

Innovative Technological Development of Russian Mining Regions (on Example of Kemerovo Region)

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Abstract. A characteristic trend of many countries modern development is the transition to an innovative economy. At present, this is the only opportunity to secure and maintain a high standard of living for the population. Moreover, innovative development of Russian can be achieved during technological progress in its regions. In this regard, it is necessary to assess the innovative potential of the region and identify the most actual problems that impede the transition to the trajectory of innovative development. The authors outline several main indicators that help to determine the level of innovation and technological development of one of the largest industrial areas of Russia – Kemerovo region. The special economic role of Kemerovo region as a large territorial old-industrial complex of Western Siberia requires a large-scale work to solve the most acute problems of regional development. It is necessary to find the answer for existing problems through the implementation of a system of state regulation aimed at making the innovation component a leading factor of the regional economy competitiveness.

1 Introduction

To achieve a high level of innovation and technological development of Russia, it is necessary to begin modernization from the regions as the parts of the national economic system. Being the largest industrial, and primarily the mining region of Russian Federation, Kemerovo region requires special attention to activating the process of implementing innovations and modernizing the traditional sectors of regional economy. Its independent scientific, technical and technological support of industrial potential rise is a matter of national security. An analysis of the level of innovation and technological development of Kemerovo region will enable understanding the current situation in the region and identifying the most urgent development problems.

2 Material and method

The methodology of the analysis of regional innovative and technological development is based on the concepts of innovative economy formation, introduced by G. Mensch [1], J. Schumpeter [2], B. Lundvall [3], N. Kondratiev [4], S. Glazev [5]. The problems of

innovation and technological development of the regions are examined in the works of M. Golova and A. Sukhovey [6], V. Osipov, A. Zeldner, T. Skryl [7], including the problems of innovative development of the Kemerovo region - in E. Dotsenko and N. Ezdina [8].

To assess the innovation and technological potential of the mining region and the prospects for its development, it is necessary to analyze a number of indicators, such as:

- number of organizations performing scientific research and development,
- number of advanced industrial technologies;
- the share of costs for technological innovations and the share of innovative goods and services in the gross regional product;
- fixed assets investments.

It is the analysis of the above-mentioned indicators that will make it possible to understand how the region is ready for the transition to an innovative development and to assess its technological potential. In addition, it is necessary to analyze existing regulatory documents adopted at the regional level in the innovation field and identify problems that hamper the innovative and technological development of the mining region. For this study, Russia's key industrial region, Kemerovo Region (Kuzbass), was selected. It mines more than 50% of coal in the country, founds a significant part of iron and steel, as well as finished ferrous metals. Proceeding from this, the problem of innovation and technological development here is particularly acute.

3 Results and discussion

To ensure a high level of social and economic development of the region and achieve compliance to the world's advanced mining regions, it is necessary to keep pace with scientific and technological progress. Creation of measures to stimulate innovation activity can not achieve positive efficiency, if the level of regional innovative and technological development is not properly assessed in advance. That is, it is necessary to trace how the region is developed in this area for a long time.

In the structure of the gross regional product of Kemerovo region in 2015, the main type of economic activity was the extraction of minerals - 25.6% (in 2005 - 27.1%, in 2010 - 31.4%). As can be seen from Table. 1, production index for Kuzbass like in Russia as a whole varies abruptly. It reached a peak value of 109.6, in 2010, in 2011 - a sharp decline to 98.1%, then there were fluctuations in the range of 101-104%. In the Siberian Federal District (SFO) has also an increase of production index in 2010 - 142.2%, and then a gradual decrease to 101% in 2015. At the same time, the situation is more stable in Kemerovo region along with Irkutsk region, than in other mining regions of Siberia. This indicates more favorable conditions for mining industry innovative development.

Table 1. Production index for “Mineral Resources Mining” as a kind of economic activity, % to the previous year [9].

Territory	2005	2010	2011	2012	2013	2014	2015
Russian Federation	101.4	103.8	101.8	101	101.1	101.4	100.3
Siberian Federal District	101.9	142.2	111.5	113.5	109.2	103.4	101
Krasnoyarsk region	102.1	180.4	117.6	120.8	115.9	103	99.6
Irkutsk region	103.5	133.6	152.6	133.2	109.7	110.9	113.6
<i>Kemerovo region</i>	<i>103.6</i>	<i>109.6</i>	<i>98.1</i>	<i>104.5</i>	<i>101.4</i>	<i>104.2</i>	<i>102.6</i>
Novosibirsk region	147.6	100.3	104.5	106.2	116.8	94.5	95.3

Let's turn to the index of innovative activity of organizations (Table 2). Unlike other regions, rather low value of the indicator is observed in Kemerovo region. In 2005, it was 7.3% (in the Siberian Federal District - 8.1%, in Russia - 9.9%), in 2010 - 5.9% (in Siberian Federal District - 8.2%, in Russian Federation - 9% 5%), in 2015 - 3.9% (in Siberian Federal District - 8%, in the Russian Federation - 3.9%). The situation is aggravated by negative dynamics. Comparison with world leaders in this direction is also not in Kuzbass favor. In 2015 the value of the innovation activity indicator of organizations was: Australia - 55.8%, Brazil - 38.2%, India and China - 35.4%, Canada - 32.3%, the United States - 14.3%.

Not being an innovative leader, Kemerovo region faces a number of problems in creating, implementing and promoting innovations. The reasons for this lag, both at the level of the region and the country as a whole, according to the authors, lie consist of the following. First, the number of personnel engaged in research and development is being reduced. The low level of remuneration of scientific workers and the prestige of the profession does not ensure the inflow of young researchers. Secondly, the problem of intellectual and business migration, which is directly related to the outflow of specialists in the scientific and research field. Thirdly, low financial activity, including the commercial sector aimed at obtaining new knowledge and its practical implementation. Fourth, lack of support from the state, not only material, but also moral.

Table 2. The share of innovative activity of organizations, % to all activities [9].

Territory	2005	2010	2011	2012	2013	2014	2015
Russian Federation	9.9	9.5	10.4	10.3	10.1	9.9	9.3
Siberian Federal District	8.1	8.2	8.8	8.5	9.1	8.8	8
Krasnoyarsk region	8	10	10.2	9.5	11.2	9.3	8.8
Irkutsk region	9.2	8.7	6.5	6.9	8.7	6.4	7.9
<i>Kemerovo region</i>	7.3	5.9	6.4	6.1	4.6	7	3.9
Novosibirsk region	5.3	5.5	8.2	8.6	9.9	9.7	9.4

All this is confirmed by the data presented in Table. 3. In Kemerovo region like in Russian Federation, the number of organizations performing scientific research and development for the period 2005-2015 has changed insignificantly: only in 2015 the indicator grew by 18% (in Russia - by 16%). This can be explained by the intensification of research in response to the sanctions policy of western states, which began in 2014.

Table 3. The share of organizations performed R&D [9].

Territory	2005	2010	2011	2012	2013	2014	2015
Russian Federation	3566	3492	3682	3566	3605	3604	4175
Siberian Federal District	419	404	424	424	428	424	491
Krasnoyarsk region	60	54	53	52	52	52	72
Irkutsk region	35	44	46	49	51	45	52
<i>Kemerovo region</i>	29	27	27	26	27	27	32
Novosibirsk region	119	104	111	113	118	120	122

The raw orientation of Kemerovo region economy had an impact on innovative developments (Table 4). Other mining regions significantly overtake it in this direction. In

2015, Kemerovo region has introduced 8 innovative technologies, while the Irkutsk and Novosibirsk regions are more than 20. The main element of Kemerovo region innovation infrastructure is the Kuzbass Technopark, created to fulfill state program for supporting small and medium-sized innovation projects in 2007. The major project of Kuzbass technopark is a global project for the extraction of methane gas from coal seams, which is currently an indicator of the level of innovative development of Siberia. Another important project of residents of the Kuzbass technopark is the production of heart valves, for all regional and federal clinics located to the East from the Urals, as well as many medical facilities in Moscow, St. Petersburg, and the Volga region.

Table 4. Developed modern industrial technologies [9].

Territory	2005	2010	2011	2012	2013	2014	2015
Russian Federation	637	864	1138	1323	1429	1409	1398
Siberian Federal District	68	64	126	151	123	116	92
Krasnoyarsk region	15	6	33	38	24	26	19
Irkutsk region	4	10	7	53	41	31	22
<i>Kemerovo region</i>	<i>6</i>	<i>7</i>	<i>14</i>	<i>11</i>	<i>10</i>	<i>3</i>	<i>8</i>
Novosibirsk region	21	23	53	31	26	30	23

Dynamics, presented in Table 4, can be explained by the amount of costs for technological innovation. In 2005, they amounted to 1,845.1 million rubles, in 2012 - 12978.9 million rubles, reaching its maximum. In 2013, the decline was almost in 2 times - 6662.1 million rubles. In 2014 the decline was almost to 1 billion rubles, and then a sharp jump up to 3,899.6 million rubles. A sharp increase in the cost of technological innovation in 2012-2013 was the evidence of the fact that the economy of Kemerovo region was developing an innovative potential for the next innovation cycle, and the "surge" of activity was manifested in the increase in the volume of innovative goods and services. In 2014 there was a "jump" of this indicator almost in 7 times from 3242.9 million rubles to 21346.2 million rubles. In 2015 the volume of innovative products grew by another 30% and amounted to 32,435 million rubles. [9].

The most important factor of innovation-technological development effectiveness is investment in fixed assets. Especially in Kuzbass the problem of deterioration of the basic industrial and infrastructural funds is actual. As can be seen from Table. 5, the dynamics of investment over the past decade is characterized by sharp ups and downs. So in the period 2005-2010 investments in fixed assets increased almost in two times. Positive trends continued until 2013, until there was a sharp decline: compared to 2012, investment fell down by almost 20%. In 2015 the falling was also more than 30%.

Table 5. Fixed assets investment [9].

Indicators	2005	2010	2011	2012	2013	2014	2015
Investments, RUB million	80315	156519	214780	267812	217711	230951	162059
Index, in % to the previous year	100.0	194.9	137.2	124.7	81.3	106.1	70.2

Among the problems faced by the mining region in the transition to the innovative development, it is possible to distinguish primarily institutional ones, such as the deforming

of rules in the sphere of interaction between government and business, the significant role of the administrative resource, the incompleteness of institutional transformations in the leading sectors of Kuzbass economy and the lack of state and business institutions, necessary for structural reforms initiation (large venture funds and innovative banks, technology promoting zones, a system of guarantees for investment in innovation, etc.) [8].

According to experts, the lack of infrastructure necessary for technological development, including ensuring interaction between science and business, is a central problem of innovative transformations. To solve it, by order of Russian Federation Government No. 904 in 2007, an industrial park was established in Kuzbass, and in 2008 the law of Kemerovo Region "On Technoparks in the Kemerovo Region" was adopted. There are no other technoparks specialized for coal industry in Russia.

The need for the regulation of private-and-state partnership in innovative development predetermined the adoption of the law "On Innovative Policy of the Kemerovo Region" in 2008 and the development of the state program "Economic Development and Innovative Economy of Kuzbass" for 2014 - 2019 [10]. The implementation of this program will allow concentrating resources on solving key scientific and technological problems, and will also contribute to enhancing the role of science and technology in the development of Kemerovo region. And the implementation of the formed innovation policy in the long term should turn Kuzbass into the leading Russian center of technological support of the mining industry of global importance and dramatically improve the quality of life of the population in Kemerovo region.

4 Conclusions

The solution of existing problems requires the implementation of a system of measures, with the help of programme methods, aimed at making the innovation component a leading factor in the competitiveness of Kemerovo region.

The main areas for strengthening the innovative development of the mining region should be the following:

1. Detailed development of the long-term innovation strategy of the region with the definition of priorities and the development of innovative programs to support young entrepreneurs and innovators.
2. Improving the innovation infrastructure, which helps to create a favorable innovative climate in the region.
3. Establishment of a financing system for innovation.
4. Assistance in training and finding qualified staff in the innovation area.
5. Development of interregional and international innovative and technological cooperation, in particular with the BRICS countries and the EEMP.

Revival the modern industry of mining regions on the new technological bases is possible only during systematic investing in technical innovations and the formation of structural clusters to maintain industrial growth with information development and research. A positive effect can be achieved only with the initiation and support of the innovative development strategy of mining region by state authorities and coordination of efforts of all participants of the innovation process.

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