for assessing the industrial potential of a territory is needed to project its long-term development. This fact confirms the relevance of the work aimed at improving the research and methodological framework of decision making in the area of cluster development of territories. The Strategy of Socioeconomic Development of the Rostov Oblast until 2020 and the Strategy of Socioeconomic Development of Rostov Oblast until 2030 specify the priority sectors of the economic development of the region. The analysis of the cluster development of the region allows to identify the industries to be covered by the clustering process (Table 1).

*Table 1. Clusters in the priority industries of the Rostov Region*

| Industry | Cluster |
|---|---|
| Agriculture | Innovative territorial cluster "Don Dairy Products" |
| | "Don Valley" wine territorial cluster |
| | Innovative biotechnology cluster |
| Machine industry | "Southern Constellation" innovation and technology cluster |
| | Innovative territorial cluster of machine tool manufacturing |
| | Innovative territorial cluster of marine instrumentation "Marine Systems" |
| | Helicopter engineering territorial cluster |
| | Volgodonsk industrial cluster of nuclear machine engineering |
| Informational technologies (IT) | Information and communications technology cluster |
| Light industry | LegTexDon cluster |
| Tourism | Volgodonsk furniture cluster |

## THEORETICAL PART

The co-authors have developed a methodology for planning the cluster development of territories of subjects of the Russian Federation that has five stages (Fig. 1).

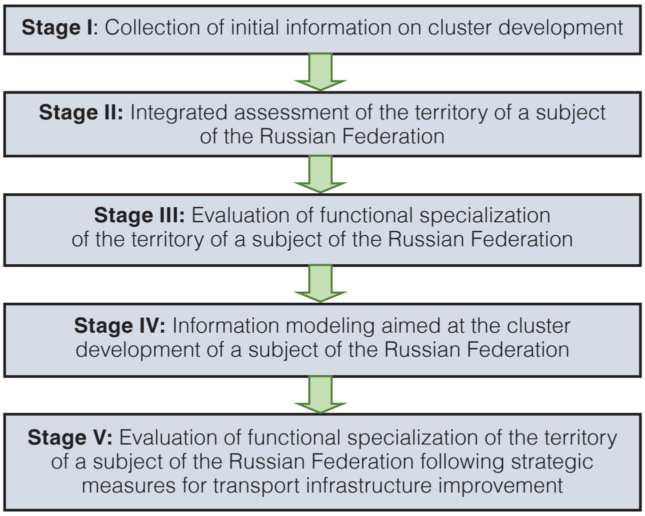


*Fig. 1. Methods of cluster development of subjects of the Russian Federation*

The cluster development planning technique is based on a method of integrated assessment of territories, that encompasses multiple approaches to the analysis of territories in terms of their cluster development by comparing the present and future characteristics of selected territories. We used ArcGIS software package by ESRI (USA) to perform the integrated assessment of the territory. Several evaluation factors, representing all aspects of activities in the RF subject, were selected within the framework of the integrated assessment process as a stage of the new methodology (Fig. 2). The quantification of

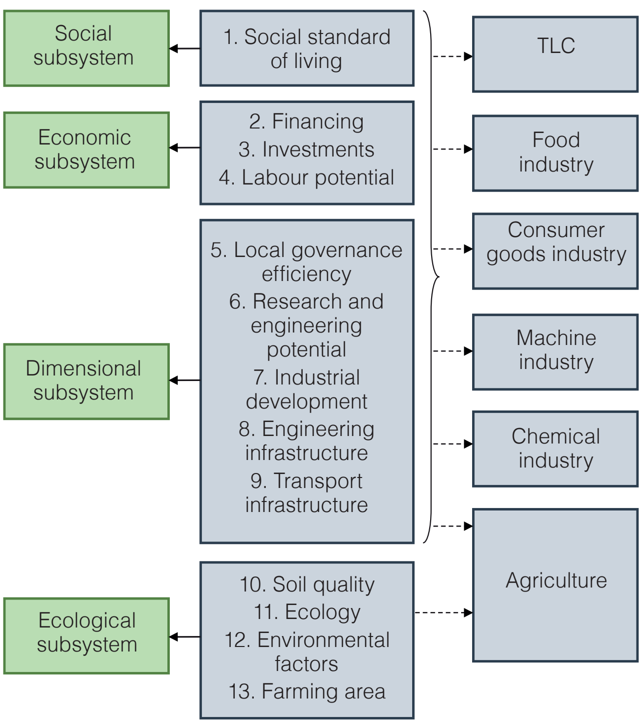


*Fig. 2. Evaluation factors of industrial development*

importance of the evaluation factors is made to demonstrate the value of each factor in relation to the value of the territory [2, 3].

Different factors have different effects on the development of a particular industry. The calculation of the functional priority of a given territory is carried out by assigning significance coefficients to each factor and calculating the target function. In this regard, there is a need to build a priority matrix (1):

| | $k_1$ | $k_2$ | $k_3$ | $k_4$ | $k_5$ | … | $k_n$ |
|---|---|---|---|---|---|---|---|
| $i_1$ | | | | | | | |
| $i_2$ | | | | | | | |
| $i_3$ | | | | | | | |
| $i_4$ | | | | | | | |
| $i_5$ | | | | | | | |
| … | | | | | | | |
| $i_n$ | | | | | | | |

(1)

where $k_1$–$k_n$ are the significance coefficients attached to the factors having relative values;

$i_1$–$i_n$ are the priority industries in the Rostov Region.

Determination of the significance coefficients of the factors of relative value is a complex statistical task, which can be solved in several ways. In the co-authors' opinion, the best one is the expert method, since it is feasible under any conditions, including the lack of any necessary information. Experts fill out questionnaires and this is how the information is collected. An expert ranks the factors by the extent of their influence on the value of the territory (Table 2) for each type of industry [4].

*Table 2. Ranking significance coefficients*

| Degree of influence | Coefficient value | Rank of the factor |
|---|---|---|
| Strong influence | 1 | 1 |
| Moderate influence | 0.5 | 2 |
| Weak influence | 0.25 | 3 |
| No influence | 0 | 4 |

This data is subject to further processing and analysis.

As a result of multiplying the significance coefficients, obtained by the expert method for specific industries, by the results of the integrated assessment of the territory, the priority rating of territories is obtained for a particular industry.

We can represent the relationship between the degrees of influence of factors on the development of local industries in form of an objective function (2):

$$P_j = \Sigma F_i K_i^j, \qquad (2)$$

where $P_j$ is the value indicator of the $j$-th type of industry; $F_i$ is the $i$-th coefficient of the relative value of the territory; $K_i^j$ is the coefficient of significance of the $i$-th factor for the $j$-th type of industry.

We use calculation results to identify the territories that are most suitable for the development of a particular industry.

Modeling as a method of studying systems is used to make complex management decisions; it represents a system of models of an object in question for the purpose of its study [5].

An information model allows to merge databases with information on the present and future situation in spatial development and generate reliable data needed for reasonable urban planning and management decisions concerning planning activities within a subject of the Russian Federation. Urban planning decisions become scientifically sound, as they are based on mathematical calculations, rather than intuition. The reliability of the results goes up because they are based on simulations of spatial development processes.

The purpose of developing an information model is to ensure the cluster development in the Russian Federation subject to the improved transport infrastructure.

The first block (Fig. 3) is a comprehensive database that includes the analysis of the following documents:

- strategy of socioeconomic development of a subject of the Russian Federation and other regulatory and legal documents;
- spatial planning scheme of an RF subject;

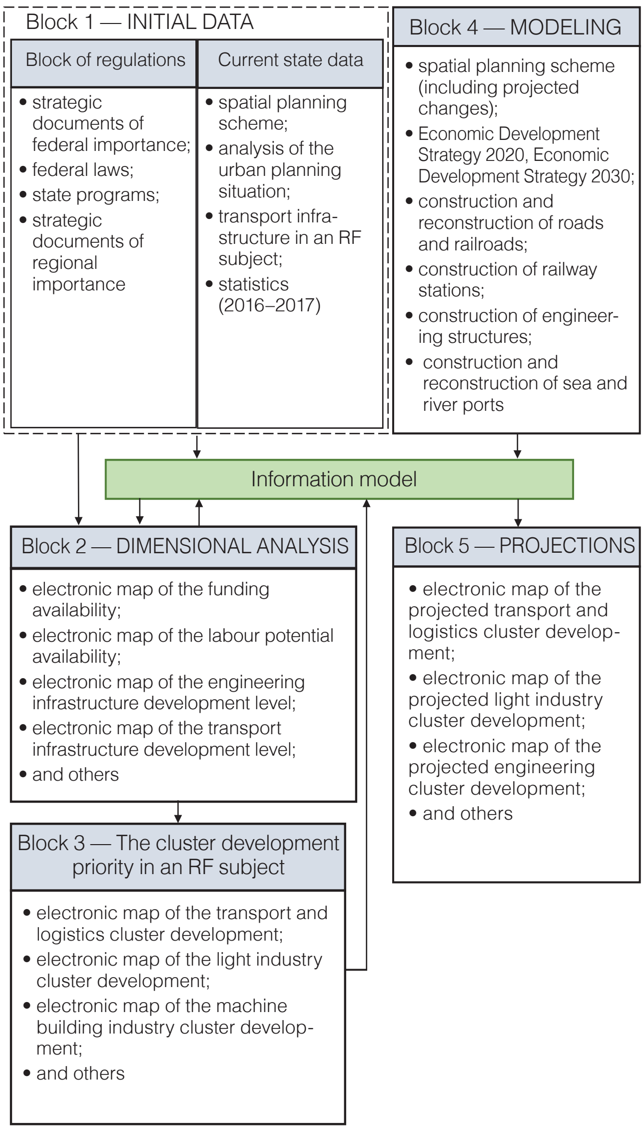


*Fig. 3. Information model of cluster development in a subject of the Russian Federation*

- statistical indicators of municipal development of an RF subject [6].

A comprehensive analysis of the spatial development of an RF subject is carried out by summarizing and arranging the urban planning documents alongside the analysis of the current situation in spatial development.

In the second block, a source of generalized information is available, and the information is presented in the electronic form. The results of the comprehensive analysis of a territory are displayed on the map of the Russian Federation with a breakdown into evaluation areas, which allows for a comparative spatial analysis of the territory and further management of urban development.

Having calculated the functional specialization by assigning significance coefficients to evaluation factors, depending on the type of sectoral development in Block 3, we obtain electronic maps of the priority cluster development of a subject of the Russian Federation.

The availability of the transport infrastructure in a territory is a variable factor. The better the transport availability, the better the prospects of the territory in terms of the sectoral development.

Project suggestions are simulated with the help of electronic map layers, attribute tables and logic relationships between them. Information modeling will allow to recalculate the functional priority of a territory in Block 5 in accordance with the projected pattern of development of its transport infrastructure. An integrated assessment of the territory, conducted anew, shows the effectiveness of decisions focused on the transport infrastructure improvement.

## EXPERIMENTAL PART

The information model of the cluster development pattern of the Rostov Region is based on project-focused decisions and measures, specified in the strategic documents and contingent on the transport infrastructure [7, 8].

The following measures will boost the development indicators of the four means of transport (highway density, railway transport, air transport and water transport) [9–11]:

- construction of new roads of federal and regional significance;
- changing the function of roads and railroads;
- construction of a high-speed railway spur;
- revamping the air transport infrastructure;
- construction of hydrotechnical facilities and dredging of shipping lanes.

Having analyzed the projected development of the transport infrastructure in the Rostov Region, we perform an integrated reassessment of the area and recalculate its functional specialization by the branches of industry [12, 13].

Fig. 4 shows the assessment of the functional specialization of the transport and logistics sector of the Rostov Region following the implementation of strategic measures for the improvement of the transport infrastructure.

Fig. 4 illustrates a marked increase in the number of priority areas for the transport and logistics development.

## CONCLUSION

Acting within the framework of a scientific research, we used a traditional methodology to identify the six industries to be

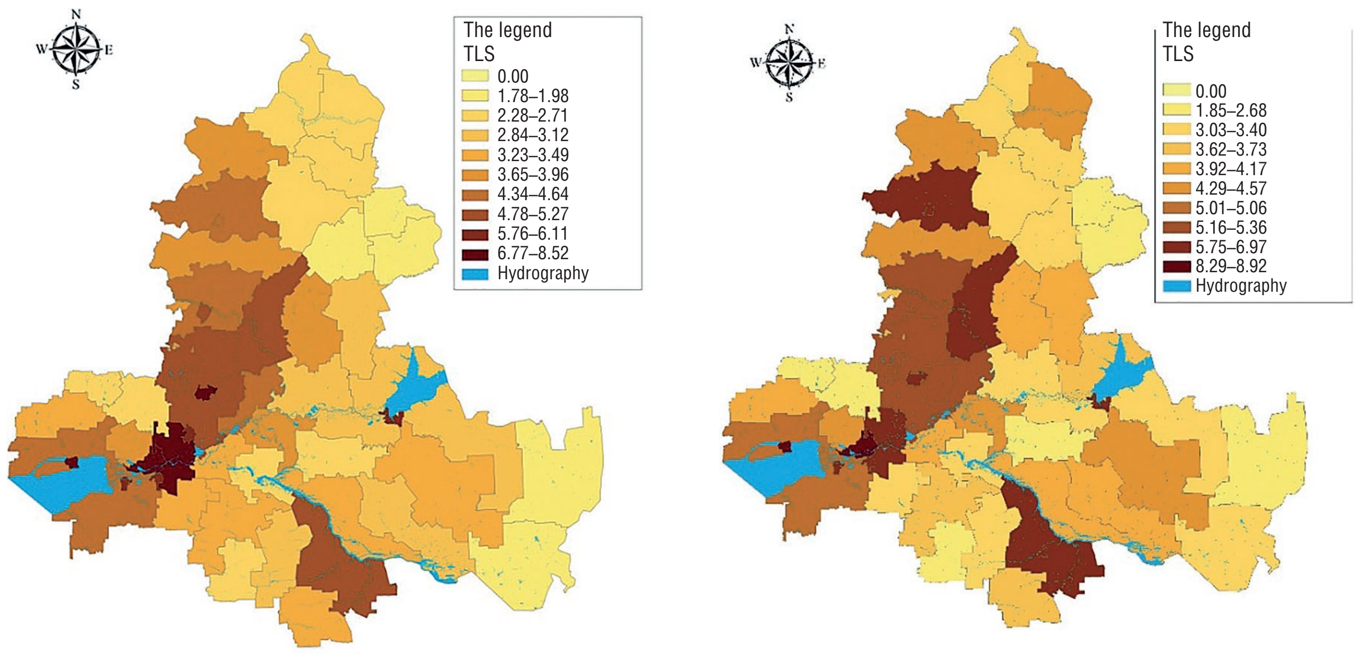


*Fig. 4. Assessment of the functional specialization of the transport and logistics sector of the Rostov Region following the implementation of strategic measures for the improvement of the transport infrastructure*

clustered. We generated a priority matrix, that has priority coefficients applicable to relative value factors in agriculture.

We calculated the objective function by multiplying the priority matrix by the results of the integrated assessment of the area and obtained the functional priority rating for the selected types of specialization in fifty five areas that we assessed. Electronic maps were made for each industry on the basis of the results of the functional priority assessment. The areas of Aksai and Krasnosulinsky districts, as well as the city of Rostov-on-Don are the priority areas for the development of all industries that were analyzed.

We developed an information model of the cluster development in the Rostov Region, which allowed us to re-calculate the functional specialization in respect of each branch of industry, taking into account the future transport infrastructure development.

The recalculation of functional prioritization enabled us to determine the increase in the potential development of industries in the territories of municipalities and urban districts.

An integrated assessment, being a universal methodology adaptable to different conditions, allows for a massive comparative assessment of the potential of the region's municipalities using factors of the relative value of a territory to address the priorities of strategic development of the subject of the Russian Federation [9, 14, 15]. This methodology, used as a tool for collecting the initial information about the territory regardless of the level of assessment, contributes to the scientific validity of urban planning decisions and the effectiveness of their further implementation.

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## Кластерная политика как базовый элемент развития экономики региона (на примере Ростовской области)

Основной целью реализации кластерной политики является обеспечение высоких темпов экономического роста и диверсификации региональной экономики за счет повышения конкурентоспособности предприятий, поставщиков оборудования, комплектующих, специализированных производственных и сервисных услуг, научно-исследовательских и образовательных организаций, образующих территориальные кластеры. Кластерный подход занял одну из ключевых позиций в социально-экономических стратегиях ряда регионов и муниципальных образований в РФ, о чем свидетельствует разработанный Министерством экономического развития РФ проект Концепции кластерной политики в Российской Федерации. Статья посвящена методике, позволяющей успешно реализовать территориальное кластерное деление и обеспечить расчет кластерной специализации на уровне субъекта РФ — Ростовской области. На данный момент отсутствует интегрированный подход к оценке территории субъекта РФ для развития кластерной политики. В исследовании предлагается адаптировать методику комплексной оценки для кластерного развития субъекта РФ. Комплексный анализ территориального развития субъекта РФ осуществляется за счет обобщения и систематизации градостроительных документов вместе с анализом уже существующей ситуации развития территории. Комплексная оценка территории заключается в интегрированном подходе к анализу территориального размещения и качественных характеристик всех видов ресурсов, целью является стратегическое планирование и управление территориальным развитием. Комплексная оценка территории произведена с использованием геоинформационных систем, активно внедренных в процессы управления территориальным развитием, в особенности при пространственном анализе территорий. Для выполнения работ по комплексной оценке территории используется один из представителей геоинфомационных систем — программный комплекс ArcGIS. На основании комплексной оценки построены карты функциональной специализации территории Ростовской области для транспортно-логистического кластера с соответствующим рейтингом районов, отображаемым на этой карте.

***Ключевые слова:*** *кластер, кластерная политика, методика, комплексная оценка, функциональная приоритетность, имитационная модель, транспортная инфраструктура, транспортно-логистический кластер*

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