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Sustainable development of a new extractive region in the oil and gas project activity on the Arctic Shelf

The article deals with the questions of sustainable development of a new extracting region during hydrocarbon field development. Balance of interests and minimizing of the contradictions between state, oil and gas companies and local communities in the oil and gas project activity define the progressive and balanced economic development of the new extracting region. The authors show the social and economic approaches for hydrocarbon field development taking into account the foreign experience of natural resources exploitation. The article also covers the questions related to the interaction between the state and oil and gas business and the creation of effective control strategy for hydrocarbon resources development in the new oil and gas extracting region.

Sustainable development, oil and gas industry, shelf, hydrocarbon resources, social and economic effects.



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The Russian legislation and subsoil use regulation system were focused on the problem of maximum involvement of natural resources in the market turnover and rental income removal at the end of the last century. In modern terms, the main priorities of the state regulation of oil and gas industry should be aimed at the creation of conditions for the mineral complex participation in the solution of a wide range of social and economic problems in connection with the economic transition to stable development.

Sustainable development of a new oil and gas region presupposes the mechanisms to ensure the necessary development, consumption level and social cohesion, sustainable economic development and implementation of stable functioning of the biosphere.

The main direction of oil and gas industry development is the creation of such conditions that would favour the convergence of realized and potential value of hydrocarbons. The public value means the totality of the effects (direct, indirect or multiplicative) which are derived from the development and utilization of hydrocarbon resources [7].

Such effects can be expressed not only in money but in the form of such indirect benefits as the increasing of the human capital value. In this case the human capital is referred to the set of such human skills as education, intelligence, creativity, work experience, entrepreneurial ability, etc. Thus, during the development of oil and gas resources in the central planning and management system they focused on the achievement of a certain level of business process perspective, so the realized value (at the regional level) differed significantly from its potential level.

It is possible to ensure the salable public value of hydrocarbon resources if we have the developed system of modern civil society institutions, as well as the efficient specialized institutional system aimed at the socially-oriented deposit development.

The economy of oil and gas regions in general is based on the extraction of hydrocarbon resources. It is heavily dependent on the pace of the deposit development. The significant changes in living conditions take place in the process of economical activity. There are also structural improvements in the regional economy and social sphere, development of transport systems, environmental changes and intensification of migration flows. Large-scale commercial development of oil and gas area, significant changes in the economic and social sphere concern the people living in this area. However, the process of oil and gas exploration is accompanied by a number of both positive and negative trends, which require the aimed actions of the state to correct these trends.

An exhausting factor of hydrocarbon resources requires taking into account not only economic but also social impacts of resource development and conditions of the regional economic activity at all the stages of production. These factors require an integrated approach to the assessment of the oil and gas exploration consequences and full accounting of the oil and gas exploration features and their influence over the social and economic system in the region.

Experience of the leading oil and gas countries shows that the approaches to the integration of hydrocarbon resources development and a wide range of social and economic problems were successfully implemented over the past 20-30 years. Such approaches suppose the emphasis transfer from the estimates of the financial and economic impacts of the projects to the social and economic results of their implementation.

Policy analysis of the industrialized countries, which are also the major users of mineral resources (Norway, Australia, the USA, the UK, Germany), shows that the liberal institutional system in the field of property related to the usage of conventional assets is supplemented with an extensive system of rules, regulations and procedures in the field of subsoil use.

These facts meet the requirement of the state in the protection of its rights as the owner of subsoil resources, as well as they create the conditions for the effective dynamics of non-renewable resources development and use in terms of the public interests.

The most typical example of responsiveness to the social and economic factors in determining of the hydrocarbon resources turnover is the development of the North Sea shelf by Norway especially. There wasn't the oil and gas industry in Norway in the early 1960s, but there was awareness that it was necessary to develop it with the active participation of the government. The auspicious economic situation favour the development of firm negotiating conditions for the oil and gas industry: sustained growth of economy, high employment, budget surpluses and the lack of urgent necessity in the accelerated development of oil and gas industry in whole.

This situation set out a framework of the stable state positions in the negotiations with the international companies which held their interests in the development of the Norwegian continental shelf. The main objective of Norway was to gain its positions by the expanding of its domestic presence: state participation in the projects and increasing of oil and gas industry regulation rate in whole. The government with the state ownership of subsoil can expect not only to receive money (taxes and charges) depending on the institutional and economic conditions, as well as the bargaining power between the state and subsoil users. A very important factor is the development of the local industries related to the supply of goods and services for the oil and gas industry.

Norway's success in the high-level use of hydrocarbon resources for the benefit of the society owes the government policy, which encourages partnerships between the foreign and Norwegian companies. Thus, the Norwegian government has made compulsory research programs for the foreign companies.

It is a prerequisite for the fact that the oil and gas technologies, developed and implemented in Norway, currently are the best ones in their fields. Since 1970 the state has been recognizing the importance of promoting competition in the oil and gas industry and at the same time the need to encourage the development of domestic oil and gas sector. Thus, the use of local goods and services was explicitly defined by the law: the Norwegian share of delivery quota was 90% in the period from 1972 till 1974 [3].

The Norwegian state-owned company "Statoil" was created in 1972. Also two private Norwegian companies "Norsk Hydro" and "Saga Petroleum" began to develop the shelf. Their activity was concentrated to create the key role of the Norwegian companies in the oil and gas sector.

The international and foreign companies were given a key role in technological ensuring in the cooperative alliance with the Norwegian companies. Also they played a role of a "catalyst" in the process of the Norwegian companies' transformation into the full-fledged offshore operators.

Joint ventures in the service sector were also established on the basis of the principles, the results of those allowed the Norwegian engineering companies to gain an access to the advanced technologies. The Norwegian experience shows that the procedure of the foreign companies' access to the development of the hydrocarbon deposits can be used effectively as a tool to solve a wide range of technological, economic and social problems. So, for example, the implemented social value of "Ekofisk" field development (it is the largest oilfield of the North Sea offshore) at the end of 2004 was the following: the total value of extracted resources included 36% of goods and services value (they were bought for the project), about 50% were the share of usual taxes and rent charges, approximately 4% were the share of salary for the employees and the owners of the subsoil companies earned about 10%.

A very important aspect of the oil and gas sector activity is its influence over the social and economic system in the region and over the country in whole. It provides the additional benefits to different recipient (for example, industry, science and education). However, not all of these benefits can be accurately assessed, for example, if we compare them with indirect and multiplier effects from the implementation of the investment projects which are characterized by the high capital intensity and long organizational period.

Promotion of the productive infrastructure in the extractive regions deserves consideration in the national economic policies. It is a prerequisite for sustainable and effective development of the oil and gas industry as a basic component of the regional economic specialization. The industrial structure of the oil and gas region is characterized by the fact that it renders the tangible and intangible productive services, which are auxiliary in nature. Oil and gas industry has specific requirements for service-producing industrial infrastructure in the region; it defines economic activities of the regional enterprises and organizations and, indirectly, the standard of living.

The main tasks of the new extractive regions at the different stages of deposit development are the following [10]:

1. At the exploratory stage:
 - creation of the conditions to attract the oil and gas companies in the region (normative and legal, investment, etc.);
 - encouraging of the hydrocarbon deposits exploration in the region;
2. At the stage of the growing production:
 - maintenance of the competitive environment in the emerging oil and gas sector;
 - attraction of new investments to the region;
 - ensuring of the effective stock selection;
 - filling of the budget;
 - rental income maximization;

- creation of the industrial, transport and social infrastructure;
- involvement of manpower resources;
- 3. At the stage of the stable production:
 - tax collection;
 - use of oil and gas production funds;
- 4. At the stage of the final production:
 - extension of oil and gas production in the region;
 - formation of a new economic structure;
 - the social issues associated with the labor force release;
 - use of accumulated intellectual, industrial, infrastructural and financial capacity.

There is necessity to maintain the employment rate and form a new economic structure in the region as the development of hydrocarbon fields is continued.

The factors and conditions established in the territory during the oil and gas sector development can be successfully used in the formation of a new structure of the regional economy in future. The auxiliary process network can be re-oriented to service oil and gas production in other regions. Oil and gas processing facilities, as experience shows, can continue their operation at the expense of raw materials from other producing regions (including the newly developed areas). The intellectual capacity (skills, knowledge and experience of employees) accumulated during the development of oil and gas region can be used in the development of new high-tech industries in the region.

At the same time creation of highly developed infrastructure in the process of deposit development allows us to consider the opportunity to cross-cutting transportation of various cargoes as a very significant way of the regional economic development at the stage of the final production.

The process of equal relationship with the major oil and gas companies and operators of the projects by the conclusion of various agreements helps to avoid the aggravation of contradictions.

Settlement of relations between the region and extractive companies is mainly related to offset of debt, environmental issues, reproduction of mineral resources and protection of the indigenous population. However, such agreements are current in nature; they are aimed to solve a backlog of problems and they don't influence over the regional economy activity in the long term.

Balance of interests and minimization of the conflicts between our state, oil and gas companies and local population largely determine the progressive and balanced socio-economic development of the extractive region. Ignoring or infringement of the interests of any of these subjects will inevitably lead to the significant reduction in the so-called synergy, based on the mutual cooperation.

The balance of interests between the state, government and local population is a key prerequisite for sustainable regional development. In the process of the Arctic deposit development the nature of such interaction has its own characteristics and the problems of interest coordination are more acute and urgent. Firstly, it is caused by the predominance of resource extraction industries and increasing anthropogenic load on the fragile nature of the northern territories. Such changes influence greatly over the old-people engaged in the traditional use of land. Natural ecosystem disturbance can mean not only the deterioration of living conditions but it can undermine their ethnic and cultural sustainability. Secondly, it is caused by the increased demands and great expenditures of the social infrastructure in the northern regions because of rugged climatic conditions. So there is a necessity to increase social responsibility of businesses which work or intend to carry out their activities in this area.

The analysis shows that interests of the population in Russia are the least protected ones in the institutional environment of interaction between government, business and local communities.

This is due to many factors such as the lack of legal safeguards to protect the population interests, weak enforcement mechanisms of the existing regulatory requirements and undeveloped civil society institutions that are able to represent and defend such interests.

The protection of rights of the people from the northern regions has become topical because there are the plans to implement the large-scale investment projects to develop new deposits of natural resources, especially hydrocarbon resources of the Arctic shelf. Such projects require huge financial and human expenditures and suitable infrastructure, which greatly change the social and economic situation in the areas covered by the impact of the projects. World and domestic experience shows that these effects can be both positive and negative according to their influence over the social and economic conditions of local population.

The process of hydrocarbon deposits' development includes the following macro-economic effects of their development:

- effective investments;
- modern technologies transfer;
- increase in budgetary revenues;
- indirect effects associated with subcontracting of the regional enterprises;
- increase of the employment in the region.

Table 1 summarizes the positive and negative consequences of the oil and gas fields' development for the region that influence over the formation of multiplicative economic effects.

All these macroeconomic effects are the components of economic multiplier effect, which expresses the current economic relationship between the sectors. At the same time it is accepted to allocate the mining industry as a so-called "generator" of the investment wave which transmits economic influence to the related sectors.

Table 1. Objective positive and negative consequences of the oil and gas fields' development for the extractive region

Positive	Negative
Rapid growth of industrial production in the region	Limitation of economic dynamics by the deposit reserves
Increase in tax base	Competitive reduction of other companies in the region because of tax preferences
Increase in profitability of hydrocarbon production	Inclination of the regional economic system to a monoprodukt type
Population's incomes growth	Differentiation according population's incomes
Impetus to the development of regional infrastructure	Sharp load incensement on the ecological system

The concept of “multiplier” (from Lat. “multiplicator” means “increasing”) was introduced in economics by the English economist Robert Kahn in 1931. Considering the influence of the public works, which were organized by the Roosevelt administration to fight recession and unemployment, he noted that public investments to public works led to the multiplier effect of employment: there was not only primary but also secondary, tertiary, etc. employment.

In other words, the initial investment costs of the budget led to the multiplication of purchasing power and employment. Those ideas were expressed in the Keynesian theory of the multiplier effect. The multiplier was meant as the coefficient in the Keynesian theory which showed the dependence of output and national income from investment changes.

The multiplier principle is based on the relationship between different sectors or industries. In general, it can be formulated as the following statement: growth of demand in one sector will automatically cause the growth of demand in other industries that are linked to each other technologically. Thus, the demand for oil and gas equipment causes an increase in demand for metal parts and electricity. In turn, the metallurgical works will increase the demand for ore; the power plants will increase the demand for natural gas, coal, etc. Thus, there is a number of investment impulses, which are very beneficial for the economic system.

Oil and gas complex is characterized not only by high and stable domestic and export demand for its products, but also creates a high

level of demand for the products of the related sectors. The degree of related sectors development is characterized by a so-called multiplier index. The developed countries have the following multiplier indices: Norway – 1.6-1.7; Australia – 1.8-2.4; the USA – 2.1. Calculations show that the “oil and gas” multiplier is 1.9 in Russia; it corresponds to the multiplier indices of other oil-producing industrialized countries [9].

Thus, Russian revenues from the “engineering” line of the Shtokman gas condensate field (by placing orders with Russian contractors, carriers, etc.) can double the revenue of its similar “gas” line.

There is a growing demand for high technology, high-tech products of manufacturing industries due to the movement of oil and gas resource base to the Arctic shelf.

The main high-technology industrial potential of Russia is concentrated in the sectors of the military-industrial complex. Its conversion to the production of oil and gas equipment is associated with the decision of the key economic objectives – it is necessary to provide a guaranteed recoupment of investment in the production of equipment for oil and gas industry at the expense of hydrocarbons, which will be produced within the framework of the oil and gas development projects meeting the demand for the equipment. Consequently, the economic growth in the defense sectors and other “non-extractive” industries of the Russian economy depends on the extent and effectiveness of investments to the oil and gas projects.

Table 2. Characteristics of the multiplicative effect

Baseline characteristics	Multiplicative effect
Contents of the effect	It is a set of indirect influence effects over the regional economy; it is expressed in the ability of the complex to develop sectoral and inter-sectoral production to meet the demand for resources due to intra-regional demand for these recourses.
Forms of the effect	<i>Sales multiple</i> is generated by the use of common distribution channels and sales management from the single center
	<i>Output multiple</i> is arisen from the initiation of regional demand for the production resources. It takes stock of the necessity to develop sectoral and inter-sectoral production meeting this demand.
	<i>Revenue multiple</i> is expressed in the growth of wages, rent, profits and other income of the participants in the cluster
	<i>Employment multiplier</i> expresses the correlation of output growth and total employment in the region

All of these macroeconomic effects (*tab. 2*) are the components of economic multiplier effect, which was calculated firstly by the team of scientists under the leadership of A. Arbatov [2].

The multiplier denominates the existing economic relation between the individual sectors. The mining industry as a “generator” of the investment wave influences over other related sectors. If you have a good empirical base the multiplier makes it possible to determine the economic strength and the period of its validity in advance.

Multiplier effect weakens as the distance between a particular sector and the generator sector becomes longer and demand and profitability drop. This effect loses its effectiveness over time, it is quenched.

According to the logic of the market economy, a private investor seeks to maximize the direct economic effects taking into account the existing risks; the state should maximize the total economic and social effects taking into account the social, environmental and other constraints. A private investor and the state play their own game on three key issues: taxes, costs and profits [6].

Thanks to the multiplier macroeconomic effect is more powerful and longer in the long-sighted and rational system of taxation of private investment projects which include oil extraction. It is behind of the direct financial effect which is received by the direct participants of the project.

Thus, the time horizon of the state should be much more extensive than the time horizon of the commercial participants of the investment project. If the investors are interested in the returning of the invested funds as soon as possible without high risks, the state is interested to start a creative economic process and put off a direct budgetary effect if it is necessary. It allows you to find a rational combination of the zones of interest between the state and investors. However, in this case the state should refuse to meet a part of its ongoing interests in order to achieve the long-term economic objectives.

The state reduces the economical effect which is potentially achievable for the society in order to increase the direct revenues to the budget. This effect can be measured by the integral (total) economic effect of the project, determined by a combination of direct and indirect effects of the project and multiplicative effects generated by the previous effects[1,6, 11].

Obviously, the more businesses will be involved in indirect participation in the oil and gas project, the greater the final effect will be. And the more the tendency of companies to invest, the greater macroeconomic effect will be. It is very important and difficult object of government regulation.

Based on the above, it is rightful to conclude that the most important strategic objectives of the government and the regional authorities concerning the regulation of subsoil use

in the oil and gas sector is to ensure sustainable and balanced development of oil and gas industry in the extracting regions and in the whole country. It is possible to achieve these goals by the use of the state methods and tools to regulate the economy in the conditions of market formation.

Thus, the multiplicative (indirect) effect in the realization of oil and gas projects is stipulated by the development of other industrial enterprises in the new extractive region. It means that investments in the cluster form the increment of consumption and revenues not only in the cluster, but also in other sectors of economy.

The magnitude of the multiplier is greatly affected by such features as population savings rate, current tax regime, the level of capital investment financing, government consumption from the state budget and non-budget funds, as well as a number of other macroeconomic indicators.

The longer chains of internal economic relations, generating the effect of multiple capital circulation and, therefore, the additional indirect economic activity, correspond to the larger value of the multiplier. For example, if the project is distinguished by a high share of added cost in its results and the resources (goods and services) which are consumed, as well as by higher wages of the staff and direct contracts, it usually means the strengthening of indirect economic effects and multiplier increase.

However, it isn't clear that such projects should be preferable. Although the oil and gas projects with a large share of fixed capital investments realized in Russia have lower values of the multiplier, but firstly, they create the necessary conditions for implementation of follow-up plans, creating a higher multiplicative effects (for example, oil development creates demand for transport services).

Secondly, large investment projects generate a significant absolute increase in indirect economic activity that facilitates the management of investments and creates good preconditions for the further economic growth.

Depending on the development level and other features, the internal investment market determines itself the optimum balance between different projects and makes the attractive investment climate.

In general, the efficiency in related industries can be measured through the multiplier using the following relation [4]:

$$\mathcal{E} = \sum_{i=1}^n M \cdot \mathcal{E}_i$$

where E – cumulative investment effect;

M – multiplier;

\mathcal{E}_i – the secondary effect of the i -th sector from the basic industry investment;

n – a number of industries where the effect is obtained by the basic industry investment.

Huge reserves of hydrocarbon resources on the Arctic shelf allow us to speak about a significant rental potential for the country in spite of the remoteness and harsh climatic conditions, which raise cost of works in these areas. Prudent fiscal policy of the oil and gas field development in the North of Russia could become not only a profitable investment and source of rental income for the state, but also it can be the basis of regional socio-economic development.

The development of gas and condensate field in the Barents Sea and the laying of pipeline to the coast of the Murmansk Oblast will significantly contribute to the socio-economic development of the neighboring regions, in particular, the Arkhangelsk Oblast, which is one of the shipbuilding centers in Russia. Despite the production diversification occurred in the largest military enterprises of the Arkhangelsk Oblast and their reorientation to civilian purposes, the organizations were able to maintain

their high professional technical personnel and ability to work with high technology. As the largest shipbuilding center in Russia, Arkhangelsk and its transport companies would be able to supply the goods for the oil and gas projects to the Murmansk Oblast.

It is important to note that the resulting indirect effects exceed the direct cost in the economic aggregate.

Thus, according to the expert judgements, the implementation of the projects to develop the Arctic hydrocarbon resources and the effect of oil and gas industry development in the Murmansk Oblast will influence over the eight regions: the Murmansk Oblast, the Arkhangelsk Oblast, the Vologda Oblast, the Leningrad Oblast and St. Petersburg, the Republic of Karelia, the Republic of Komi and Nenetsia Autonomous Okrug. Not only extractive, but manufacturing and machine building North-West regions, building industry and power industry will feel the main effect of the oil and gas complex development. According to studies, every additional ruble of the oil and gas industry increases the GRP by 1.5 – 1.6 rubles [5]. An additional effect will be obtained in the form of tax base increasing, job creation, incensement of solvent demand, etc.

The world practice proves that during the realization of the oil and gas projects up to 80% of the total amount of work is the share of the enterprises that are suppliers of the oil and gas industry. These suppliers include service companies, large metal, construction, transport and other suppliers of materials, equipment and steel structures, as well as scientific and educational institutions which are representatives of various industries.

When we refer to oil and gas, most people think about big corporations, but only a few of them know that small companies also work on the shelf. Many important service and supplying companies on the shelf are the small businesses. Seven companies out of ten have fewer than 10 employees [8].

The emergence of a new oil and gas region in Russia determines the need for small business development in the oil and gas sector through the effective economic instruments aimed at creating and supporting of small and medium-sized companies in the oil and gas sector. The special feature of the organizational structure of the global oil and gas sector is the high role of small firms at the initial and final stages of exploration and development of the raw material provinces.

The development of large oil fields requires a significant amount of steel structures, equipment, paint-and-lacquer materials, special clothing, foodstuff, as well as construction, exploration, transportation, scientific researches and other kinds of works and services.

Oil and gas industry generates employment of hundreds of the related industries' enterprises. Currently oil and gas industry has an exclusive national economic and social importance because it predetermines the employment, and efficiency of economic relations, it strengthens the inter-regional relations and increases the tax base.

The maximum pulse rate of production capacities and capacity expansion should be a general approach of industrial policy to develop hydrocarbon fields in new extractive regions. This will allow the bulk of enterprises to restore the economic situation, establish financial management, settle with creditors and increase investment opportunities due to depreciation charges, as well as by increasing of their own profits for investment that will allow them to modernize the fixed assets and maintain them in working condition.

Oil and gas projects can involve the key industries which are related to intersectoral technological chains. Accelerated development of these chains will be a driving force for the allied industries, that is, they will stimulate the development of their suppliers, etc. The multiplicative effects will operate at the certain stage.

They are a kind of self-stimulation of economic growth. In fact, it is a stimulation of an upward spiral of production demand, and subsequently, investment and consumer demand. According to the results of many scientific studies, the domestic demand is the main and the most reliable engine of economic and social progress.

It is important that the industry creates the bulk of gross domestic product, as well as the fact that this industry determines the technical

level of other sectors of the economy and social sphere, and, consequently, the positive dynamics of industry determines social development.

Obviously, the development of hydrocarbon resources in new regions should be socio-oriented in nature. It is necessary to use a comprehensive approach to solve the problems of the extractive territories, taking into account the specifics of formation, development and operation of the oil and gas sector in the region.

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