ББК 65.04
UDK 338.9
L 85

L 85 **Local Production Systems and Regional Economic Development** /ed. by A.S. Novoselov and V.E. Seliverstov. – Novosibirsk, Sofia, Lodz, Ternopil, 2014. – 352 p.

This collection of papers contains the results of research carried out by the participants of the "International Project FOLPSEC № 295050 within the 7th EU Framework Program FP7-PEOPLE-2011 IRSES" "Functioning of the Local Production Systems in the Conditions of Economic Crisis (Comparative Analysis and Benchmarking for the EU and Beyond)".

The papers study the following problems: sustainable development of local production systems, business strategies of LPS, innovativeness of clusters, critical infrastructure protection, corporate social responsibility, environmental protection, local production system management, governance of local production systems in Bulgaria, Poland, Ukraine and Russia, policy guidelines with some measures of general application, aimed at problems observed in all LPS, and some specific measures differentiated according to a typology of local production systems.

ISBN 978-5-89665-277-9

ISBN 978-5-89665-277-9

INNOVATIVE ASPECTS OF CLEANER PRODUCTION[1]

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The paper is devoted to the problems of innovations in environmental protection management. The main directions of cleaner production due to the introduction of innovative economic development principles to solve environmental problems are outlined. Particular emphasis is placed on the disclosure of the contents of environmental innovation. The author identified main difficulties in the practical implementation of innovative development in the environmental field. We also analyzed the possible effects of exposure to the crisis in the relationship between economy and ecology. We propose new financial tools for providing the attraction of investment in the long term and capital-intensive environmental projects in the conditions of economic crisis. Using the example of the Lower Angara region, the author has showed the possibility to test the exploration and development approach based on innovative principles.

MAIN DIRECTIONS OF THE CLEANER PRODUCTION DUE TO INNOVATIVE FACTORS

The formation of the innovation economy in Russia requires not only constant technological improvement, setting up the production of high-tech products with high added value, but also the change in the interaction of the state and business in a wide range of relations, including those in the environmental field. The latter is due primarily to the fact that, first, the situation is changing with the availability of natural resources, because of their qualitative and quantitative depletion, which makes the problem of their management and integrated use the urgent one. Second, in the absence of significant positive trends in environmental enhancement over the last few decades there has accumulated a complex tangle of problems, which call, in particular, for the assessment of the economic damage caused by the negative anthropogenic impact on the environment, and for the development and implementation of mechanisms for its compensation which has long been a common practice in the developed countries. Ignoring environmental damage indicators when making decisions leads to the selection of inefficient variants of the territorial organization of production and the whole of social and economic development. Third, we have to effectively solve the emerging serious environmental problems on timely basis which is possible only in the case of their permanent identification and before-the-fact prevention. All of this raises an important innovation in environmental management, including change of value criteria, the formation of an adequate institutional framework.

Particularly acute these problems are in Siberia, where the key sectors of the economy, made up mainly manufactures mineral complex, and the lower floors of energy production cycles, on the one hand, are usually among the environmentally hazardous activities and on the other hand, are concentrated in a limited number of locations, creating an increased load on the environment.

[1] This article was prepared as part of the 7th Framework Programme of the European Union FP7-PEOPLE-2011 IRSES Project № 295050 FOLPSEC – Functioning of the local production systems in the conditions of economic crisis (comparative analysis and benchmarking for the EU and beyond).

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Innovative aspects of the economy are directly related to the solution of environmental problems and the possibility of sustainable development of individual regions and the country as a whole. In this context, taking into account the current economic crisis, the search for ways out of it should be focused on the creation of conditions for the sustainable economic development.

In modern conditions of social and economic development of Russia and its regions the key challenges in the environmental field in the light of innovation development are due, at least, to the following circumstances:

1) the necessity of deliberate government economic policy focused on cleaner production, provided a systematic approach to solving problems of structural and technological changes in the economy in favor of resource-saving and environmentally friendly production, which would not only lay the foundation for an innovative economy, but also to provide both economic and environmental benefits;

2) the use of strategic planning and management in government environmental policies, as environmental problems are generally long-term and require a strategic approach to their solution;

3) the need to develop and implement new and effective tools in the field of environmental regulation, to stimulate, on the one hand, the ecological modernization of production, development and use of environmental technologies, the formation of the market of environmentally friendly products and environmental services, and, on the other hand – an environmentally responsible business behavior. Such tools should be supported both in law and in the appropriate means of implementation.

Contribution of principles of the innovative development into the solution of environmental problems is manifested first of all in the fact that the modernization of the technological base of production creates the necessary technical and other conditions for its ecologization in different directions. Among these directions affecting the environment, both directly and indirectly, we can name primarily the following [1, 2, 3, 4, 5, 15]:

1) technological innovation, accompanied by increased production efficiency, expansion of assortment and improving the quality of goods and services produced or used in this technology, the change of models and generations of technology, technological structures and technological methods of production, having one of the results link economic development with environmental protection requirements;

2) resource conservation (as one of the key varieties of technological innovation) associated with the introduction of resource-saving technologies allowing not only reduce the volume of production of various types of natural resources, but also ensuring a more comprehensive and integrated their using, one of the consequence of which is reducing the load on the environment by extractive and manufacturing industries;

3) environmental innovation, including :

- ecological restructuring and ecological modernization, providing changes in the sectoral structure by reducing the demand for polluting industries or by upgrading enterprises – consumers of such products;
- development and use of environmental technologies (in particular, the increased use of technology of the utilization waste of all kinds, recycling of resources after their treatment, reclamation of disturbed lands, etc.);
- creating ecological development, including specialized machinery, forming market of the environmentally friendly products and environmental services;
- formation of environmental requirements for the development of technologies, the implementation into the practice of environmental management systems so-called “new existing technologies”, corresponding to contemporary and relevant economic and environmental standards and regulations, and which should be an incentive for

innovative activity (especially in the sectors of energy sector, other natural resources exploration intensive industries and environmentally hazardous sectors), as it reflects the requirements of scientific and technological progress[1];

- implementation of environmental management systems in industry, which is a modern mechanism of environmental management, an internationally recognized and widely used by the vast majority of industrialized countries for more than 20 years; the presence and operation of the environmental management systems accompanied by improved environmental performance enterprise, by reducing environmental risks and costs of environmental protection, increase competitive advantage and so on;
- environmental marketing, promoting the rapid development of technologies and processes that reduce environmental impact, and accelerated formation of the market of environmental goods, which requires a corresponding development of marketing management tools;
- environmental certification, confirming compliance with the characteristics of the manufactured product to standards in the field of environmental protection;
- creation in Russia of the so-called "intellectual infrastructure" of environmental activities – licensing systems for all activities affecting the dangerous ecological situation, and environmental audits. These activities are essential tools in additional environmental control and regulation of the actual human impact on the environment in accordance with the possibilities of acceptable use of natural resources and the assimilation potential of the environment;
- ecological consulting, and others.

4) creation of eco-innovation tools, promote the development of markets for environmental services, environmentally friendly products, technologies, etc.;

5) innovation management, legal and other solutions that improve the efficiency of use of natural resources and the environment along with improving or at least maintaining the quality of the environment;

6) formation of long-term market of rights to pollute the environment by learning from the experiences of other countries that have implemented this mechanism in the practice of environmental regulation, as well as international experience in this field (in particular, the economic mechanism of the Kyoto Protocol) and then transfer this experience to the national level.

POSSIBILITIES AND RESTRICTIONS OF TRANSITION TO SUSTAINABLE ECOLOGICAL AND ECONOMIC INNOVATIVE DEVELOPMENT IN MODERN RUSSIAN CONDITIONS

The implementation of above mentioned directions of innovative development will not only significantly improve the environmental situation, but also enhance the competitiveness of domestic enterprises in world markets by improving the environmental performance of their products. However, the practical implementation of these areas faces many challenges, primarily related to the need for such a mechanism, which is primarily allowed to stimulate entrepreneurs to make the transition to the new resource-saving and environmentally oriented technologies, the implementation of which would bring tangible and economic and environmental benefits.

[1] In Russia, the implementation of the requirements of such a system were put into law by the federal law "On Environmental Protection» № 7-FL of 10.01.2002. In terms of economic methods of environmental protection, the law is important in it marked the need to provide tax and other benefits when implementing the best available technology, alternative energy sources, the use of secondary resources and waste management, etc. (Article 14). Unfortunately, this is a constructive economic situation remains declarative, as the incentives and rebates for the introduction of environmentally friendly technologies are virtually absent.

In the Russian context this innovative mechanism has not yet been formed, so we must begin from scratch, skillfully combining both incentives and sanctions to environmentally irresponsible businessmen. This supercomplex task that requires a fundamental change in the existing trends in the economy (immediate transition to the quiescence of innovative development.) and, most importantly, a change in mentality, first of all, the ruling elite, as it is related to a need for a national level of innovation-oriented environmental strategy of the social and economic development and the development of an appropriate environmental and economic policies.

Turn towards sustainable ecological and economic innovative development in modern Russian conditions is constrained by the action of a number of factors, the main of which are well known. These include, in particular:

- preservation mainly raw nature of the economy with predominance of fuel and energy, metallurgical and forestry sectors as well as the nature of natural-resource exports, and in conditions of exhaustion of many kinds of natural resources as a factor of economic growth;
- high level of nature intensity of production (including energy), which tends to a constant increase (now in Russia the cost of natural resources per unit of GDP is 2–4 times higher than those indicator of developed countries);
- the absence of significant structural changes, leading to a decrease in the proportion of extracting and polluting industries;
- absence of economic and legal barriers to the functioning of dirty technologies, due primarily to the satisfactory state environmental policy, primitive economic mechanisms in the field of environmental protection;
- considerable wear and tear of equipment, estimated for various industries in the 60–80 percent or more, thus constantly increasing the potential environmental risks associated with its use and the risk of accidents due to the lack of technical and technological reliability of decision-making;
- unfavorable ecological situation in many parts of the country, which has a negative impact on human health and the duration of their life (according to WHO estimates, the share of environmental contamination in the formation of people's health is about 20%, in Russia the contribution of environmental factors in the morbidity and mortality in most regions country for at least 2-fold higher);
- environmental problems accumulated over decades, which are often exacerbated by problems encountered in recent years (including as a result of a weakening of state control and hasty privatization of property) and will require a mechanism to eliminate them and compensation for the damage that has to be one of the tasks of the state.

Reverse these negative trends prevailing possible only when takes place the transition to an innovative economy and technological modernization. This transition will be accompanied by large-scale solution of the ecological problems, which will not only reduce the amount of human impact on the environment, to prevent the exhaustion of natural resources and rationalize their use, but also significantly improve the environment of people, creating the conditions for reducing the negative impact of pollution on health people and increasing life expectancy.

Given the strategic interests in environmental innovation should focus primarily on:

1) orientation to achieve the desired practical results in the improvement of the environmental situation;

2) control of the environment as one of the essential elements of state regulation in the sphere of nature management;

3) creation of stimulating effects for environmental investments;

4) strengthening of coordination and cooperation of all interested parties under the auspices of the authorities at all levels.

POSSIBLE CONSEQUENCES OF THE INFLUENCE OF THE CRISIS ON THE RELATIONSHIP BETWEEN ECONOMY AND ENVIRONMENT

Modern crises are making significant features in the relationship of the economy and the environment. Impact of the crisis on the state of affairs in the environmental field is usually two-fold, causing on the one hand, environmental degradation, and on the other hand – its relative improvement, allowing to reduce the load on the environment (Figure 1).

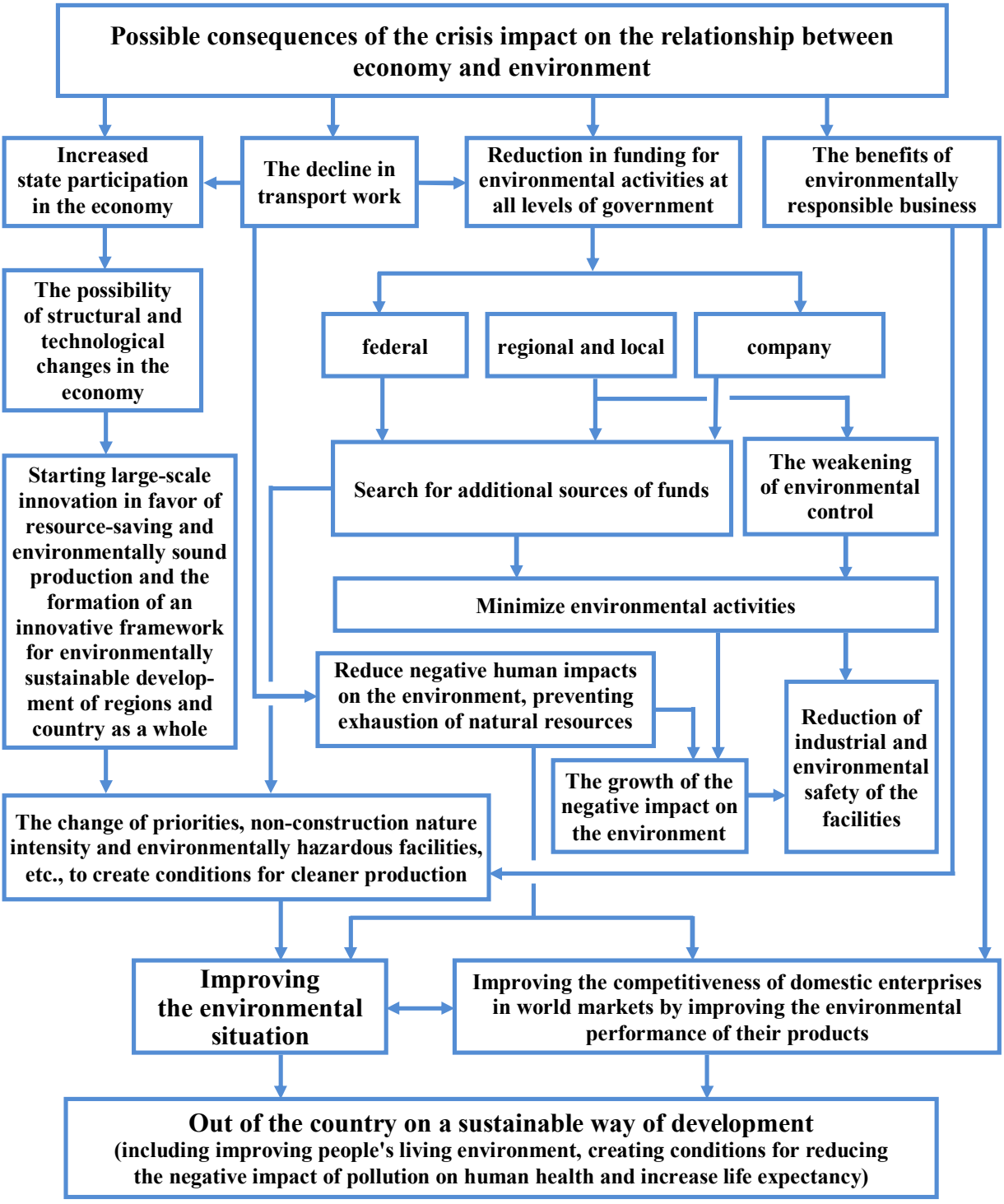

Fig.1. Possible consequences of the crisis impact on the relationship of economics and environment

Decline in production, reduction of transportation leads to a reduction in emissions and discharges, as well as reduced energy demand, which in turn leads to a decrease in revenues of carbon dioxide and mitigate the greenhouse effect.

However, such a reduction in environmental impact is temporary and, as experience shows, as the crisis pressure on the environment not only restored to the same level, but, as a rule, much stronger. This occurs, in particular, because of the desire of enterprises during the economic crisis, to reduce production costs, saving on all reflected in the reduction of industrial and environmental safety of the facilities. In addition, during the crisis of power, especially in the local level, local authorities often mitigate environmental requirements in relation to individual producers and generally weakened control by the environmental authorities. As a result of the ecological situation in the region is usually much worse.

The decline in production is accompanied by a decline in the financial resources from the producers, forcing companies to seek out additional sources of internal funds. This is most often seen in curtailing environmental activities, as it is not directly involved in the main production process and the company will first try to save on the environmental costs, which leads off environmental equipment, saving on electricity, expensive reagents, etc. This was shown by the experience of the crisis of the 1997–1998's in Russia, when the reduction of environmental pollution was far inadequate drop in production, and in some cases there was a marked deterioration of the environmental situation.

During the crisis, reducing the cost of environmental protection is specific not to the production level, but also to all levels of territorial administration – from federal to local, leading to partial or complete curtailment of environmental programs.

Along with this economic crisis generates and some opportunities to solve environmental problems [1, 2, 4, 15]. First of all, participation of the state in solving economic problems increases and thus the opportunity for radical structural and technological change, the transition from resource-based economy to an innovative environmentally sustainable economy are appeared.

Reduction of financial resources at the federal level may force the authorities to review the energy policy of the country and abandon the expensive and environmentally hazardous projects for the construction of new (often highly questionable in terms of their economic and environmental studies, and did not pass most of the state environmental expertise) hydro- and nuclear power plants, as well as the implementation of many other nature-large projects.

The structural transformation of the economy requires significant investment and time to implement them. The action of the Russian government to rescue the major energy and metals companies shows not only the consolidation of the commodity nature of the economy, but also leads to a shortage of funds for investment in the modernization and diversification of production. As a result, instead of the formation and development of high-tech industries and, as a consequence, the reduction of environmental pollution and waste of natural resources, we will have the opposite effect.

The consequences of economic crisis in Russia, especially in Siberia, the impact on the ecological situation faster and stronger, if a significant missed opportunity to modernize production, which resulted from new technologies industry can become the new “environmental” track. However, one cannot ignore the fact that in today's crisis, the Russian company in the search for additional sources of finance is not on the way to finding the best technical solutions, and cost savings, and especially the environment. Therefore, it seems that the appeal of the country's leadership for Russian companies to exploit the situation to the modernization of production (including environmental) is unlikely to be heard by them, and after the crisis should expect any significant increase of human pressure on the environment.

In keeping with today's financial crisis is problematic to expect a radical change for the environment for the better. It is also important to consider that environmental problems require, as a rule, long-term solutions, which focus on the crisis reduced.

An important aspect of financial support environmental measures in times of crisis (and not only) is that the lack of funds to main production activities pushes aside everything else, first of all, the environment. At the same time, environmental protection measures, as long-term, require long-term investment for a fairly large investment lag when payback not only requires long periods, but it cannot be achieved at all (for example, under the existing criteria of investments, ignoring usually economic damage from pollution).

Under current conditions in Russia of the functioning the financial system, when one of the biggest problems is the lack of funding so-called "long" money (i.e. funds to banks for more than one year), environmental sphere remains outside the immediate interests. One solution to this problem is to use these new financing mechanisms, as collective investors (mutual funds), as well as syndication and bond issues [6]. The advantages of these sources of funding are, first, their low cost compared to commercial loans, and second, their big attraction for investors through the use of new technologies, the effect of participation, transparency, operating international reporting systems, improve the quality of products and services and ensuring the environmental safety of the production.

In the end, what environmental scenario would have the best chance for the implementation will largely depend not only on the legislative and regulatory support, forming an effective economic mechanism of environmental regulation, and many other conditions, but also the political will of government officials, their real steps on the use of modern situation for the modernization of the economy. It should be added that in today's market the current level of environmental protection and resource saving technologies and determines the competitiveness of the Russian economy in the world (or rather, its lack of competitiveness). At the same time, the increasing demands for environmental quality and safety of products, the transition to the integration of environmental parameters of the technologies used for the production of products, is one of the important directions of increasing international competition.

Environmental innovation development can not only gradually reduce the level of negative human impact on the environment, but also bring benefits of environmentally responsible business (which requires the establishment of appropriate economic rules of the game), contributing to the overall output of the country on a sustainable path of socio-economic development. In turn, the choice of the ways out of the crisis give a chance and allows the state to conduct structural and technological restructuring of the economy in favor of resource-saving and environmentally safe production and establishment of an environmentally sustainable and innovative development of the country and its regions. One of the conditions for successful development in this direction and to achieve good environmental situation as a necessary element of a decent quality of life and health is to ensure coherence of the regional government, business and the public in the field of environmental protection.

Contemporary crisis showed that the state must be present in the economy, not so much as an owner, how much and above all as a regulatory and guiding force. It is not only the failure of the market, the need to internalize the external effects, including those related to environmental pollution. Launch large-scale processes such as modernization and innovative transformation of the economy by government forces only.

In general, the problems of modernization the Russian economy faces require a change of value criteria for a wide range of relations, including those with the natural environment. Thus, confining to only technological aspects upgrade seems unpromising without creating appropriate institutional environment, one of the elements of which is building relationships with natural environment. A new paradigm in the field of environmental protection, based on the concept of sustainable development, proceeds from the awareness of the need to reject consumer attitude towards the environment and building a partnership with her. Environmental and economic consequences of such a partnership, arising from the consistency of the coexistence of natural, technical and human capacities

are obvious. It is not just about the transition to resource-saving and environmental-oriented technology with all its consequences for the economy, the environment and humans, but also the formation of an environmental ethic, respect for the natural environment, the strengthening of the principles of eco-efficiency and environmental justice.

In other words, it is necessary a change in the criteria, the formation of an adequate institutional framework, without which the modernization of the economy is doomed. Institutional reforms should be aimed at creating a new and better legal and economic mechanism to regulate the interaction of different levels of government and natural resources, subject to the mandatory inclusion of environmental requirements in the procedure for assessing the socio-economic benefits of management decisions.

IMPLEMENTATION OF THE INVESTMENT PROJECTS IN THE REGION OF NEW ASSIMILATION (IN THE CASE OF THE LOWER ANGARA AREA IN THE KRASNOYARSK TERRITORY)

All these problems are particularly pronounced in the implementation of new investment projects in pioneer areas. An example of this type is the region of the Lower Angara area in the Krasnoyarsk Territory. The region is one of the most promising to attract major new investment in Russia. The main reason for the attractiveness of the region is the presence on its territory of diverse and often unique in quality and scale of energy and raw materials, including ferrous, non-ferrous and precious metals, hydrocarbons, various non-metallic materials, forest, water and hydropower resources. The important role played by the previous work in the form of constructed Boguchansk hydro-power station (launch of which was implemented in 2013) and certain infrastructural development. In particular, there are two railway access to the region (Achinsk–Lesosibirsk and Reshoty–Karabula), built railroads Karabula–Yarki, built bridge across the Angara, highways, including Kansk–Kodinsk. Mention may also be available projects Ust-Ilimsk connection with Lesosibirsk as part of the North-Siberian Railway.

All these advantages of the Lower Angara region have led to the development (dating back to the Soviet period) integrated development projects in the region [7, 8, 9] up to now realized in the investment project “Integrated Development of the Lower Angara area” [10, 11]. In this latest project is essentially a fragment of the Lower Angara Federal Target Program (FTP) of development [9], limited to the first stage (2006–2012) by mainly Boguchany industrial hub (Boguchany hydro-power station, aluminum plant and pulp and paper mill). There is no doubt that the great advantage of the initial phase of development of the region is the establishment of a number of large infrastructure projects. In the longer term (the second stage – 2013–2020) is proposed to build new enterprises in the industrial hub Kodinsk (Tagara mine, cement factory) and in the Boguchany node (gas processing and petrochemical plants). New productions are planned in the area Motygino (Gorevsky mining, Motygino hydro-power station). The second phase of development of the Lower Angara region is mainly due to the development of oil and gas fields of the East Siberian oil and gas complex (in the southern Evenkia) and therefore, except for a few industries and transport and energy infrastructure, in the spatial aspect this phase is beyond the bounds of most Lower Angara Funding requirements of this phase is estimated at 540 billion rubles. Note that the current state of the region is characterized by low levels of economic development, investment crisis, mono orientation (timber industry), high share of the shadow economy, sustained emigration and unemployment.

Investment project "Integrated Development of the Lower Angara area" is the largest project in Russia, implemented in the post-Soviet period. The mechanism of its implementation is based on the principle of public-private partnership. Financial support by the state from the Investment Fund of the Russian Federation on co-financing and is aimed at the creation of large transport and energy infrastructure, which should contribute to the strengthening of the industrial potential of the region. In this case, 55.2% [12] of funds required for the project is provided by Vnesheconombank.

Describing the investment project as a whole, it should be noted that in it, in particular, there are no such important features as the complexity of the development of the area from the point of formation and functioning of the basic sectors of its economy in relation to the social and environmental impacts, coordinating the establishment and operation of all facilities on territory, the desire to build an innovative development model with the constant adaptation to the demands of STP, the formation of local infrastructure, taking into account requirements of environmental protection and restoration of natural resources, solving complex web of social problems, aimed ultimately at improving the lives of people, the ability to use available natural resources in the interests of not only large companies, but also people living in the region (and in general in the context of sustainable development – in the interest of present and future generations), etc.

As in the previous design, and present an investment project completely insufficient attention to environmental issues, including those related to the creation of the water reservoir and the compensation of damage, including the lack of science-based predictions of long-term effects of reservoir water quality, ecosystems the Angara river and most Boguchany reservoirs and assess the accumulation of toxic substances in the water and on the bottom of the reservoir. This project continues the current practice hydropower construction when focusing water works, and everything else is considered as minor and insignificant. Remains outside of the project and a connection problem in one place environmentally incompatible large-scale productions (it is primarily on the placement site in Boguchany aluminum and pulp and paper mills).

At the same time the assimilation of the Lower Angara requires a considered approach providing its development from the standpoint of integrating economic, social and environmental priorities through the development of high-tech production, creating energy efficient and environmentally friendly enterprises. This will determine, as will the development of the area in the long term – will it remain mostly raw (limited only by the lower floors energy-production cycles) and emphasis will be placed not only on the integrated development of the area on a "hydroelectric station – aluminum plant" or "forest, water – pulp and paper mill", but also to diversify the economy as a whole, creating the conditions for long-term sustainable development. In this case, the focus should be not so much about mining as the development of processing industries, building the upper floors of energy-production cycles, production of products with high added value and competitiveness in domestic and international markets. Location of such facilities may be in some cases, not in the Lower Angara region, but in the more southern areas of the Krasnoyarsk territory.

In considering the views of the Lower Angara region could become a model region to test the approach to assimilation and development based on innovative principles.

Among the factors contributing to the need to go to the region with the technologically advanced industries, an important place belongs to the specifics of local environmental conditions in the region, making a significant contribution to the formation of the ecological situation. The Lower Angara area has a low potential for assimilation, which is due, first, to unfavorable (high) potential contamination of the atmosphere (Lesosibirsk and Kodinsk areals have the worst conditions) and, second, to the low self-cleaning capacity of surface waters and, therefore, adverse conditions for the oxidation of organic matter, and already achieved a fairly high level of water contamination by organic (in particular,

phenols, oil products and other organic substances). This is compounded by the creation of reservoirs and a violation of the natural hydrological regime of the river Angara. Self-cleaning ability of the Angara has to date largely been exhausted, and a number of pollutants (such as suspended solids, phenols, petroleum products, etc.), water quality does not meet the required standards, which, in turn, imposes special requirements for basic and environmental technology planned in the region of production. Add to that already developed quite a high level of background contamination of the aquatic environment in Boguchany and Kodinsk, on which much of human pressure as a result of the investment project.

Equally important is the choice of capacities for the enterprises of the region. The planned power Boguchany aluminum plant 600 thousand tons per year does not correspond to international practice, as maximum power aluminum smelters in the world of 200–250 thousand tons per year, and is now close to 190 thousand tons per year [13, 14]. Moreover, the ecological incompatibility of aluminum production process and technological cycle of the pulp and paper may lead to the risk of recurrence by Boguchany of the sad fate of Bratsk, where the creation of such a super power resulted in the death near the town of pine forests.

In general, low regenerative capabilities of the natural environment of the Lower Angara region impose strict requirements for production technology. This includes both the technology (the main production technology) and environmental innovations (environmental protection measures, etc.). Only under these conditions can raise the issue of the creation here of the economic complex in general, and in the targeted structure of production and their capacities in particular. And there must be not only a priority of advanced low-waste technology for the primary production of the objects, but also to conduct a variety of conservation measures to ensure comprehensive coverage of all sides of human impact on the environment, including the use of the opportunities of the industrial location and the territorial organization of the productive forces, waste management, the choice of different options technologies of neutralization of pollutants and their combinations, etc.

Thus, the specificity of the region is such that its exploration and the formation of the production and spatial structure of the economy will require the development of adequate innovation policy. Such a policy should be formulated as the “bottom” (at the level of individual objects), and the “top” (at the level of the federal government and the Government of Krasnoyarsk territory).

Among environmental innovations, in the first case, first of all, should be noted the development and use of eco-oriented technologies, including the organization of waste management, the introduction of environmental management systems at industrial plants, environmental certification, the formation of environmental marketing, etc.

In the second case – the consideration of structural features of interest and opportunity of the region's economy in the long term (which require a refusal from raw materials scenario), creating tools eco-innovation activities with a focus on encouraging the introduction of environmentally friendly technologies, the formation of the environmental requirements for the development and continuous improvement of technology , the development of systems for licensing of all activities affecting the dangerous ecological situation, restoration institute environmental expertise, implementation of environmental audits, etc. The solution of many of these problems could contribute to the transformation of the investment project in the federal purpose-oriented program.

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