

# *Formation and analysis of regional innovation landscape indicators*

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**Abstract** — The problem of proving high growth rate and level of national and regional socioeconomic development determines the necessity for improvement of existing approaches to designing strategic regional planning system. Unfortunately, nowadays there is no clear and targeted system for integrating and coordinating the formation of a long-term development program gradually paying balanced attention to a wide range of state and regional interests. The aim of this research is to provide theoretical and methodical arguments for both necessity and opportunity to use integrational (enlarged) complexes in order to improve the methodical framework of regional strategic planning basing on regional innovation landscape.

This article demonstrates the results of complex regions socioeconomic development level assessment obtained using the provided method of regional socioeconomic development level assessment and reasons local indicators of regional innovation landscape formation.

**Keywords** — *strategic regional development, regional innovation landscape, integrational regional complexes, local level of innovation landscape*

## I. INTRODUCTION

The transformation of modern society makes the issue of sustainable and efficient socioeconomic development relevant for many countries. This matter is of great importance to Russia as well. Russia is the country of sharp economic, social, ethnic, national and political contrast between regions. Meanwhile, this diversity forms a wide range of actions for potential investors that have almost unlimited possibilities for choosing regions with the best investment conditions.

However, the increase of regional investment attractiveness is equally an important and complicated issue. Russian regions are growing more active and independent, which is demonstrated by management decentralization, specialization and segregation of economic and financial structures. Regional interests are generally aimed at stabilizing reproduction processes and implementing innovations in order to preserve and increase accrued production, social and innovation potential.

The current basic territorial development document and "green card" are various federal and regional strategic programs; and innovations are considered to be the basis for development in almost all regional strategies. We can conclude with certainty that nowadays innovations are at the core of economic progress, and this is applicable to national economy and certain regions in particular.

Thus, the issues of multiple regional innovational activities directions are clearly actualized, but their solutions require a complex approach and increased attention of authorities on federal and regional levels.

We believe that for determining investment opportunities, the innovation condition and potential of a specific region can be characterized by its innovation landscape, which formation and development must be aimed tactically at improving regional investment and innovation policy and strategically at providing the best indicators of socioeconomic development.

The problem of providing high growth rate and level of national and regional socioeconomic development determines the necessity for improvement of existing approaches to designing strategic regional planning system [1]. Unfortunately, nowadays there is no clear and targeted system for integrating and coordinating the formation of a long-term development program gradually paying balanced attention to a wide range of state and regional interests.

In our opinion, the solution of this problem involves studying opportunities for providing sustainable and efficient regional socioeconomic development by forming and developing regional innovation landscape. Taking into account the number and diversity of Russian subjects acting as the main objects of strategic regional planning, we deem it reasonable during the initial phase of this process to use integrational (enlarged) regional complex, primarily, Federal Districts of the Russian Federation, as such objects.

## II. MATERIALS AND METHODS (MODEL)

The notion of innovation landscape has not become widespread yet. Authors tend to define this notion fragmentarily, thus, most approaches can be described as generalizing. For instance, T. Achkasova and A. Gorkina define innovation landscape as a territory with different level and character of interaction and interdependence of innovation results on different stages [2]. According to A. Ipatova, the essential element of regional innovation landscape is innovational potential, understood as quantitative characteristic of total material and financial resources [3]. Besides, several researchers use the notion of innovation landscape in order to provide a complex description of key factors (markers) influencing innovations within an organization [4].

Taking into account multiple opinions and definitions, the authors of this research consider that innovation landscape includes, primarily, the integrational total sum of basic parameters, like socioeconomic conditions, state and municipal authorities' activity indicators, applied innovational management tools, the presence of innovation infrastructure and cluster interrelations [5]. Thus, in our opinion, the notion of innovation landscape can be viewed as an important complex regional characteristic and studying the influence of innovation landscape on regional socioeconomic development seems highly relevant and demanded.

Due to absence of commonly acknowledged methods of establishing regional innovation landscape level, the authors propose the set of local indicators of innovation development, which are reasonable to be applied for analyzing regional innovation development, and in particular, for long-term planning of development of Russian regions. Within this research, these methods have been applied for addressing the following objectives:

- reasoning the methods of calculating regional innovation development indicators;
- calculating local indicators of innovation development for Russian Federal Districts;
- finding the differentiation of innovation development level of the subjects of the Russian Federation.

Assessment of regional socioeconomic development requires the system of indicators. There are currently several methods of complex socioeconomic development assessment of Russian regions. Several methodological approaches have been established; however, in most cases, researches apply the integral approach.

For instance, the methods of establishing regional socioeconomic development level, developed by V. Klotsvog and L. Chernova, are focused on preparing integral indicators basing on generalized data [6]. A. Kurakova distinguishes three generalized indicators: particular and indicator values and their constituents (correlation between actual and expected output decline, welfare coefficient, changes in general employment and employment in industries, etc.); generalizing indicator values (gross regional product, human capital development index, economic safety indicators, etc.); integral values of statistical expert point assessment and expert approach [7]. The integral assessment system, developed by L. Chernova, is based on

four criteria and includes the following: specific gross regional product per capita taking into account populational purchasing power parity; correlation between average per capita income and subsistence level value, general unemployment coefficient, indicator of regional general socioeconomic independency [8].

Basic and integral indicators for the Russian Federation subjects socioeconomic development assessment are calculated according to the methods defined by the federal target program "The reduction of the differences in the socioeconomic development of the Russian Federation regions (2002-2010 and up to 2015)" [9]. According to the official methods, the basic indicators for the Russian Federation subjects complex socioeconomic development assessment are:

- gross regional product per capita;
- volume of basic capital investments per capita;
- foreign trade volume;
- regional financial welfare taking into account purchasing power parity per capita;
- share of average small businesses staff number;
- registered unemployment level;
- correlation between average per capita income and subsistence level value;
- percentage of population with income below subsistence level;
- total turnover of retail sales, public catering and payable services calculated as per capita;
- main funds of economic branches per capita;
- aggregate indicator of social infrastructure areas development level.

Basing on the complex assessment results, Russian regions have been divided into 5 groups:

- Group 1 – regions with above average development level;
- Group 2 - regions with average development level;
- Group 3 - regions with below average development level;
- Group 4 - regions with low development level;
- Group 5 - regions with extremely low development level.

Apart from this, we consider it important to use assessment methods applicable for assessing innovation landscape of a specific region and several regions, thus enabling to structure regions according to their innovation landscape condition, management decisions concerning labor force allocation, regional innovational processes development, etc.

As an assessment method, we propose to apply calculation of local levels of innovation landscape conditions. For assessing separate indicator groups, we propose to apply the point assessment method that has been distinguished by us, thus getting the average number  $A_{avg}$  of points as an assessment of regions with maximum values for all innovation landscape characteristic types:

$$A_{avg} = \sum_{l=1}^m a_{kj} / K, k = 1, K, \quad (1)$$

where  $a_{kj}$  is the assessment of  $k$  region by  $j$  characteristic type;

$K$  is the total number of regions in the country that have high innovation development level;

$m$  is the range-based sample of regions.

The local level determining the general position of a region, is estimated the following way:

$$J_{state} = A_{avg} / A_{max}, \quad (2)$$

where:

$A_{max}$  is the assessment of the region with maximum points;

$A_{avg}$  – is the assessment of the country this region belongs to.

For a more detailed analysis it is possible to apply the method of point assessment ( $A_{avg}$ ) as the calculation of local level of regional innovation development. In order to perform this task, several groups of innovation landscape indicators are chosen for analysis, including internal expenses on scientific research and development activities; the share of internal expenses on scientific research and development activities; innovation activity of organizations; inventing activity coefficient; share of organizations implementing organizational innovations; patent applications; gross regional product; share of organizations implementing technological innovations; share of innovational goods, works and services of the total volume of loaded goods, performed works and services.

The next indicator is the budget funds availability level. This value demonstrates the extent to which a region is provided with budget funds for implementing innovation activity or innovation development. In this context, this value is calculated the following way:

$$J_{bf} = \sum_{i=1}^m n_i / N, \quad (2)$$

where:

$n$  is the sum of  $i$  type of regional enterprises financial support;

$m$  is the total number of state financial support types;

$N$  – is the total sum of budget funds provided for support and stimulating innovation activity in a region.

Another important result for planning innovation landscape assessment is product upgradability. This element explains how innovational products are upgraded a certain region. In modern Russian transformational economy conditions, local methods enable to estimate the regional innovation development level. But more important is that their interpretation may serve as the basis for distinguishing intraregional innovation development differences that reason state management and increase regional policy efficiency.

### III. RESULTS AND DISCUSSION

The state plays an important role in regional innovation landscape formation. Under the conditions of social and economic relation transformation, the essential factors providing high regional development level are improvement of territorial economic structure and rational regional development in dynamic market conditions. Innovation landscape, its formation and usage are the basis for implementation of the abovementioned factors. On the one hand, regions and the state are interested in creating innovation landscape, but on the hand, there is no current paradigm, which could be applied as the

source for innovation landscape formation and interaction between the state and regions. Thus, we consider it reasonable to add issues related to shaping innovation landscape to processes of regional strategic planning.

Unfortunately, nowadays regions themselves are unable to solve various issues related to socioeconomic development, implementation of strategic programs and, consequently, innovation landscape formation. The abovementioned aspects indicate the necessity for an all-national approach to preparation and implementation of long-term development programs based on innovation landscape formation. This is a hard task that must be solved with the help of efficient regional policies.

Current practice demonstrates the disbalance of regional strategic planning on regional and federal levels. “Top-down” target guidance is incoherent and limited and does not always correspond to the logic and methodology of modern strategic management. Without clear target indicators provided by federal bodies of authority, regions face serious difficulties when preparing their own target directions. Instead of making joined efforts to address common strategic tasks, many neighboring regions start wasting their resources on unreasonable competition related to solving particular target tasks.

This situation creates an objective necessity for introducing an additional regulating and coordinating body of authority that could act as the mediator concretizing relations between “the center” and “the region”. On the other hand, fulfillment of strategic programs often determines the necessity not only for mobilizing regional internal resources, but also for consolidating regional efforts with other (in most cases, neighboring) regions. Besides, for many state objectives (industrial, innovational, military, etc.), selecting multiple separate regions as objects for strategic planning, seem inefficient compared to selecting numerically limited integrational (enlarged) regional complexes (IRCs). In our opinion, this function can be successfully performed by Federal Districts of the Russian Federation, which growing role in strategic planning on state and regional levels would actively enhance fulfilment of social and economic development objectives.

In order to distinguish the best way for forming regional innovation landscape, it is of utmost importance to study the possibilities of Federal Districts acting as IRCs in relation to providing conditions for socioeconomic development based on innovation landscape opportunities. IRCs have different conditions for development and innovation landscape formation possibility. It seems important to study IRCs innovation development indicators in order to define specifics of regional innovation development formation. The results enable to come to objective conclusions on regional economic development and set reasonable state priorities concerning territorial socioeconomic development.

The results of analysis of several key indicators performed according to the abovementioned official methods in order to distinguish the socioeconomic level of Russian complex regions are represented in Table 1.

Table 1 – RATING OF REGIONAL COMPLEXES (FEDERAL DISTRICTS) IN RELATION TO REGIONAL SOCIOECONOMIC DEVELOPMENT INDICATORS AS OF END 2016

Indicator	Regional complexes							
	Northwestern	Central	Volga	Far Eastern	North Caucasian	Siberian	Southern	Ural
Gross regional product per capita (rub.)	4	2	6	3	8	5	7	1
Volume of basic capital investments per capita (rub.)	8	1	2	7	5	3	4	6
Foreign trade volume (USD millions)	2	1	3	6	8	5	7	4
Regional financial welfare taking into account purchasing power parity per capita	6	1	2	8	5	4	3	7
Share of average small businesses staff number (%)	2	1	3	4	8	7	5	6
Share of population with income below subsistence level (per cent) of total population number (rub./months)	3	1	6	2	8	7	8	4
Total turnover of retail sales, public catering and payable services calculated as per capita	4	1	6	2	7	8	5	3
Main funds of economic branches per capita	7	1	3	8	2	4	9	6

Basing on Table 1 data, complex region have been grouped in the following way according to their socioeconomic development:

- Group 1 – Central; Volga;
- Group 2 – Northwestern; North Caucasian;
- Group 3 – Siberian; Ural;
- Group 4 – Southern, Far Eastern
- Group 5 – none.

Obviously, these methods could be applied for estimating socioeconomic development level of IRCs. The results emphasize that not all regional complexes have high development indicators. This must be taken into account while forming innovation landscapes and developing strategic development programs. Meanwhile, it must be noted that a more detailed innovation landscape analysis requires other indicators, such as local levels of regional innovation development. Application of these indicators combined with reasonable forecasting and strategic planning would enable to solve socioeconomic problems of Russian regions and reduce innovation development differentiation.

The results of our complex regional innovation landscape development local indicators calculation performed according to the abovementioned methods are demonstrated in Figure 1. As it can be seen from Fig. 1, The Central, Northwestern and Volga Districts have the highest indicators. This can be explained by their industrial potential, developed infrastructure and volumes of innovational products, works and services. Moscow, the largest economic, scientific, technical, political and cultural center, is located in the Central District and provides its relatively high indicators. The Volga regional complex has slightly lower (by 4.3%) results, while the Southern region demonstrates significantly lower indicators.

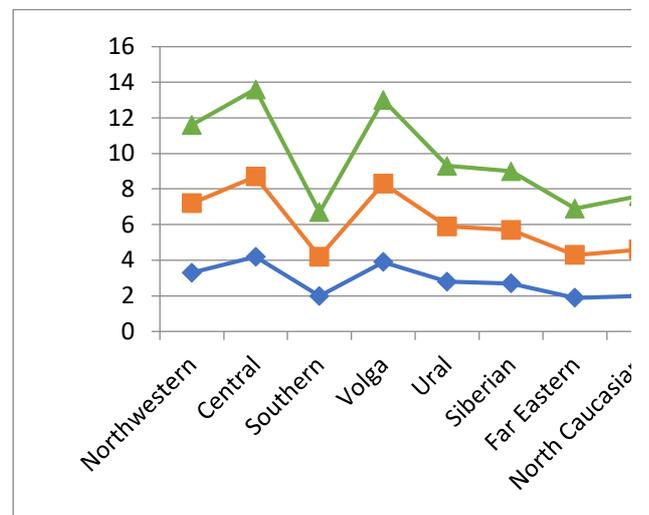


Fig. 1. – General IRC indicator of 2013-2017

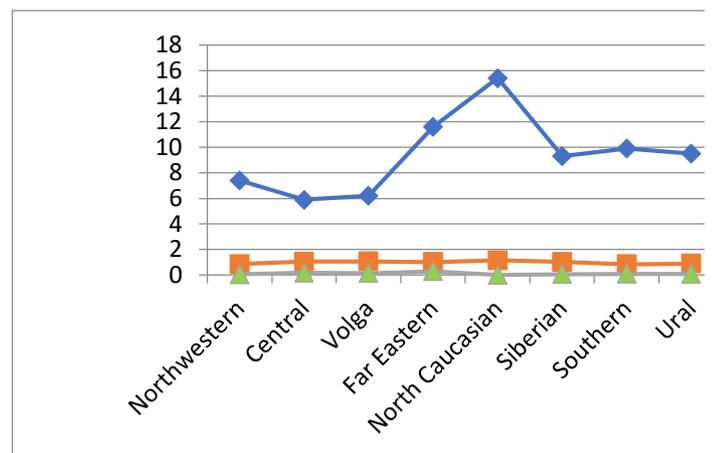


Fig. 2. Indicators of local level of innovation development, budget funds availability and IRC production upgradeability as of 2017

However, if indicators of the Federal Districts are analyzed separately, the situation changes (Fig. 2). Data shown in Fig. 2 demonstrate obvious intraregional differences. The Far Eastern, North Caucasian and Volga regional complexes demonstrates the best local level of innovation development indicators. This allows us to conclude that these regions demonstrate good indicators to their high gross regional product and share of technologically innovative organizations. In this case, it seems reasonable for the state to sustain this situation while simultaneously stimulating innovation activities of Northwestern and Ural regional subjects. A positive factor is approximately equal distribution of budget fund for regional innovation development.

Another fact of great importance is the low production upgradeability level in the Northwestern Southern and Ural IRCs, thus an audit of certain regional subjects would be recommended in order to distinguish reasons for such low indicators and consequently include these regions in strategic plans for eliminating these reasons.

The analysis results require estimating the influence of generalized indicators on innovation landscape formation. In order to do this, we provide the scale of regional provision of indicators:

- A – high provision rate;
- B – average provision rate;
- C – low provision rate.

The current indicators influencing innovation landscape formation are demonstrated in Table 2.

**Table 2 – IRC INDICATORS INFLUENCING INNOVATION LANDSCAPE FORMATION (2017)**

Indicator	Regional complexes							
	Northwestern	Central	Volga	Far Eastern	North Caucasian	Siberian	Southern	Ural
Efficiency of economic entities innovation activity	B	A	A	B	A	C	B	C
Innovation potential	A	A	B	C	C	B	B	B
Innovation conditions	B	A	B	C	A	B	A	C
Climate conditions	C	B	B	C	B	B	A	B
Socioeconomic structure	A	A	A	C	A	B	C	B

Thus, data in Table 2 demonstrate a contradiction between availability of conditions for economic activities and innovation development and formation of leader and outsider regions. These facts should be used for preparing strategic development programs. Studying specifics, opportunities, factors and indicators of innovation landscape formation on the IRC level enables a more detailed state approach to defining strategic development objectives for the Russia Federation subjects.

**IV. CONCLUSION**

Currently, there are many problems related to formation of innovation-based economy and regional innovation landscape. They include insufficient state policy regulating innovation activities, absence of scientific and technological basis and resource capacities in regions, underdeveloped legislative regulation of innovation-based economy, etc. In our opinion, the main directions for solving these problems are the following:

- active state support of innovation enterprises;
- efficient activities of regional authorities;
- analysis of regional socioeconomic structure and its specifics;
- support of regions implementing innovation activities;
- implementation of methods based on using local levels of innovation development;
- qualitative development of regional human capital;
- tax incentives to encourage scientific and technological activities;
- development of approaches to distinguishing regional innovation landscape indicators and factors;
- granting integrational (enlarged) regional complexes the opportunity to participate in development of strategic programs for certain regional subjects taking into account the analysis of opportunities for innovation landscape formation on the basis of existing conditions.

In case of application of the abovementioned approaches to addressing these problems, national and regional economies would be able to achieve a higher level of innovation development.

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