Methods to Ensure Cluster Development of Rostov Region Territory in terms of Agricultural Sector

S Sheina¹, A Fedorovskaya¹
¹Don State Technical University, 1 Gagarin square, 344000, Rostov-on-Don, Russia

E-mail: bina-87@mail.ru

Abstract. The main objective of cluster policy implementation is to ensure high rates of economic growth and diversification of the regional economy by increasing the competitiveness of enterprises, suppliers of equipment, components, specialized production and services, research and educational organizations that form territorial clusters. The cluster approach has taken one of the key positions in the social and economic strategies in several regions and municipalities in the Russian Federation, as evidenced by the draft "Concept of Cluster Policy in the Russian Federation" developed by the Russian Federation Ministry of Economic Development. This article covers the methodology that allows to successfully implement the territorial cluster division and ensure the calculation of cluster specialization on the level of the subject of the Russian Federation, namely Rostov Region.

1. Introduction
Clusters and cluster policy are gaining popularity as an approach to economic development, since it is this approach that contributes to the competitiveness of the sectoral development of regions and the country as a whole by combining production, scientific, educational and infrastructure potential [1].

Since the formation of regional industrial clusters is one of the tools for implementing policies to improve the efficiency of social and economic development of the territories, it is necessary to elaborate an appropriate methodology for assessing the sectoral potential of the territory for future planning of its development. This determines the relevance of work aimed at enhancement of the scientific and methodological basis for decision-making in the field of cluster development of territories [2,3]. In accordance with the Strategy of Social and Economic Development of Rostov Region up to the year 2020, as well as the Strategy of Social and Economic Development of Rostov Region up to the year 2030, priority sectors of economic development of the Region have been identified. The analysis of the cluster development of the Region made it possible to identify the sectors covered by the clustering process (see Table 1).
Table 1. Presence of existing clusters in Rostov Region within the framework of priority industry branches.

| Field of economy | Cluster                                                                 |
|------------------|-------------------------------------------------------------------------|
| Agriculture      | Innovative territorial cluster “Donskiye Molochnye Produkty” (Don Dairy) |
|                  | Territorial wine-making cluster “Dolina Dona” (The Don Valley)         |
|                  | Innovative cluster for biotechnologies                                  |
|                  | Innovative technological cluster “Yuzhnoye Sozvezdie”                   |
| Machine Engineering| Innovative territorial cluster for machine-tool manufacture            |
|                  | Innovative territorial cluster for maritime instrument manufacture    |
|                  | “Morskiye Sistemy” (Maritime Systems)                                  |
|                  | Territorial cluster for helicopter building                             |
|                  | Volgodonsk industrial cluster for atomic engineering                    |
| Information technologies (IT branch) | Cluster for information and communication technologies |
| Consumer goods industry | Cluster “LegTexDon”                                                      |
| Tourism          | Touristic industrial cluster                                            |

2. Theoretical part

To enable advancement planning of the territories within the Russian Federation subject, a methodology for planning the cluster development of territories of the subject of the Russian Federation was developed. This methodology consists of 5 stages (see Figure 1).

Stage I: Initial data collection on cluster development

Stage II: Comprehensive evaluation of the RF subject territory

Stage III: Ofunctional specialization assessment of cluster development for the RF subject territory

Stage IV: Information modelling of the RF subject cluster development support

Stage V: Functional specialization assessment of the RF subject territory cluster development after the strategic measures to improve the transport infrastructure of the RF subject have been taken

Figure 1. Methodology of the RF subject territory cluster development support.

The methodology of cluster development planning is based on the methodology of comprehensive assessment of the territory which allows from to approach the analysis of the territory for the cluster
development of the subject of the Russian Federation different angles by comparing the current and future characteristics of the selected territory [4,5].

ArcGIS software package by ESRI company (USA), a representative of geographic information systems and one of the leading products in its field, was used to perform work on comprehensive assessment of the territory. Within the framework of a comprehensive assessment, as one of the stages of the developed methodology, a number of evaluation factors that reflect all aspects of the functioning of the Russian Federation has selected [6,7], as presented in Figure 2. Numerical calculation of the evaluation factors expression is made in fractions of a unit, reflecting the value expression of each factor relative to the territory value.

Various factors have different impacts on the development of a particular industry. Calculation of the functional priority of the territory is carried out by assigning coefficients of significance to each factor and calculating the target function. In this connection, there is a need to generate a priority matrix (1):

$$
\begin{array}{cccccc}
& k_1 & k_2 & k_3 & k_4 & \ldots & k_n \\
\text{i}_1 & & & & & & \\
\text{i}_2 & & & & & & \\
\text{i}_3 & & & & & & \\
\text{i}_4 & & & & & & \\
\text{i}_5 & & & & & & \\
\ldots & & & & & & \\
\text{i}_n & & & & & & \\
\end{array}
$$

(1)
where \( k_1 \) - \( k_n \) stand for coefficients of significance of relative value factors; i1 - in stand for priority industries of economy in Rostov Region.

Determining the coefficients of significance of relative value factors is a complex statistical task that can be solved in several ways. In the authors' opinion, the most appropriate method is the expert one, as it is applicable under any conditions, including the lack or absence of necessary information. Information is collected by individual filling in the questionnaires by experts. The expert should perform a ranking of factors by the degree of influence thereof on the value of the territory (Table 2) for each type of industry.

**Table 2.** Ranking of the factors as per significance coefficients.

| Degree of influence | Coefficient value | Factor rank |
|---------------------|-------------------|-------------|
| Strong              | 1                 | 1           |
| Moderate            | 0,5               | 2           |
| Weak                | 0,25              | 3           |
| No influence        | 0                 | 4           |

The data thus obtained undergo further processing and analysis.

The rating of priority of territories for a particular type of industry is obtained via multiplication of coefficients of significance of factors obtained by the expert method for certain types of industries by the results of comprehensive assessment of the territory. The dependence of the influence degree of the factors on the development of the industry branches in the region can be presented as the target function (2):

\[
P_j = \sum F_i \cdot K_{ij},
\]

where \( P_j \) is the value index (utilization priority) for a j-th industry branch; 
\( F_i \) is i-th coefficient of the relative value of the territory; 
\( K_{ij} \) is the coefficient of significance of the i-th factor for j-th industry branch;

The results of calculations were used to identify the territories most suitable for development of this or that branch.

### 3. Experimental part

The comprehensive analysis of territorial development of the Russian Federation subject is carried out by means of generalization and systematization of urban planning documents together with the analysis of existing situation regarding the territory development.

After the calculations of functional specialization by assigning the coefficients of significance to the assessment factors depending on the type of sectoral development in block 3, the spatial analysis of the existing cluster development in the region has been carried out.

After the analysis of the current situation regarding the development of territory of the Russian Federation subject the processing of preliminary project proposals on development of territory has been carried out. These proposals have been formed from the provisions of the Strategy of social and economic development of the subject of the Russian Federation based on the existing structure of the territory, from the Strategy of transport infrastructure development of the Russian Federation subject, the Scheme of territorial planning (with forecast changes), as well as regulatory documents and legislative acts in force in the territory of the Russian Federation subject. Project proposals have been modeled with the help of electronic map layers, attributive tables and logical links between them [8].

Our of the priority sectors of the Rostov Region's economy, the agriculture has been selected as an example to assess the functional priority of its territory.

On the basis of the comprehensive assessment, maps of the functional specialization of the Rostov Region territory have been generated for the agricultural complex with the corresponding rating of districts displayed on these map [9,10]. The distribution of the functional priority rating for the agricultural complex in the Rostov Region is shown in Figure 4.
Figure 3. Distribution of functional priority rating for agriculture in the territory of Rostov Region.

In order to determine the areas of highest priority for the development of the agricultural complex and, subsequently, the cluster of this industry, the following ranking of the results of comprehensive assessment of the Rostov Region has been adopted (Table 3).

Table 3. Ranking of the Rostov Region territory comprehensive assessment results for agriculture.

| Territory value index | Potential for industry development |
|-----------------------|-----------------------------------|
| 0…5,7                | Low                               |
| 5,75…6,85            | Moderate                          |
| 7,11…max             | Strong                            |

4. Conclusion
Within the framework of the scientific research in accordance with the methodology elaborated, 6 sectors have been identified for which clusters or cluster initiatives have been prepared, or formation of a cluster structure has been planned. A priority matrix has been generated, including priority factors of relative value for the agricultural complex.

The calculation of the target function by multiplying the priority matrix on the results of a comprehensive assessment of the territory and the rating of functional priority on the selected types of specialization has been obtained for 55 assessment sites. Based on the results of the functional priority assessment, an electronic map of the agricultural complex of the Rostov Region has been generated.

The priority areas for the development of the agricultural complex are the Millerovskiy, Belokalitvenskiy, Salskiy and Proletarsky districts. The majority of municipal districts have moderate potential for development of the agricultural complex.

Comprehensive assessment being a universal methodology adaptable for use under various conditions allows to make a large-scale comparative assessment of the potential of the region's municipalities in regard of the factors of relative value of the territory to address the priorities of the strategic development of the Russian Federation subject [11]. The use of this methodology as a tool for collecting initial information about the territory, regardless of the level of assessment, contributes to the scientific feasibility of urban planning decisions and the effectiveness of further implementation thereof.
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