

# Structural problems of mining region innovative development (Kuzbass, Western Siberia)

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**Abstract.** At present, the issues of overcoming the negative structural shift in Russian economy, accelerating economic growth, reducing technological and social- and-economic gap between Russia and the developed countries are strategically important. Modern structure of Russian economy which had been developed as a part of market model does not generate the innovative type of development. In this situation, mining regions, the structure of which was formed in the early 20th century and is represented by the extractive industries, are undergoing the greatest problems of innovative development. Therefore, despite high urbanization and industrial development level the economy of Kuzbass (Western Siberia, Russia) is characterized by significant structural problems. They are associated with primary extractive nature of the regional industry, in which coal and iron ore, metallurgical and chemical industries dominate. They highly depend on Russian and global market of raw materials, widely use low-productive technologies, and they are characterized by high level of fixed capital depreciation and insufficient pace of innovative infrastructure development. The solution of the structural problems of economic development of mining region is connected with technological modernization of extractive industries and use of modern materials for the production of high-tech products.

## 1 Introduction

The structural problems of mining region are mainly connected with the "old industrial" origin of its economy, when from the beginning of the 20th century the mining (mostly coal) and metallurgy industries had been extensively developing, and later - the power industry and connected with these branches machinery. All these was accompanied by a high level of investment, output, gross income and tax revenue in two main industries of the regional economy - the coal and metallurgy ones.

## 2 Material and method

The analysis methodology of structural problems of the region is based on the concept of a multi-sector economy, outlined by D. Bell [1], C. Clark [2] and Robert Reich [3], the theory

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of technological layers by S. Glaziev [4], the ideas of neo-industrial accelerated development by M. Gasanov and S. Zhironkin [5-9]. The structural problems of Kemerovo region economy are considered in the papers of K. Kolotov, A. Zhavoronok and others [10-11].

Now the most important structural problems of economy in "old industrial" areas are ecological issues [12-13]. They are connected to national economy structural problems through institutional issues [14-15] among them can be found the following:

1. De-formalization of rules in the interaction between government and business, its transition to "black" (corruption) and "gray" (implementation by the authorities of public functions by evasion of law) zones.

2. A significant role of the administrative resource, in which practically no one institution can acquire legitimacy without the governor's approval. Accordingly, all attempts to influence the reproductive, industrial, competitive structure of the regional economy will inevitably come across with the necessity of agreement with the highest regional authorities, each of "white" and "gray" and "black" interaction with business.

3. Incomplete institutional reforms in major industries of Kuzbass economy. This concerns in the first place the structure of the property. Despite the fact that by the end of 2008 in the form of ownership 41960 (81.8%) enterprises in the region were private, 4,700 (9.2%) were municipal, 1681 (3.3%) were owned by the state, the majority of coal-metallurgical Kuzbass assets were distributed among several of the largest companies in the country. Such groups as "Evraz Holding", "Mechel", "Gazprom", "Severstal" are the main investors in the region. This concentration of ownership in the hands of an extremely limited group of businesses prevents the development of new market institutions required for structural transformation of Kuzbass economy and makes business dependent on informal agreements with the authorities.

4. Unformed state and business institutions necessary to initiate structural reforms (major venture funds and innovative banks, techno-innovation zones, guarantee system for investments in innovation, etc.). Established in 2007 Kuzbass Technopark is focused on the extraction of raw materials, whereas its participation in the development of deep raw material processing depends entirely on the "subjective will" of corporations - the owners of coal and metallurgy enterprises.

### **3 Results and discussion**

The structural problems of Kemerovo region industry can be presented as the following:

A) Physical depreciation and obsolescence of fixed capital. Despite the fact that one-third of the equity capital of Western Siberia is centered in Kemerovo region, its average depreciation for regional economy is 43%, in industry - up to 55%, with an annual increase on 1-2%.

The maximum depreciation is typical for fixed capital of regional key sectors - power industry (in 2006 - 59%, in 2013 - 53% for power equipment), coal industry (mainly mining: in 2008 - 48%), machinery (in 2000 - 70%, in 2008 - 67%, in 2013 - 62%). During the reforms the average depreciation of fixed capital at the enterprises of Kuzbass main sectors have increased on the average of 11%, far exceeding the critical level of 40%.

Mainly, depreciation growth of the production means in Kuzbass is associated with an investment problems of regional machinery, which fixed capital modernization is going very slowly, with the annual disposal ratio of 1.5% and the implementing ratio - no more than 10% (with maximum 12, 7% in 2006). That is, keeping such rate of investment in Kuzbass machinery the full update of its production means will require more than 60 years.

B) Lack of investments in renewal of fixed capital in traditional for Kuzbass primary industries and insufficient capital flow in processing sector. Over the entire period of reforms the problem of predominance of enterprises' own funds as a source of investment had not been solved in the region.

On the average for the period of 1998-2010 own investments in the fixed capital were unstable and varied from 75% in 1998-2002 to 69% in 2004-2010. This indicates that the reproduction of fixed capital at the own funds expense exhausted itself. This is comparable with the investments of outside investors (in 2002-2012 - 20% on the average), which are also not able to meet the needs of economic subjects in a speedy renewal of fixed capital.

To a large extent, this was due to the fact that the main investors in the extractive and processing industries in the region, as well as in the services and infrastructure, are the largest coal-mining and metallurgical companies, which in 2007-2008 accounted for more than 70% of investments. Foreign investments, the maximum of which was in 2007 (US \$ 579 million), were mainly trade and other loans (92.2% of total revenue).

B) Over-concentration of investments in coal industry. Industry investments in equity capital in Kemerovo region also have "pro-mineral", or rather "pro-coal" character. On the average in 2006-2013 the structure of investments in Kemerovo region economy was the following: extraction of mineral resources (primarily coal and iron ore) - 53%, processing production - 16% (including metallurgy - 5%, chemical industry - 4%, machinery - less than 1%), power industry - 6%, transport and communication - 11%, construction - 1%, R&D and education - less than 1%, agriculture - 3%, real estate, trade, housing and utilities infrastructure, and other socially important services - 11 %. Achieving the "top" of coal mining output led to the fact that, since 2004, there had been a slowdown in investment in the region – on 45% in 2005, on 1% in 2008 and on 34% in 2009 (including small enterprises and the informal sector of economy according to preliminary data).

Mainly, slowing inflow investments in regional economy is closely connected with the concentration of capital in coal and metallurgy industries, in which in 2006-2013 only 22% of investments were directed for the purchase of high-quality new and more efficient equipment, and 6% for the full technologic upgrade, while 45% for major repairs and 26% for the replacement of the means of production by their analogues. In such circumstances the possibility of decreasing the fixed capital depreciation in the leading industries and the development of R&D, machinery, deep processing of minerals investments are rather weak.

During reforms the sectorized structure of regional economy also comes across the large-scale problem of mineral resource orientation and the lack of factors to overcome it in the nearest future. On the contrary, the prospects for consumption growth of mineral resources by global and Russian economies make favorable for Kuzbass marketing conjuncture of deepening "metal-coal" profile (largely due to the projected by 2020 deficit of natural gas on the domestic market by 120 billion m<sup>3</sup>). When investments in advanced processing of material resources depend on the agreement between the governor and the main owners the dependence of the regional budget from unstable situation in the global commodity markets is increasing. In particular this applies to iron and steel industry which, using coal, heavily depends on the world prices and demand for its products. Coal mining itself, first of all, is connected with the danger of man-made accidents, and secondly, is strongly tied to the iron and steel industry. This reduces the stability and forecasting the sources of revenue for the regional budget and deprives the regional authorities of confidence in the possibility of financing the structural transformations in future. Thus, three main Kuzbass industries (coal, metallurgy and chemical industry), generating more than 70% of GRP, provide only 54% of taxes. The main "generator" of Kemerovo region GRP is the industry (over 85%) and in its structure - fuel, metallurgy, energy industry (in total - more than 70%). At the same time, these industries generate about 50% of the federal and regional tax revenues.

Consequently, the issue of critical depreciation of fixed capital in basic sectors of the regional economy should be added by the detraction of their contribution to budget revenues, inadequate to their high share in GRP and investment.

The main feature of the innovative and technological structure of Kemerovo region economy is the prevalence of 19<sup>th</sup> - early 20<sup>th</sup> centuries technological layers: the 2<sup>nd</sup> (coal mining, steel-making), the 3<sup>rd</sup> (road and urban construction, engineering industry), and the 4<sup>th</sup> (power and chemical industry). These industries account for more than 75% of Kuzbass GRP (up to 90% of its production part). Along with that the 5<sup>th</sup> and 6<sup>th</sup> layers are hardly represented. On the contrary, in neighbor regions there is quite another picture. So, in Novosibirsk region the 2<sup>nd</sup> layer is less than 5% of GRP, the 3<sup>rd</sup> and 4<sup>th</sup> are about 55%, the 5<sup>th</sup> is 25%, the 6<sup>th</sup> is about 2%. In Tomsk region, in spite of a significant part of the mineral resource industries, the sectors of the 5<sup>th</sup> layer produce about 20% of GRP.

Outdated technological layers, prevailing in Kuzbass economy and corresponding with the end of the 19<sup>th</sup> – the beginning of the 20<sup>th</sup> century, give rise to a number of social-and-economic problems, such as the prevalence of low-skilled labor, unequal in terms of added value regional exchanges, low labor productivity in terms of value, the presence of mono-town-satellites of major industrial enterprises with a difficult social situation and others.

The development of enterprises of modern 5<sup>th</sup> and the newest 6<sup>th</sup> layers in Kuzbass is inevitably connected with the development of R&D. But in this aspect region lags behind other regions of Western Siberia. So, innovative activity reached its peak in 2006, when, according to the Department of Education and Science of Kemerovo region Administration, 275 applications for inventions were filled in the region (the 4<sup>th</sup> place), giving the way to Novosibirsk (625), Krasnoyarsk (424) and Tomsk (406) regions. Diversification of the regional economy, described in the Investment passport of Kemerovo region, in one way or another, is connected with mineral resource sectors and do not provide technological increase higher than the 4<sup>th</sup> layer (the development of power complexes on the basis of coal enterprises, underground coal gasification, methane production from coal seams, service and technological support of the mining industry and specialized engineering, new small production of special grades of steel, as well as metal-processing complexes). The main investors in the framework of these areas are again the largest commodity groups - the main owners in Kuzbass.

Consequently, within the framework of existing sectoral, institutional and technological structure of the regional economy the transition to new technological layers cannot be possible, together with abandoning single-industry mineral resource cities, monopole dominance of large holdings, the use of outdated and physically worn-out equipment. It is important to note that the structural problems of Kuzbass economy significantly worsened in today's crisis. In late 2008 - early 2009 the situation in Kuzbass economy was going to turn out from crisis into disastrous. So, of 30 million tons of unsold by 2009 coal only 12 million was finally sold. 12 coal mining and 3 metallurgical enterprises (producing 11% and 33% of coal and metal in the region respectively) were on the verge of bankruptcy. By mid-2009 58% of industrial and 39% of civilian capital construction had been frozen; the number of unemployed had increased by 4%. As a result, production and investment imbalance of regional economy toward primary industries in 2008-2009 became even more: investments in coal processing in 2008-2009 amounted only 18% of coal industry in the region, in machine-building - 11% of total investment in the regional metallurgical complex. Regionally, the proportion of coal processing and coal chemistry in export is 6% of exported mined coal, and the volume of exported machinery equipment is in 9 times less than exported outside the region metallurgy industry product. As a result, the processing enterprises in 2008-2012 received only 17.5% of total investment for regional industry and deterioration level of their fixed capital exceeded 55%.

## 4 Conclusions

Thus, the structural problems of Kemerovo region economy are typical for the industrial area and identical national ones. They include permanent depreciation of fixed capital, and inadequate sources of investments for its updating, over-concentration of investments in coal industry, de-formalization of rules in the field of interaction between the authorities and business, unfinished institutional reforms in major sectors of regional economy and the important role of administrative resource, monopolies in the key sectors (power, metallurgy, chemical industry), the dominance of the 2<sup>nd</sup> and obsolescence of the 3<sup>rd</sup> and 4<sup>th</sup> technological layers.

Neo-industrialization of regional economy means overcoming its de-industrial structural problems in innovative development of coal, metallurgical and chemical industries, the emergence of new forms of investment relations, changing the role of the state. The technological basis of neo-industrial structural reforms of Kemerovo region economy is a convergence of innovations in the key sectors of regional economy. This means the establishment of new branches of advanced processing of raw materials produced in Kuzbass – bio-coal fuel, composite polymers and semiconductors, ultra-light alloys, the reconstruction of coal machinery and automation, the development of heat power industry recuperation.

Investment component of neo-industrialization of regional economy includes the development of public-private investment partnerships in innovation, guaranteeing investments in advanced raw materials processing on the basis of convergent technologies, issuing the subordinated loans for the establishment of regional guarantee and insurance funds for industry innovation investments.

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