# ENVIRONMENTAL ECONOMICS

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## Scenarios of ecological modernization of mining corporations on the basis of innovation

*The article considers the objective and subjective reasons interfering with the innovative modernization of the mining and mining and smelting companies on the basis of the analysis of the external and internal environment of the Russian mining corporations, during the post crisis period. On the basis of theoretical notions about the economic category of "modernization" and the analysis of ecological corporate policy of the mining companies, the scenarios of ecological modernization of the basic manufacture and main funds of nature protection appointment and the condition of their implementation taking into account the specificity of mining manufacture are proved.*

*Mining, mining and smelting companies, innovative development, ecological modernization, factors and scenarios.*

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Due to the revolutionary events in the Middle East and North Africa unexpected by most politicians and economists, the largest natural disaster in Japan and the anthropogenic disaster caused by it, the experts develop the forecasts and scenarios for recoveries of various countries and global economy from the today financial-and-economic crisis less actively. It is impossible to estimate the implications of the impact of these events on the global economy for the present, but their negative character is obvious.

Since the middle of 2009 the world prices for fuel and energy resources are increasing and now they have reached almost the pre-crisis level. The growth of prices are going on against the background of slow recovery of the major economies of the world, "debt crisis" of some countries in the European Community and "overheating" of Chinese economy (the fact is considered by many economists), which in fact has not reduced the growth rate of gross domestic product during the crisis. Therefore, the danger of collapse in prices for oil and

natural gas still remains, all scenarios for our country's economy in the post-crisis period up to 2013 are built on the prognosis of these prices. The world markets also observe a high volatility in prices for metals, their concentrates, agrochemical raw materials and other natural material and the products of its enrichment exported by Russian mining and mining-and-metallurgical companies, such volatility also reflects the continued macroeconomic instability in the world's leading economies.

Monitoring of financial and economic situation of Russian mining and mining-and-metallurgical companies during the crisis has showed that the majority of them could managed not only to avoid bankruptcy, but to remain profitable and they also gradually reached pre-crisis output of main production since the second half of 2009, and some of them even increased their earnings compared to 2008 [1]. During the crisis almost all export-oriented mining enterprises in Russia have actively implemented the policy of multiplying assets at the expense of mergers and takeovers of companies, which were in a difficult situation, besides it the assets grow at the expense of purchasing the deposits abroad. The state support for mining industry during the crisis has played a positive role in mitigating its impact on businesses, especially for those who had debts to foreign banks or lost opportunity to use their credits because of the crisis. In order to prevent the shortage of finance for the real sector of economy the state has provided loans to Russian banks. Despite the fact that Russian banks failed the mission designed by the state for lending to the real economy, almost all enterprises in the mining industry during the crisis did not abandon the plans to expand their own resource base, i.e. they continued to construct some new quarries and mines and increased the current capacities. The analysis of production and economic activity of the enterprises of the Kola mining complex during the crisis has showed that the increase in capacity of its own mineral resources base of enterprises occurred against the total saving of all types of costs.

The analysis suggests that the major mining companies have implemented the most logical strategy for a market economy during the crisis: they bought up the assets of weakened competitors and suppliers; exercised tight savings of costs for working capital, first of all for salaries, and for socio-economic and environmental programs, using its monopoly economic and political situation in the region, where the enterprises are located.

The reports on the introduction of ore production or the increase in ore production at some mining enterprises during the crisis confirmed that some companies intend to implement its growth strategy in the future, and others whose field life-cycle has already been completed, intend to stabilize production. In both cases, greater production or production of earlier level of main products of the company will witness an increase in production of ore in the future. If the technology of ore-dressing treatment is constant, it means an increase in production volume of other natural resources used in the technological process (water, air, fuel and energy resources, land, etc.). In accordance with the known pattern of interaction of production and nature with using the current technology, that is, with the constant quantitative ratio of consumption of natural resources per a unit of main product, the volume of waste production will increase in proportion to the volume of output. However, when using poorer ores and keeping its enrichment technology without radical changes, the volume of waste will be significantly higher, even if the output of main products will remain the same.

As the statistics of environment protection shows the crisis falling of output of main production of the mining and mining-and-

metallurgical companies became the reason for smaller volumes of pollution [2]. However, the rates of decrease in pollution were lower than the rate of decline in production volumes. For example, the average annual rate of decrease in water pollution made by the industrial effluents of the enterprises of the Kola mining complex was lower than the average annual decline in production of its core products. So the volume of apatite concentrate production by an annualized basis decreased by 6.2% and the volume of its discharges - by 5.2%. However, in 2009, that is with increased production, we started to observe an increase in the atmospheric emission at the enterprises of the Kola Mining and Metallurgical Company, JSC "Apatity", at JSC "Kovdorsky mine", as well as an increase in the discharges at JSC "Pecheganikel" and others [3].

Thus, it is possible to suppose with a high degree of probability that the anthropogenic load of mining enterprises on the environment will grow under any scenario of economic recovery. The targets of "Strategy of socio-economic development of Russia until 2020" adjusted for the effects of the crisis and "Strategy of development of the Arctic zone of the Russian Federation until 2020", the targets of the strategies of the federal districts (the Southern district and the Urals district, the Far East district and the Baikal region, North-Caucasus district, North-West district), the targets of the subjects of the federation, of the federal strategies for the development of infrastructure industries, selected industries and other documents of a strategic and territorial planning are based on the realization of investment projects to further development of fuel and energy complex, mining complex and other resource extraction complexes. This is especially noticeable in the strategies and programs of social and economic development of the subjects of the federation, in which, unlike the federal strategic planning documents, the development of five areas of innovation development (energy efficiency, nuclear, space, medical and information technologies) is given little importance.

An exception is the state program of energy saving and improving of energy efficiency in Russia until 2020, its implementation will undoubtedly help to reduce the risk of growth of pollution. However, the regional and municipal projects on improvement of energy efficiency concern mainly the budget sector and the enterprises of regional and local subordination, and the federal law on energy efficiency provides for the stimulation effects for them too [4].

As for the privately owned enterprises under federal jurisdiction, which include almost all mining companies, the state program for energy efficiency has the character of the document of indicative planning, that is, its role is limited to information and orienting function. It is also necessary to mention about the lack of interrelationship between the development and the implementation of the indicative plan to increase energy efficiency and the innovative-and-industrial policy of the country, the strategy of which has not yet been developed.

Energy saving and improving of energy efficiency of production was and is still a major and permanent direction of restructuring of large mining and mining-and-metallurgical companies, since they are characterized by the highest costs for fuel and energy resources. However, the feature of the present stage of efficiency is that it is regarded as a part of the innovative technological and technical modernization of the Russian economy.

Upgrading or renewal of the Russian economy on the innovation basis is understood as a general and non-alternative direction of its development which is necessary to achieve the objectives of Strategy 2020. The renewal of the production base is also necessarily because of its deterioration in kind. However, there is a

significant difference between the technical, technological, environmental and other types of modernization and its types of innovation basis. According to universally accepted definition of "innovative development" by J. Schumpeter we understand it as five new combinations: use of new techniques or new technologies, introduction of products with new properties, use of new raw materials, changes in the organization of production and the emergence of new markets. All these combinations should provide some additional profit to the enterprise, but in this case it will be motivated to upgrade [5].

A feature of the mining and mining-and-metallurgical companies is that they have higher profit rate than the companies of processing industry, which is indirectly confirmed by the indicators of profitability, which were approximately 2.9 times higher in the sectors of mining production (excluding the fuel and energy sector) than the average for the economy in 2009 [1]. In other words, these companies can get extra profit without innovations, as their subject of work is free natural material. The second major cause of unresponsiveness of mining companies to innovations is their monopoly position in the Russian market of natural resources. Various authors refer to several causes of poor perception of the Russian economy of innovation: a focus on short-term income by controlling the financial flows, the low efficiency of tax incentives, the lack of an optimal balance between private and national economic interests [6, 7]. It should be noted that all of them are inherent to the mining companies.

The mining companies also have specific characteristics that prevent their innovative modernization. As you know, the mining and mining-and-metallurgical companies belong to the so-called "old" industries, in which the restructuring of production is been carrying out since the Industrial Revolution of the 18th century. Therefore, for these industries the "disruptive technologies" is simply impossible to imagine, in order to implement we have only those innovations that improve the efficiency of production, but they do not change the fundamental technology.

Among the major obstacles to innovation development we should also mention the deposits' life cycle, which must be at least 40 years according to the method of making a decision on the establishment of the enterprise. An expensive and long-term modernization of the production makes economic sense for only those companies that are provided with raw materials for several decades. The rest companies have the following combinations of innovative ways of development: introducing the products with new properties and using new raw materials. It doesn't require any explanation that during the economic crisis to implement both of these ways interlinked closely with the possibility of the emergence of new markets, is problematic. In our opinion, the main reason is the lack of long-term strategy and program of innovation and industrial policy in the country, which are necessary for specifying the directions of development and production of new materials and products and their volumes in the long-term strategy.

However, it should be noted that the uniqueness of mineral resource basis, geological, mining, hydrological and ecological conditions of each deposit can serve as a reason for the development of specific, individual and original technologies of mining production and ore-dressing treatment, which differ from the standardized technologies. It can be concluded that the innovative technological upgrading is possible, firstly, at all newly created companies of mining complex and, secondly, at the existing enterprises during the transition to a new (by mineral composition) raw materials (for example, when developing the man-made deposits) or to a new product.

As you know, our country is one of the first in the world since the mid 60-ies of XX century, that started to carry out nature-conservative activity that is to use some technical and technological means to prevent or neutralize the damage done to the environment. Currently, according to the data of the Russian Federal State Statistics Service, the annual average value of fixed capital for nature conservation in the country is 617 billion rubles or 1.37% out of the total value of fixed assets. In the Murmansk region, where the second largest in the country mining complex (the Kola mining complex) is situated, the share of funds for nature conservation is 2.28% [2].

In 2000 the Model List of fixed assets for nature conservation was defined more exactly, their composition lost the installations and devices, which were the elements of technological scheme, and the employees on a priority basis for getting the products and related profits and for creating normal sanitary and hygienic conditions in the workplace [8]. In line with this approach now the environmental fixed capital may be only buildings and installations, the main functioning objective of which is related to the protection of environment.

Besides, depreciation of fixed assets for nature conservation is not included in current environmental protection cost which is the part of the production price. Consequently, unlike other fixed assets of the enterprise the nature conservation funds do not keep their value during the production process, and they lose it.

Thus, at the enterprise the modernization of basic technology and technologies for treatment of the environment from pollutants can be carried out on their own, independently from each other. In other words, the fundamental ecological modernization of basic technology of main products and ecological modernization of environmental facilities and equipment as processes can be separated in time. In this regard, for ecological modernization of the nature conservation funds on an innovative basis, there are no obstacles specific to the decision to do innovative change of basic technology of the mining company, except one: a source of environmental investments is a company's profit.

The companies don't want to invest the modernization of environmental funds and this fact is largely due to existing economic mechanism of payment for environmental pollution, and most of all, to the institution of "temporarily agreed emissions/discharges". Cancellation of this institution is at the forefront of environment public administration reform, announced by President and Government President of the country after the May meeting (2010) of the State committee on state regulation of environmental protection. Starting from 2012 the consequences of the abolition of "|temporarily agreed emissions/ discharges" will be the penalties from the company's profit with the coefficient of 100 for exceeding of regulatory emissions / discharges and 25 – for the placement of solid waste. According to the calculations of the Russian Union of Industrialists and Entrepreneurs (RUIE), only the penalty coefficients will increase the payment for negative environmental impact from 125 to 2000 times, and this payment will come from company's profits. First of all, the new system of regulation and payment for environmental pollution will affect the mining and mining-and-metallurgical companies, which are among the environmentally dangerous industries, their share of the anthropogenic pollution is more than 50% of the anthropogenic pollution of the country. Therefore the economically reasonable scenario for them will be the scenario of ecological modernization of the environmental funds. The probability of this scenario will largely depend on the development and practical application of public incentive mechanism or various measures of "green amnesty" to which the government intends to allocate 18 billion rubles [9].

Neutralizing the harmful effects of industrial activity on the environment, the environmental funds are involved in the production process, i.e. without the operation of the main production the environmental funds are not required.

Therefore, the cardinal direction of the ecological modernization of the main production is supposed to be transition to the 2020 system of "technical rationing", in which the environmental requirements are based on technical regulations.

The transition to the system of the best available technologies (BAT), based on the latest scientific and engineering developments and having sufficient practical application taking into account the economic and social factors, will mean a guaranteed reduction of negative environmental impact. It is also expected to borrow the best foreign technologies, their ecological safety and efficiency have been already proved.

The likelihood of this scenario for the ecological modernization of the mining and mining-and-metallurgical companies are dependent on the effectiveness of government measures to reduce basic and specific obstacles to innovation. A significant place among these measures must be taken by institutional changes to reform the government management of the environment protection. A package of three bills that would mean the beginning of the reform was expected at the May session of the State Duma (2011). However, they were not included in the agenda of its meetings because of continuing disagreements within the government, first of all, the disagreements concerning the assessment of their impacts on revenue and expenditure budgets, as well as in connection with lobbying by the representatives of large industrial corporations, who are satisfied with the current economic mechanism that is favorable to profit of business entities without the risks of innovation.

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