



**Assessment of cluster policy implementation effectiveness in the Russian regions**

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**ABSTRACT**

Effective implementation of cluster policy is a necessary condition for the transition of the Russian economy to an innovative development path. For the analysis within the framework of this study, five regions of the Russian Federation were selected with successful experience in implementing cluster policy on their territory, namely the Republic of Tatarstan, Yaroslavl, Kaluga, Samara Regions and the city of federal significance in St. Petersburg. A factor analysis of the development of clusters in these regions was carried out according to five main parameters, on the basis of which integral indexes for the development of clusters were derived, and the regions-leaders and regions-outsiders in the implementation of cluster policy were identified. The analysis of subjects of the Russian Federation from the standpoint of the innovation index was also carried out.

**Keywords:** Cluster, cluster policy of the state, cluster strategy, innovative variant of economic development, innovative sites



## **1. INTRODUCTION**

The implementation of cluster policy today is a priority in the scenario of an innovative breakthrough in the Russian economy. An important factor is the measures taken by the federal authorities to create and implement the state's cluster strategy. In particular, the need to formulate this strategy is reflected in such normative-legal and program-targeted acts as "The Concept of Long-Term Social and Economic Development of the Russian Federation for the Period to 2020", "Methodological Recommendations for Implementing Cluster Policy in the Subjects of the Russian Federation", "Strategy of Innovative Development of Russia to 2020", Order of the Ministry of Economic Development of Russia No. 277 of 16.07.2009" On the establishment of an Interdepartmental Working Group on the Development of State Policy in the Sphere of Development entrepreneurial activity in territorial clusters", etc.

Today, the management of regional competitiveness is becoming increasingly difficult due to the reduction of the traditional industrial potential of regional economies. As a result of the analysis of existing socio-economic realities, it was decided to reorient to the development of new technological and production network structures - innovative clusters.

To assess the effectiveness of these innovative structures, it is advisable to use the method of factor analysis, based on determining the correspondence of a number of characteristics of existing reality. As comparative characteristics, five factors were taken: the existence of a strategy for the development of territorial clusters, the volume of subsidies to regions from the federal budget for the implementation of integrated innovative projects for the development of innovative territorial clusters, the number of Cluster members, the number of jobs created, and finally the share of extra-budgetary investment in development of the cluster.

In 2015, the Government of the Russian Federation approved subsidies to regions for the development of innovative territorial clusters (ITCs). The total amount of funds from the federal budget amounted to 1.25 billion rubles, the distribution passed between 20 regions of the Russian Federation, in which 24 ITCs are located.



## **2. DATA AND METHODOLOGY**

Cluster, as an open system, promotes the interregional relations development, which compensates the imbalance in energy resources allocation. Thus, taking into consideration the great length of the country, the ten time zones existence and the mismatch of peak loads in the power systems it is possible to maneuver production resources in time and space, and redeploy them as needed in opposite directions. The main cluster complexes objectives are to promote and facilitate efficient, economical and environmentally friendly use of resources, which in turn will reduce the resource-intensive electricity production, and to find new solutions on how to guarantee the sustainability in the electric power industry. Currently many scientists are working on the issues connected with cluster development in the energy sector, as well as with overall state policy in relation to resource-exploration industries.

A number of scientists believe that the effectiveness of government policies depends on the depth of oil refining, as well as on the implementation of a strategy to diversify its mining industry (Benchmarking: Bronze Label of the European Cluster Excellence Initiative (ECEI): European Secretariat for Cluster Analysis, Rodnyansky D.V., Yasnitskaya Y.S; Lai, H., Warner, M. 2015) .

Other authors consider effective and high quality forecasting and planning as drivers for growth in energy sector, since it allows redeploying resources among the strategically important sectors of the economy promptly and rationally (Sato, Y., Damayanti, A. 2015).

There is also a point of view that actions of the state and large state monopolies can act as drivers for growth in the energy sector, and integration processes at the corporate level can trigger it as well (Massol, O., Banal-Estañol, A.2014, Sadyrtidinov, R., Rodnyansky, D. 2015, Yasnitskaya Y.S., Rodnyansky D.V., Volkova N.V. 2016).

In our opinion, nowadays an important tool to improve the system of state regulation in energy sector, as well as to intensify socio-economic development, is to form and to develop energy clusters (Rodnyansky D. V., Yasnitsky J. S. 2016).

As a basis for the study, the author's group identified five regions of Russia that have clusters on their territory, and the profile of almost every regional cluster is different from the rest. These regions are the Republic of Tatarstan, Yaroslavl, Kaluga, Samara Regions and a city of federal significance in St. Petersburg.



Almost a third of the allocated funds (343.2 million rubles, or 27.5% of the total) falls on three of the regions under consideration: the Republic of Tatarstan, the Samara Region, and the Kaluga Region. The largest funding received the budget of the Republic of Tatarstan - 158.6 million rubles, the region intends to direct them to the development of the Kamsky ITC, which specializes in two characteristics - oil and gas processing (oil and gas chemistry) and the automotive industry. The second place in terms of directed funds was received by the Aerospace Cluster of the Samara Region, in the ruble equivalent the amount was 136 million rubles. And, finally, the third place in the Pharmaceutical cluster of the Kaluga region. The volume of its financing amounted to 48.6 million rubles.

According to the results of the study, based on the factor method, three regions became the clear leaders by all criteria: St. Petersburg, the Republic of Tatarstan and the Samara Region. These subjects of the Federation differ not only in their high indicators of the effectiveness of cluster structures, but also in their involvement in the "INVEST IN" project, which, incidentally, has been launched only in the most developed regions. From here one can draw a direct parallel to the mutual influence of the rates of social and economic development of the region and the pace of clustering that it involves, which attracts additional investments for the development of the regional economy. Also revealed an obvious outsider - the Yaroslavl region. Despite the eight-year experience of the region in the development of the cluster structure, there is a low dynamics of Cluster efficiency indicators. For the eight years of its activity, only a little more than 500 jobs have been created, which may indicate a possible irrational choice of the development sector. High investment activity was also not achieved, the Yaroslavl pharmacoaster has the lowest total investment indicators. In comparison with two clusters-leaders (RT Petrochemical cluster and Aerospace cluster of the Samara region): the average annual investment volume in RT is 78 billion rubles, Samara region - 12.55 billion rubles, and Yaroslavl region only 3.4 billion rubles. This indicates a low interest of investors in this sector of the region and the need to modernize the course of strategic objectives.

### **3. RESULTS**

For the economic evaluation of cluster development, it seems necessary to calculate the integral indicator for the collected data for 2016. In accordance with this, the indicators



were reduced to a comparative form. To calculate the index of each indicator, linear scaling was used using the formula:

$$K_i = (X_i - X_{\min}) / (X_{\max} - X_{\min})$$

The procedure of linear scaling brings data to a single range of values. All calculated values are in the interval (0; 1), where 0 corresponds to the minimum value of the characteristic, and 1 - to the maximum value.

Indices of indicators are presented in Table 1. The region's development strategy for territorial clusters gave them an index of one, and the absence of that was estimated to be zero.

**Table 1 Index indicators of the regions under consideration for 2016**

<b>Cluster</b>	<b>Index of the indicator of the availability of the development strategy</b>	<b>Index of the number of participants in the cluster</b>	<b>Index of the number of jobs created</b>	<b>Index of the subsidy from the federal budget to the regions for the implementation of integrated innovative projects</b>	<b>Index of the index of extrabudgetary investments</b>
Machine building cluster of the Republic of Tatarstan	1	0,04	0,20	0	0,20
Petrochemical cluster of the Republic of Tatarstan	1	0,10	1	1	1
Innovative cluster of the	1	0,54	1	0	0,05



Republic of Tatarstan					
Pharmaceutical cluster of the Yaroslavl Region	1	0	0,01	0	0,07
Machine-building cluster of the Kaluga region	0	0,06	0,17	0	0,19
Pharmaceutical cluster of the Kaluga region	0	0,26	0,05	0,31	0,01
Aerospace cluster of the Samara region	1	0,17	0,75	0,86	0,16
Machine-building cluster of the Samara region	1	0,15	0,08	0	0,08
Petrochemical cluster of the Samara region	1	0,15	0,17	0	0,59
Cluster of Information Technologies, Radioelectronics, Instrumentation, Communication and	1	1	0,37	0	0,002



Information Technologies of St. Petersburg					
Cluster of Innovation Development in the Sphere of Energy and Industry of St. Petersburg	1	0,06	0,02	0	0,00003
Cluster of jewelers of St. Petersburg	0	0,01	0	0	0
St. Petersburg Cluster of Clean Technologies for the Urban Environment	1	0,12	0,73	0	0,0015

To calculate the integral index, each indicator was given a weight in accordance with its significance for assessing the level of development of the cluster. The importance of the weights was determined on the basis of the author's approach, taking into account the recommendations of the department of target programs of the Territorial Development Department of the Ministry of Economy of the Republic of Tatarstan, which deals with the Kamsky Innovation Cluster. The distribution of weights is shown in Table 2.

**Table 2. Ratio of indicators and their weights**

<b>№</b>	<b>Indicator name</b>		<b>Indicator weight</b>
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1	Index index availability of development strategy for territorial clusters	k1	5 %
2	Index of the number of Cluster members	k2	10 %
3	The index of the indicator the number of jobs created	k3	15%
4	Index of the subsidy from the federal budget to the regions for the implementation of integrated innovative projects	k4	20 %
5	Index index of extrabudgetary investments	k5	20%

The integral index was calculated by the formula:

$$I_{\text{integr}} = k1 * 0,05 + k2 * 0,1 + k3 * 0,15 + k4 * 0,2 + k5 * 0,2$$

Thus, the following results were obtained, shown in Table 3.

**Table 3. Integral index of the considered regional clusters**

<b>Cluster name</b>	<b>2016 year</b>
Machine building cluster of the Republic of Tatarstan	0,124
Petrochemical cluster of the Republic of Tatarstan	0,61
Innovative cluster of the Republic of Tatarstan	0,264
Pharmaceutical cluster of the Yaroslavl Region	0,0655
Machine-building cluster of the Kaluga region	0,0695
Pharmaceutical cluster of the Kaluga region	0,0975
Aerospace cluster of the Samara region	0,3835
Machine-building cluster of the Samara region	0,093
Petrochemical cluster of the Samara region	0,2085





Cluster of Information Technologies, Radioelectronics, Instrumentation, Communication and Information Technologies of St. Petersburg	0,2059
Cluster of Innovation Development in the Sphere of Energy and Industry of St. Petersburg	0,059
Cluster of jewelers of St. Petersburg	0,001
St. Petersburg Cluster of Clean Technologies for the Urban Environment	0,1718

#### **4. DISSCUSIONS**

Based on the calculation of the integrated index, the leader among the clusters studied is the Petrochemical cluster of the Republic of Tatarstan. The petrochemical cluster secured leadership positions, having received the highest ratings for four out of five indicators (excluding the number of cluster participants). The leadership of the republican cluster is explained by the sufficient experience of cluster activities, the perfection of the regulatory and legal framework of both the Republic of Tatarstan and the internal cluster organization, the high efficiency of the management company and, as a result, the significant investment attractiveness of the site. The high level of development of the cluster is promoted by the high innovative potential of the Republic of Tatarstan, the high interest of regional authorities in the development of the cluster and the attraction of attention to the cluster association at the federal and international levels. Since the Republic of Tatarstan has been invariably a donor region for many years, including in 2016, the financing of the cluster is mainly carried out at the expense of regional funds.

The Samara Region has a good position in the Integral Index. At once two clusters - Aerospace and Petrochemical - have shown indicators with values from 0,2 to 0,4. To reduce the backlog from the leader of the Republic of Tatarstan, it is necessary to work to increase the investment attractiveness of the sites and the region as a whole. The work of this nature is actively carried out to date in the framework of the project "Invest in Samara".



The indicator with a value above the 0.2 mark was shown by the cluster of information technologies, radio electronics, instrumentation, communications and information telecommunications of St. Petersburg. Unlike its less successful colleagues, Cluster attracts most of its investments for its development, it unites in its structure a significant number of enterprises in the city's industry and creates a sufficient number of new jobs for the city economy. The least successful practices of the city are the Cluster of Innovation Development in the Energy and Industry and the Cluster of Jewelers in St. Petersburg, which have not been able to demonstrate demonstrative results of their effectiveness at the moment. However, this can be attributed to the fact that clusters were created not so long ago (2015 and 2016, respectively), and they undergo a stage of adaptation and development.

The cluster sites of the Kaluga and Yaroslavl regions were recognized as having low efficiency according to the Integral Index. The lack of funds for the development of regional clusters adversely affects their performance. Regional authorities should pay special attention to the investment attractiveness of cluster structures and the low efficiency of cluster enterprises as potential employers.

Another methodological tool in the study was the Innovation Index of the regions in question over the past 5 years, the results of which will form the basis for further forecast of the Index for the near future.

The innovation index consists of five equivalent components:

- 1) the number of personnel engaged in research and development;
- 2) the number of university students per 10,000 people;
- 3) the number of issued patents per 1000 population;
- 4) the degree of Internetization of the region;
- 5) the cost of technological innovation.

## **5. CONCLUSIONS**

On the basis of private innovation indexes of individual regions, an integral Innovation Index was calculated. The innovation index is found as the arithmetic mean of the partial indices. The final value of the Index is presented in Table 4.

**Table 4. Innovation Index**



	2010	2011	2012	2013	2014	2015	2016	2017 (forec ast)	2020 (forec ast)
Republic of Tatarstan	0,336	0,456	0,380	0,492	0,656	0,482	0,55	0,5	0,6
Yaroslavl region	0,34	0,358	0,236	0,502	0,352	0,314	0,3	0,25	0,27
Kaluga region	0,214	0,226	0,126	0,356	0,336	0,418	0,52	0,6	0,55
Samara Region	0,318	0,292	0,346	0,372	0,308	0,36	0,345	0,34	0,3
St. Petersburg	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,85	0,9

According to the results of the survey, the absolute leader, showing a consistently high level of the Innovation Index, has become a city of federal significance in St.

Petersburg. The index speaks of the city's ability to create innovations and its readiness to introduce them into the economy. The surprising fact was the lack of dynamics of indicators for the "northern capital", despite the fact that the index is consistently high. The dynamics can be given in the case of increasing the share of the city's expenses for technological innovation in the GRP structure, which is several times less than the share of innovative costs of other regions considered.

The Republic of Tatarstan also showed high index indicators. Trend for the steady growth of the region demonstrated from 2010 to 2014. However, in 2015, the values of the indicators began to recede. Probably, this was due to the crisis consequences, fluctuations of the conjuncture in the financial market and a sharp currency jump in import prices. Overcome the recession is possible with the redistribution of the structure of the GRP region with an increase in spending on innovation.

The Kaluga region at the end of the period under review showed an average indicator, the trend towards its growth is characterized by stability. Probable reasons for such a scenario may be the success of the Kaluga Region's pharmaceutical cluster, which is included in the program of pilot innovation clusters of RF subjects. According to the forecast, the trend for the increase will continue until 2020.



Innovative sites of the Samara and Yaroslavl regions are considered less effective. In the Samara region, low indices were revealed by indicators of Internetization and the share of personnel engaged in research and development. In the Yaroslavl region, the lack of interest of the population in R & D and small co-financing of technological innovations also became problem zones. To overcome these barriers, it is worth undertaking a regional network upgrade и переориентировать субъект с точки зрения развития НИОКР.

## **6. ACKNOWLEDGMENTS**

The work is performed according to the Russian Government Program of Competitive Growth of Kazan Federal University.

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*Revista Publicando, 4 No 12. (1). 2017, 502-514. ISSN 1390-9304*

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