The strategy of regional development: cluster formation methods

E L Dorzhieva[1] and T K Kirillova[2]

[1]Irkutsk National Research Technical University

[2]Irkutsk State Transport University

E-mail: delham@yandex.ru

Abstract. The article discusses the cluster approach to the regional economic development. It describes the method of creating a spatially localized recreational cluster. The method for calculating the integral indicator of clustering has been improved. The indicators of recreational development have been added to the group of regional economic development indicators. To assess the correctness of the results, the integral indicator for assessing the regional socio-economic development has been calculated by the multifactor ranking method. It involves the calculation of the Euclidean metric, which shows the deviation of the integral indicator from the standard. The main risks of spatially localized recreational clusters have been identified.

1. Introduction

Currently, in order to achieve the positive dynamics of economic development, it is necessary to implement a strategy for the development of regional economies and mobilize all regional resources. The regional economic development strategy determines new directions of long-term development and includes measures aimed to achieve the strategic goals. The cluster approach can be used to implement the strategy of regional economic development. The cluster approach makes it possible to coordinate the interests of businesses, territories, population, regional government bodies, develop a solution to the key economic and social problems and improve the competitiveness of the regional economy [1,2].

To create spatially localized recreational clusters, favorable socio-economic conditions are required. At this stage of development of cluster initiatives, there is no single method for identifying clusters based on key indicators and procedures that can be used to determine the geographical boundaries of clusters and specific parameters (competitiveness, innovation, efficiency) [3].

It is assumed that the regional process of clustering should be initiated by the federal government, through targeted investment programs, regulatory legal acts aimed to create favorable conditions. The regional government can initiate the process of clustering taking into account regional interests. The initiative should be aimed at enhancing the local clustering process, as well as creating favorable business conditions by creating technoparks and funds (venture funds, regional development funds) and performing management and financial support functions [4].

Figure 1 presents an algorithm for creating spatially localized recreational clusters taking into account peculiarities of the region.
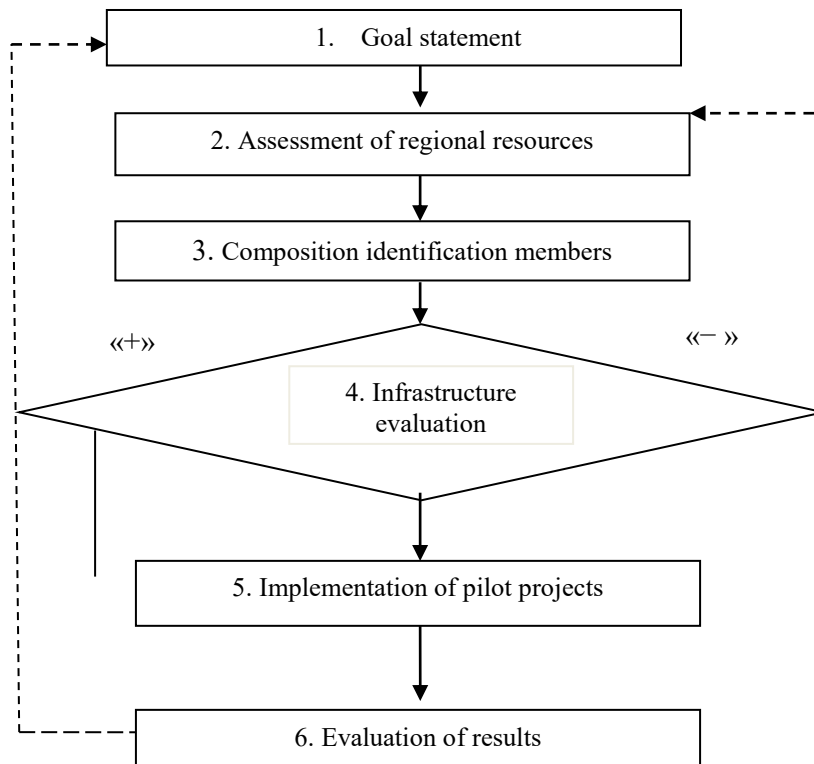
Figure 1. The clustering algorithm.

At the first stage, an assessment of the region is carried out and key points of growth are determined taking into account possible environmental restrictions. Thus, the possibility of creating a cluster is assessed.

In order to assess the regional potential, it is necessary to study various factors: geographical location, industrial location, demographic location, transport location, marketing location and agrarian location. These indicators will be qualitative.

To assess quantitative indicators, it is required to assess the potential of regional clustering, i.e. advantages of the region (resources, location), the presence of potential enterprises and infrastructure organizations located in the region.

The system of Russian state statistics, that was transformed in the 1990s, does not meet the growing needs. This is reflected in errors, ambiguous interpretations of the same indicators, incomparability of data for different regions and municipalities. Some statistical data that are required to conduct a comprehensive analysis cannot be obtained due to the "regulated" access.

Regional problems are described using a set of formalized indicators. An analysis of these indicators in dynamics, their comparison with similar indicators for other regions or normative values allow us to identify problems and potential "growth poles" [3].

To assess the clustering potential, both absolute and relative indicators can be used. Socio-economic processes and phenomena are multidimensional; as a result, a set of indicators is used to describe them. The admissible combinations of various indicators provide the analyst with the right to an individual assessment. The existing possibility of different interpretations creates a desire to obtain evidence-based and reproducible results. In many cases, this creates the need for an integral indicator. As a rule, the integral indicator is a dimensionless value constructed according to the formal principle and containing a certain set of indicators. At the second stage, the comprehensive assessment of regions is based on the quantitative assessment methods. For the quantitative assessment, the method for calculating the integral indicator of regional clustering has been modified.

The method for calculating the integral indicator of clustering differs from other methods. Indicators that characterize the development of recreational activities in the region have been added. It will be relevant for those regions that aim to shift the focus from a raw material orientation to service activities, which makes the use of available natural, climatic and recreational resources more efficient.

The basic elements of this method are based on the methodology for calculating the integral indicator of regional socio-economic development suggested by A.V. Ermishina [3]. Her diagnostics is based on the indicative analysis procedures and a set of indicators of the socio-economic state and recreational potential.

To analyze the indicators of regional development, the method of synthesis of basic indicators is used. The criteria for assessing the sustainability of development is assessed by the method proposed by M.V. Mazunina [5]. To do this, the following conditions must be met:

$I_{1m0}/I_{1m1} > 1$; $I_{2m0}/I_{2m1} > 1$; $I_{3m0}/I_{3m1} > 1$ – safe level (all elements are more than 1);

$I_{1m0}/I_{1m1} > 1$; $I_{2m0}/I_{2m1} < 1$, $I_{3m0}/I_{3m1} > 1$ – pre-crisis level (one of the elements is less than 1);

$I_{1m0}/I_{1m1} < 1$; $I_{2m0}/I_{2m1} < 1$, $I_{3m0}/I_{3m1} > 1$ – crisis level (any two elements are less than 1);

$I_{1m0}/I_{1m1} < 1$; $I_{2m0}/I_{2m1} < 1$, $I_{3m0}/I_{3m1} < 1$ – critical level (all elements are less than 1),

where I_{1m0}, I_{2m0}, I_{3m0} –indicators of socio-economic, recreational and natural-ecological development in a certain year taken as a comparison base.

I_{1m1}, I_{2m1}, I_{3m1} – indicators of socio-economic, recreational and natural-ecological development in a certain year, for which it is necessary to determine the sustainability of development.

The regional development is sustainable only when the ratio of all indicators to the basic ones is more than 1.

It is necessary to select and group statistical indicators; the data should be selected for several periods (5-10 years, the longer the period, the more correct the research).

The integral indicator of clustering is calculated for each year as the geometric mean of estimates of all indicators I_{km} by formula

$$AT_m = \sqrt[3]{I_{1m} \cdot I_{2m} \cdot I_{3m}} \qquad (1)$$

The symbols used in linear scaling calculations:

AT_m – general regional development index in m year, $m = \overline{1,6}$;

I_{1m} –socio-economic development index in m year;

I_{2m} – recreational development index in m year;

X_{ij} – a set of statistical indicators by which the attractiveness indicators are calculated;

i – indicator number, $i = \overline{1,n_k}$;

n_k – number of statistical indicators I_k, $k = \overline{1,3}$;

j –number of the region, $j = \overline{1,5}$.

The linear scaling method is used to compare various statistical indicators regardless of their units of measurement and varying degrees of variability in their values. Each indicator is ranked from 0 to 1. The scaled value of each indicator is calculated by formula

$$\hat{X}_{ij} = \frac{(X_{ij} - X_{min})}{(X_{max} - X_{min})} \qquad (2)$$

where X_{ij} - value of the i-th indicator for the j-th region; X_{min}, X_{max} – minimum and maximum values of the i-th indicator.

Using the scaled statistical data, the development assessment indexes I_{km} can be calculated for each region:

$$I_{km} = \sum_{i=1}^{n_k} \hat{X}_{ij}, k = \overline{1,3} \qquad (3)$$

The indicator values are substituted into formula (1) and the integral indicator of socio-economic development is determined for each year.

To assess the correctness of the results, it is necessary to calculate the integral indicators of regional socio-economic development by the multifactor ranking method. It involves the calculation of the Euclidean metric, which shows the deviation of the integral indicator from the standard. The formulas are presented in Table 1 [6].

Table 1. Stages of rank score calculation.

Stage	Name	Formula
I	Standardization	$X_{st_{ij}} = \dfrac{X_{ij}}{\sum_{j=1}^{5} X_{ij}}$ (4)
II	Deviation from the standard	$X_{dev_{ij}} = 1 - X_{st_{ij}}$ (5)
III	Sum of squares of deviations	$X_{sum_j} = \sum_{i=1}^{n_k} X_{dev_{ij}}^2$ (6)
IV	Deviation rating	$X_{rate_j} = \sqrt{X_{sum_j}}$ (7)
V	Ranking	$minX_{rate_j} = 1; \ maxX_{rate_j} = 5$

The regions that rank first are closer to the standard (reference); the regions that rank last are more distant from the standard. To calculate the indices for each region, the ranking integral assessment of clustering in a particular year can be carried out. The regions can be ranked by the results obtained.

An assessment of recreational development can be more systematic. All the indicators taken into account are divided into three subgroups: development of recreational and tourist infrastructures; level of tourism development, natural and ecological resources. The resulting dynamics of the ratio of the indicator components can be visually assessed by building diagrams based on the calculated data.

The improved methodology for the integral assessment of clustering can show which of the selected regions is a leader. This methodology makes it possible to assess the infrastructure development, the investment attractiveness, and the recreational development.

It is necessary to pay attention to the restrictions on the development, especially the ecological ones, study this issue and develop a program aimed to reduce environmental pressure.

At the third stage, a general concept of a spatially localized recreational cluster can be developed. It should describe the circle of potential participants.

A Cluster Development Center (CDC) can be created in the region. In accordance with the order of the Ministry of Economic Development, CCRs are aimed to facilitate decision-making and coordinate projects that ensure the development of clusters and cooperative interaction of participants.

The head of the CCR holds large-scale public meetings of all interested persons of city and district administrations and representatives of large, medium and small businesses. The center establishes priorities, develops strategies and programs for cluster development, including a set of cluster projects and implements government support measures. The center is composed of representatives of cluster members, executive authorities of the region and local authorities.

The main block (cluster core) includes the following groups of organizations: tour operators, travel agencies, hotels, recreation centers, camping camps; partners and suppliers (food suppliers, trade companies, souvenirs shops, companies organizing leisure activities). Thus, this block produces and sells a tourist product.

The second block includes specialized companies that provide intermediary services: enterprises that supply organic agricultural products, suppliers of equipment, raw materials, electricity, water,

heat, transport, and construction companies. This implies the use of own agricultural and food products, improvement of infrastructure and equipment, construction of additional infrastructure facilities, production of advertising and printed materials.

The third block (facilitating) includes a temporary creative team acting as an expert and advisory council for implementing the cluster development strategy, the educational sector, public authorities, transport and communications, public structures, research organizations, financial institutions, and households providing a variety of services to tourists. These organizations and structures operate in the market of goods and services, regardless of the development of recreational activities, but their involvement in the cluster will create more favorable conditions. This block reflects the peculiarity of tourism consumption, causes a derivative multiplier effect from the availability of transport and other services, and contributes to the creation of recreational conditions.

The list of cluster members is variable. At this stage, the CDC structure is formed and all activities are coordinated.

The fourth stage is characterized by the development of a competitive mechanism for selecting and implementing flagship investment projects (pilot) within the action plan. The projects will help to establish closer ties between the cluster members.

The following regional projects may become flagship initiatives.

1. A regional financial fund that will accumulate reserves for targeted financing of cluster associations, innovative projects (with clear project selection criteria).

2. Partnerships for training and advanced training of the staff in cooperation with educational organizations and enterprises of the cluster members. It is possible to create a partnership aimed at staff training and retraining. The programs ensure the constant influx of qualified workers dependent on the requirements of the region.

3. A collective brand aimed to popularize the cluster and assist in gaining foreign markets.

4. A program aimed to improve the environmental situation, solve environmental, social, economic and organizational problems and expand the list of tourism activities in the Baikal region.

Pilot projects can be initiated both by the temporary creative team (TCT), which helps to generate and implement cluster ideas, and by representatives of small businesses and initiative groups. Projects are selected on a competitive basis.

An expert group evaluates projects. It should include at least seven specialists working on a contract basis. The work should be based on the principles of independence and objectivity, professionalism and complexity.

The projects are funded on the public-private partnership (PPP) basis and monitored by the government.

The economic effect of spatially localized recreational clusters is assessed by the following quantitative indicators: an increase in the number of tourists, infrastructure facilities, investment projects, small and medium-sized businesses, added value of goods and services, and a decrease in transaction costs. Qualitative indicators include the quality of goods and services, the range of goods and services, the flexibility of companies and competitiveness, the profitability of cluster members.

The overall results of the regional development strategy based on the cluster approach is an increase in productivity and innovative activity of organizations belonging to the spatially localized recreational cluster, which will increase the non-price competitiveness of the non-resource sector. The increasing intensity of development of small and medium-sized businesses will accelerate the socio-economic development of the regions where the clusters are located.

References

[1]   Dorzhieva E L and Lukyanchikova N P 2014 *Corporation development   strategy: an innovation vector*

[2]   Dorzhieva E L 2015 Innovative strategy for Corporation development: selection and implementation *Actual promlems of economics* **2** pp 195-199

[3]   Ermishina A V 2016 Regional Competitiveness vol **1**

[4]   Kochkina E M and Radkovskaya E V 2014 Mathematical methods for assessing the potential of territory clustering *Competitiveness of companies and territories: cluster technologies* p 175-189

[5]   Mazunina M V and Skryabin E Yu 2013 Theoretical and methodological bases for assessing the sustainability of development of the region *Entrepreneurship* **5** pp 25-30

[6]   Kirillova T K 2014 Automation of the process of assessing the clustering of regional enterprises *Information technologies and problems of mathematical modeling of complex systems* **1** pp 26-33

[7]   Kazimirov I A and Peshkov V V 2019 Determination of price behaviour in the secondary residential real estate market using a multidimensional regression model *Proceedings of Universities. Investment. Construction. Real estate* **9**(3) pp 476–487

[8]   Kirillova T K and Noskov S 2013 Mathematical model of interference of factors of economic development of the territory *Fundamental research* **6**

[9]   Kleiner G B 2012 *Development mesoeconomy* (Moscow: Nauka)

[10]   Markov L S and Yagolnitser M A 2006 *Clusters: formalization of interrelations in non-formalized production structures*

[11]   Mintzberg G 1998 *The strategic process: concepts, problems, solutions*

[12]   Nekrasov N N 1975 *Regional economy*

[13]   Perskiy Yu K and Kovalyova T Yu 2013 Innovative development of the territory: a new status of regional policy *Ural Branch of the Russian Academy of Sciences* **2**