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INDUSTRIES AND INTERINDUSTRY COMPLEXES

Formation of an Innovative Cluster of Subsoil Usage

A. I. Ryumkin
Tomsk State University
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Abstract—The content of one of the most prospective variants of transition of the Russian economy to an innovative way of development on the basis of the leading sector of energy supply in the economy of Russia is stated in this article. Objectively, it is one of the most science-intensive areas, differing by the uniqueness of each of its objects, the prospecting and development of which are related to research and analytic activity in specifying the features of deposits, characteristics and qualities of layers, and the parameters of boreholes. The concept of the formation of an innovative cluster of effective subsoil usage in Pritom'e, which is created with allowance to the unique position of the Tomsk scientific and educational complex at the periphery of the two biggest territorial provinces of energy resources, such as western Siberian oil and gas and Kuznetsk coal, located not far from the greatest deposits of rare metals.

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In the 21st century, humanity actively relate their future with new technologies. A priority is also given to the innovative model of economic development in Russia; the innovative way of a country's development is usually opposed to the primary way (as negative). Such estimates are not surprising, because there is almost no detailed research on the problems of the economic policy in Russia based on wide and reasonable usage of natural resources [1]. Meanwhile, the level of usage of new technologies in geological prospecting, geophysics, and the oil and gas industry is much higher than in other industries. For example, complex mathematical models for describing layer structures during prospecting and extraction monitoring are actively used in oil and gas production. In the world, oil and gas objects are the largest consumers of highly productive computer equipment and software [2]. Since in the nearest decades, world demand for energy resources will steadily increase because of the population and economic growth, their deliveries are economically perspective for Russia, and, in addition, they guarantee the necessary measures of "energy diplomacy." Therefore, the development of innovations in the country's main industry, which provides about 45% of the budget incomes and 55% of currency earnings, is the main problem. Its solving will allow for modernizing other segments of the production complex of the country along the chain of industrial interrelations.

Nowadays, Russia does not reach the levels of developed countries in production efficiency, having the largest mineral raw-materials base in the world. Meanwhile, the aggravating competition between countries dictates the necessity of a significant reduction in expenses and usage of new technologies of prospecting, extraction, and processing of minerals, which is impossible without "forced" development of innovative methods in subsoil usage. Basically, it is possible to reach a double effect, that is, increase in the efficiency of the production sector of subsoil usage and development of a domestic innovative complex to solve this problem.

Since subsoil usage is always spatially localized, conducting an active cluster policy with a motivation for the development of prospective clusters is most constructive. According to the official definition, territorial and production clusters are associations of companies; suppliers of equipment, components, specialized production, and services; scientific research and educational organizations related on the basis of territorial closeness and functional dependence in the sphere of production and realization of goods and services. At the same time, clusters can be both on the territory of one and several subjects of the Russian Federation [3]. Generally speaking, the perspective of clusters creation is confirmed in many federal documents, although the number of successful initiatives is not large.

From the perspective of the above-mentioned problem, the position of the Tomsk city is unique, because it has one of the strongest scientific and educational complexes in the country and is situated on the territory of regions with resource of world significance, such as the West Siberian oil and gas province and the Kuznetsk Basin. From the point of view of administrative and economic considerations, it is reasonable to limit the spatial structure to the territory of Tomsk oblast (TO) and Kuzbass. At the same time, there is an opportunity of extraction of solid and liquid minerals, consideration of the special features of local oil generated from carbonaceous organic matter [4], production of methane from coal deposits, compensation for the deficit in raw materials of metallurgy of the Kuznetsk Basin by means of Bakcharsk iron-ore deposits of TO, and also incorpo-

ration of unique technologies of the Siberian chemical factory (SChF) in the enrichment process and mineral processing (rare metals). Many of these opportunities, which can only be realized by usage of innovative technologies, resulting in a significant strengthening of internal relations in the region and appearance of transport streams, for which infrastructural development is necessary. According to some elements (the existence of solid and liquid energy sources and atomic power at the same time), this region is unique.

It is known that strong competitive clusters developed due to the capacity of generation of innovations, which allowed them to be ahead of competitors. In this case, there is an opportunity for formation, on the basis of clusters, innovations in the field of effective subsoil usage, its sustainable development, and, on its example, development of the most important mechanisms of motivation of the country's innovative development.

Condition and opportunities of cluster development. A detailed description of the production base of the region is in the works of some authors [5–7]. At present, in Tomsk, Kemerovo, and regions adjacent to them, along with the biggest universities and NII, there is a pretty developed complex of interactive production, project, research, and service enterprises, which is a prototype of strong clusters of subsoil usage, such as oil and gas productions, as well as coal mining and metallurgy. A high level of technologies is used in many enterprises of the region, although there are many unclaimed long-term developments. A special program (SO RAN) was supposed to implement them in the Kuznetsk Basin [8], but its realization depends on the level of financing and organization of target management.

According to the usual scheme of production development, the formation of several clusters is possible in the region, for example, oil and gas in the Tomsk region and in the north of the Kuznetsk Basin and coal and metallurgy in the Kuznetsk Basin. However, the regional specificity—generality of many problems and tasks of the organization of production processes, need in new technologies to realize long-term projects, and the existence of a strong education and research complex—lead to the necessity of new variants of development, which would fully realize the idea of innovative clusters of subsoil usage of in Pritom'e.

At present, it is possible to isolate two main approaches to the organization of innovative development in Russia:

–The innovative approach, in fact, importing western forms of organization of innovative systems and related creation of incubators of innovations, technoparks, and venture capital firms, is unproductive because of the lack of internal demand for innovations;

–The corporative approach, differing by the unavoidable narrowing of the subject of long-term researches, lack of fundamental ideas, traditional presentation of objects, absence of the necessary flexibility, corporative secrecy, and orientation towards using and copying import technologies, leads to the reproduction of technological lag behind world analogues (with autonomous organization of corporative centers).

Approaches, taking into account the specificity of the country's conditions and the peculiarities of the objects, are necessary for effective innovative development.

Now target-oriented programs of local cluster development are successfully realized in different regions of the world. There are some similar projects (car cluster of the Samara region, Omsk petrochemical, St. Petersburg shipbuilding, and others) in Russia. In the context of the cluster policy of the Russian Federation, it is supposed that the executive authorities of the subjects of the Russian Federation will be initiators of the formation of organizations of cluster development. At the same time, the financing of cluster development can be supported by means of the federal budget, including innovative funds of the Russian Federation and government support of small and medium-size enterprises (SMEs) [11].

Conducting a supporting cluster policy [12] is more reasonable if the government takes part in the organization of cooperation between the participants in a cluster; fulfills partial financing of projects; and invests in the development of infrastructure, education, marketing, and motivating cluster development. Taking into account the specificities of the functionality and location of the innovative cluster in Pritom'e, it is possible to isolate the following main tasks of development:

–qualitative increase in the work efficiency of cluster structures on the basis of innovative technologies;

–more advanced processing of primary raw materials;

–expansion of the directions of subsoil usage, involving other minerals in processing, except profile energy resources;

–complex development of the territory with allowances for more efficient usage of the infrastructure;

–increase the incomes of federal and regional budgets;

–conservation of the ecology of the region.

The sector of subsoil usage differs in its specificity from other sectors of the economy; that is, each of its objects is unique. It requires monitoring and individual decisions at each stage—from conducting regional and exploration works to operations in separate borehole—but they should not be typical and common decisions in contrast to, for example, the machine-building and electronic industries or the energy industry. This defines the great research potential of the cluster and the efficiency of usage of innovative approaches at all levels and stages of the subsoil usage process.

The specificities of the cluster are indicated in an analysis of the regional problems of subsoil usage and long-term projects related to them at the regional level. By measures of rational structural policy within the cluster, it is possible to significantly increase cross-clus-

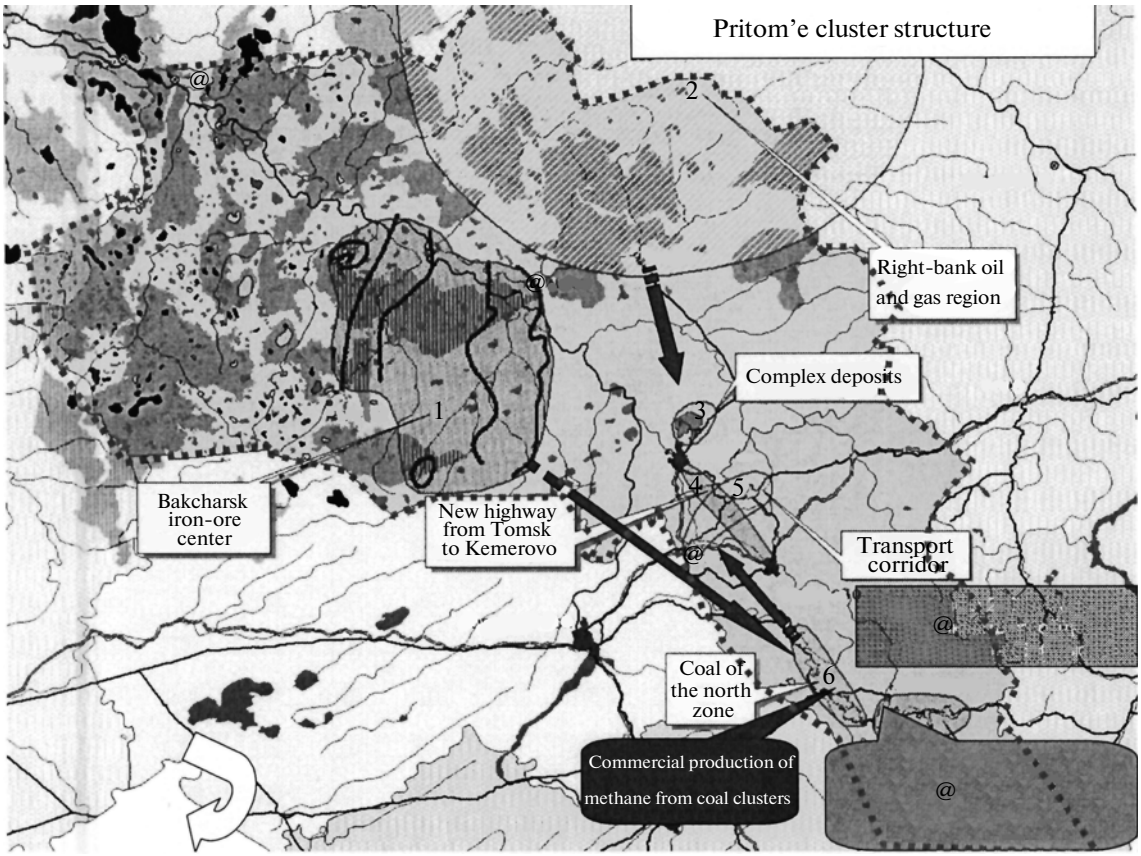

Fig. 1. New projects in the region and the spatial structure of the cluster.

ter communication, dramatically reduce expenses on transportation, and increase VRP, realizing the following long-term projects (Fig. 1):

–forcing of prospecting of the long-term oil and gas industry of Pravoberezh'e on the basis of new technologies;

–organization of extraction and processing of coal methane and production of liquefied gas on the basis of new technologies;

–absorption of the biggest Bakcharsk deposits of iron as a raw-material base of metallurgy of the Kuznetsk Basin and Ural in Russia;

–exploitation of polymetals in the southeast of the Tomsk region to produce alloy additives in the steel industry;

–formation of centers of innovative technologies for subsoil usage in Tomsk and Kemerovo;

–processing of dumps and waste materials of some enterprises in the region to elicit noble and rare metals;

–capacity utilization of the biggest Siberian chemical plants of the Seversk city on the basis of processing and enriching products of primary subsoil usage and extracting valuable metals;

–establishment of a transport connection between the Kuznetsk Basin, Tomsk region, and the West Siberian oil and gas complex (WSOGC);

–formation of a modern base for production of mining and field equipment for the WSOGC and eastern regions of the country on the basis of the strong mechanical-engineering plant in Yugra;

–creation of a modern interregional logistics center in the Yashkino region, which will include a big storage terminal, international airport, river port, and a railway terminal.

All these projects have the most important goal, but their realization is impossible or difficult on the basis of the previous technologies. For a long time, the territory of the right bank of the middle reach of the Ob River was unpromising for producing oil and gas and was not almost researched. In recent years, works on prospecting poorly studied areas have started upon the initiative of the administration of the Tomsk region. The results of deep drilling and regional geophysical works allow for hope concerning the high perspective of the Paiduginsk and Predeniseisk oil and gas regions. At the same time, the hugely bad knowledge and the vast area of the territory do not allow for obtaining results within a reasonable time frame on the base of traditional technologies. It is necessary to use innovative methods of exploration

geophysics, structural and formational interpretation of the data on seismic works, aggregation of the data of high-precession magnetic measurements, gamma spectometry to create verifiable and interpretational models, and informational technologies to prepare geopictures, as well as to create three-dimensional geological and geophysical models.

It is also necessary to have new technologies of final reconnaissance, extraction, and enrichment to develop the biggest Bakcharsk iron-ore deposit. Here, in recent years, more than 1000 t of iron ore with a high concentration of iron were recovered on the basis of a technology of hydraulic mining of boreholes. A new technology of metal enrichment on the basis of nanotechnologies, which allows for getting ultraclean ingots with a concentration of iron of more than 98% and including alloy additives, was developed. At production volumes of up to 100 mln t per year, the necessities of the metallurgy complex of the Kuznetsk Basin and Ural are provided and the delivery of raw materials for export becomes possible.

This project includes some potential production in the area of polymetal deposit development in the region [13, 14], which need complex processing and substandard technologies related to the structure of the raw materials and their location. It is possible to receive a complex of noble and rare metals (platinum, gold, silver, titanium, zircon, lanthanide, and others) from the processing residues of some productions of colored metals in Siberia on the basis of ecologically clean fluoride technologies of the SChF. It would allow for getting a guaranteed resource base of solid-state production and creation of new-generation nanomaterials and sensors. At the same time, the conversion and long-term loading of the SChF and also its inclusion in the technological chains of the cluster and possible further usage of its high-tech potential are provided.

Organization of modern production of mining equipment on adjacent territories is reasonable because of the formation of a resource base in the eastern regions of the country. The specialization of the mechanical-engineering plant in Yugra, where production of mining equipment has been started, can be advanced.

The organization of direct express tracks from Tomsk to the Kuznetsk Basin and the creation of a modern logistic center in the region from Taiga to Yashkino are reasonable to transport goods between the enterprises of the West Siberian oil and gas complex, Tomsk region, and the Kuznetsk Basin; provide transshipment from one type of transport to another; to store; and group.

At the level of digging, the main problem associated with projecting and deposit processing is to get full and true information about the spatial structure and physical and chemical parameters of layers, the characteristics of which are changeable. It is proposed to use two- and three-dimensional geological models of deposits as an instrument for object description. Basic geological and geophysical data are not enough and the attempts of creation of detailed mathematical models and cartographic pictures are not successful. The lack of information should be compensated for at the stage of exploitation under careful supervision during the process of extraction in almost every borehole. Technologies processing, which provides the necessary information cheaper than expensive drilling or additional works, are extremely important.

The structuring of geophysical researches in boreholes, vertical profile shooting, and seismic works on the surface to study productive layers; usage high-resolution seismic to plan geological exploration works [15]; and continuous support of geological models [16] and deposit monitoring are necessary here.

To project and develop deposits in such conditions, V. D. Lysenko suggested an adaptive system of development [17], allowing for rebuilding project decisions, taking into account new data (changing the network of boreholes, combination of injection and production boreholes, etc.).

Despite the certain importance of innovative approaches to the decision-making process at some stages of the process of projecting and developing hydrocarbon deposits (HDs), a complex innovative system of development, which combines different components, has a significant value. In this case, a similar determination system is used by domestic enterprises, such as OAO TsGE (a complex description of the processes of study and development of HDs [18]), RITEK (projecting and developing), and Rosneft' (a system approach to the organization of scientific and project works).

Organization of the innovative infrastructure of the cluster. In our opinion, the organization of a cluster will allow for the addressing of some existing disadvantages of the national innovative system (NIS) of the country [19]. Officially, there are all elements of the NIS in the country. In particular, based on these, the Tomsk region takes a leading position among the regions of Russia, having offices for commercialization in all universities and big research institutes (RIs), some business incubators, venture capital funds, and a center for technological transfer. Neverthless, the efficiency of RIs is far from being perfect. At the same time, officials evaluate the situation with cautious optimism, and politicians and experts evaluate the situation as unsatisfactory. The organization of an innovative cluster on the basis of closely cooperating scientific and educational complexes and a strong sector of subsoil usage will significantly accelerate the problem-solving process. Let us consider some key tasks at different stages of the innovative chain.

First of all, it is required to motivate the demand of production for innovations in every possible way. Within a cluster, this is reached through the formation of overall and corporate programs of technical modernization, the contents of which can be increased if specialists of

leading universities, RIs, and the Siberian Branch, Russian Academy of Sciences, participate within councils in the coordination of the scientific and technical policy of the cluster. At the same time, really great tasks of leadership achievement should be determined in international competition to avoid the trap of technological borrowings and, at the same time, limitation of autonomous technological development [21]. Since state corporation are leading developers in the sector of subsoil usage in the Tomsk region, such a task is quite achievable. It is necessary to provide motivation for the establishment of departments of the corporate scientific and technological centers of large enterprises in the cluster. It is evident that the potential of the Russian Academy of Sciences, special scientific RIs, and, in particular, principally new ones in innovative works is significantly higher than that of the industrial economy, and both sides have won from cooperation. Big service companies are interested in the presence in perspective segments of the market of their services. Since there are perspective regions of energy resources located close to each other, such interest should be long-term. Participation in such programs, usage of common centers of services, and technological transfers are very useful for SMEs.

It is reasonable to use the created cluster as a polygon to implement and approve legal and normative initiatives (a type of organizational and administrative initiatives). For example, to give enterprises economic initiatives in the area of innovations, it is necessary to partially reduced profit taxes, which could be directed to create and buy new products; to motivate the exploration of hard-to-recover reserves of raw hydrocarbons, as well as small and developed deposits, by means of a special tax policy; to use rent deductions and evaluate reservoirs and resources; to form license programs, etc. [1, 22].

It is necessary to carefully elaborate and constantly improve the education system and intellectual-property rights (including intellectual property created through budgetary financing) to support the interest of universities, RIs, SMEs, and developers. It is easier to create an efficient patent system, which will guarantee the patent holder with a high status, in the clusters of certain specializations.

The most important problem of RIs is the financing of innovations, which is closely related to the problem of direct investments. Unfortunately, the Russian financial system is of little use for long-term production financing. In such conditions, earlier created venture capital funds, corporations, and special-purpose funds have to work under severe competition from usual financial institutions, certainly losing in commercial efficiency. That results in the disinterest of employees, corruption, and, finally, re-profiling of these structures. All the main institutions participating in the country's development should be in a cluster. It is necessary to create a modern financial infrastructure, providing the existence of the main elements of intergovernmental financial institutions, if a project with international participation should be undertaken. Creating a cluster of natural-resource orientation, such purposes are real in view of foreign capital, which is actively invested into these fields in Russia. It is desirable to establish regional offices of international financial structures (MIGA, Multilateral Investment Guarantee Agency; EBRD, Asian Bank of Reconstruction and Development) that will need intergovernmental agreements with the active participation of famous consulting structures to reduce risks and to provide heavy guarantees.

It is also necessary to form an active Russian system of venture investments, probably, on the basis of creating mutual funds or agencies. Probably, it is necessary to invite foreign venture investors who have an experience in clusters of close profiles, for example, Houston, Aberdeen, and Stavanger [23].

The government's participation in innovative processes is so called by the necessity for the creation of motivations to generate innovations, which are not reasonably generated by the market environment. Such market failures [24] are compensated for by the formation of structures supporting innovations [19]. It is reasonable to create such new structures for supporting innovations, taking into account their production specificity. Along with that, it is reasonable to organize a special agency of long-term development (such as DARPA, United States), the strategic goal of which would be to provide the technological superiory of Russia in the sphere of prospecting, development, and processing of energy resources. The main task is to provide the transfer of long-term fundamental research into production technologies. Many tasks to be solved are related to a complex theme, which covers the departmental directions of the Ministry of Natural Resources, Ministry of Industrial Policy, and the Ministry of Energy of Russia. It is necessary to have exceptionally qualified people for this.

There are many opportunities to achieve a new quality level for organizing work with the help of innovative centers of new technologies created within public and private partnerships with the participation of companies in the area of subsoil usage in the oil and gas sector of the region. Such centers should work on behalf of the productivity of all participants in the cluster, providing development of prospective technologies.

First of all, it is necessary to create an analytic center of subsoil usage with a huge database on the geology, geochemistry, and geophysics of the region; on natural resources; and on processes and technologies of subsoil usage. Such a center, which would be equipped with modern instrumentation and equipment, should become a base for making and coordinating more responsible (probably, collective) management decisions. It is necessary to conduct a complex analysis of the data on geology, geochemistry, oilfield geophysics, and Earth remote probing because of the final recon-

naissance of potentially the largest oil and gas province in the Ob–Eniseisk interstream area. It is necessary to use the newest methods of creation of depth images and wave tomography, developed in recent years on the bases of supercomputer centers [25] for their interpretation. It is reasonable to organize these works in created center of geophysical researches, which will allow for significantly reducing the time and cost of prospecting works. Specialized centers with supercomputers, the processing power of which is important to organize distributed systems, conduct extremely labor-intensive calculations during modeling hydrodynamic processes, process seismic data and the data of Earth remote probing, solve reverse problems of geophysics, and recovery of geoimages, should closely cooperate with the mentioned structures and production. These centers should become general-purpose and collective-access centers.

A significant number of multipurpose developments is not used in the sector of subsoil usage or does not correspond to its needs. For example, this is the major part of developments in the area of nanotechnologies (including the creation of nanocovers), usage of nanomaterial-creating equipment, usage of nanopowders, nanofilters, etc. Many developments in the area of reinforcement materials and working surfaces; magnetron ionic and plasmatic vacuum systems; vacuum electron-optical weld deposition; thermo- and waterproof, anticorrosive, and antifriction protective coverings on the basis of inorganic polymers need to be constructively improved. Purposeful improvement of famous technologies, such as gel-forming compositions of oil recovery factor improvement and oil-pushed mixtures is justified. Methods of electronic introscopy can find widespread acceptance. Systems and hardware and software complexes of supervisory control and management, telemetry for the oil and gas industry, management of hydraulic units and electric power supply, and systems of management and diagnostics of equipment modes have a significant demand.

Many of the theoretical workings of other applications can be successfully developed for subsoil usage. For example, mathematical tools of mechanics of liquid and gas, which were widely used to model the processes of special subjects at the Tomsk State University, are used in modeling of deposits. Usage of supercomputers for oil and gas applications is limited, although they are widely used abroad for processing seismic data, reservoir modeling, and analysis of geoimages. New models and solution methods of certain equations and development perspectives in related directions can be a base for higher efficiency of software replacing imports in the sphere of systems for modeling deposits and monitoring extraction, creation of arrangement projects, geoinformative systems, and SAPR.

On the basis of the mentioned workings and taking into account the need to develop clusters, it is necessary to create some organizational structures or innovative enterprises, which will become the heart of the complex of applied research of innovative infrastructure of the cluster. They include the following:

–analytical center of effective subsoil usage;

–center of geophysical researches;

–supercomputer center;

–center for technologies for increasing oil recovery;

–experimental center, that is, a factory of nanomaterials;

–development center of borehole equipment of high accuracy;

–center of modern hardening and recovery technologies;

–development center of new technologies for extraction of rare materials;

–development center of sensors and control equipment.

In our opinion, this project has to be realized with significant organizational and financial government participation in the creation of a cluster, formation of its content and development program, productive infrastructure and a complex of innovative centers of new general-purpose technologies.

To attract foreign investment into subsoil usage of the region, it is necessary to define some (medium and small) deposits, transferred to MSEs for prospecting and development, which are innovatively more active in comparison with big enterprises and corporations abroad. It is possible to provide the conditions for attracting financing for innovative developments within special programs in the case of implementing projects at the level of intergovernmental agreements. Since it is hard for SMEs to create their own expensive base for prospecting and monitoring of deposits, they are mostly interested in the using of the shared resources of the cluster, services of the center of geophysical researches, and supercomputer and other centers for reasonable charges, which will finally contribute to the strengthening of cooperation within the cluster and compensation of initial expenses.

It is necessary to provide a modern investment description of the territory, for example, with the help of geoinformational systems and channels of distribution of geodata, which are familiar to investors [26–27], for providing investors with the maximum amount of information about the region and opportunities of a preproject analysis of variants, which would be suitable for establishing a business.

Distribution and Territorial-Planning Problems. The analysis made by us confirms the viability of the formation of an innovative cluster of effective subsoil usage in the region. At the same time, there arise problems related to the spatial organization of production and the corresponding infrastructure for productive projects in the sphere of subsoil usage on the territory of the Tomsk and Kemerovo regions (the external belt of the cluster is the use of innovative technologies) and also to the proper organization of the territory for establishing

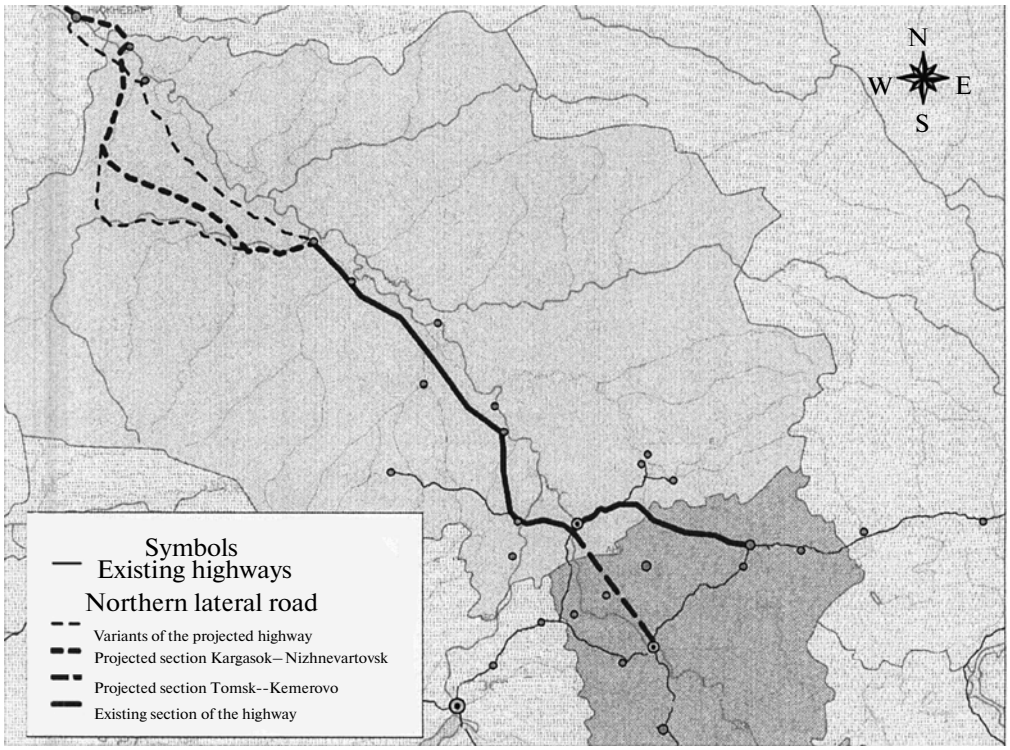

Fig. 2. Northern lateral road with an exit to the Kuznetsk Basin.

innovative centers (the inner core is the generation of innovations). Their solution within the existing normative base is conducted during the development and correction of territorial (space) plans.

Problems related to the placement of new productive enterprises of subsoil usage near their resource base (Fig. 1) and organization of a general energy and transport infrastructure of the cluster are solved in the process of territorial planning of the external belt.

The inner core of the cluster, related to the placement of centers for the development of innovations, is connected to the existence education and research complex of Tomsk and Kemerovo, between which it is necessary to install operational communications. This territory includes two service corridors, that is, from the West Siberian oil and gas complex to Tomsk to Kemerovo and a corridor along Transsib in the region from Yurga to Anzhero-Sudzhensk (Figs. 2, 3).

Examples of the creation of such distribution and innovative clusters are known in the world, for example, the so-called "research triangle" of the United States, which is supported by three centers in the state North Carolina (North Carolina State University, Duke University, University of North Carolina–Chapel Hill). The research triangle ELAt (Eindhoven–Leuven–Aachen) and also the project "Oxford to Cambridge Arch" for the creation of a zone of an innovative economy between two recognized research centers [28] have a similar structure in Europe. Usually, the whole territory rapidly develops under the influence of such centers.

Considering the territory between Tomsk and Kemerovo, let us notice its exceptionally favorable economic and geographic location. Here is the corridor of the trans-Siberian railroad, connecting the Yurga city and semiurban cities (such as Yashkino, Taiga, Anzhero-Sudzhensk, Mariinsk) and crossing the Tom River in the Yurga region. The machine-building plant of Yurga, the cement plant in Yashkino, railroad center (that is, exit to Tomsk from the Taiga station), and deposits of coal in the Anzhero-Sudzhensk region are on this line. Factors, such as the main traffic artery, traffic center (that is, river–railway), closeness of industrial centers, and natural resources are more favorable to be developed. For example, they stipulated rapid early growth in Novosibirsk and Krasnoyarsk. It appears that only the remoteness of the territory from regional centers did not stipulate enough economic development in this region in the period of the planned economy.

At present, such obstacles are easily overcome in a century of freeways. The distance between the Tomsk and Kemerovo cities on a straight line is about 100 km, which allows for providing access to the centers (within an hour) even within the agglomeration. The accessibility of territories along the railroad is only about half an hour. Taking all of this into account, it is reasonable to plan the creation of a big interregional logistic center in this region within a special economic area, which would be focused on servicing transport streams in the West Siberian oil and gas complex, that is, Transsib, from the Kuznetsk Basin to Transsib, and from the WSOGC to

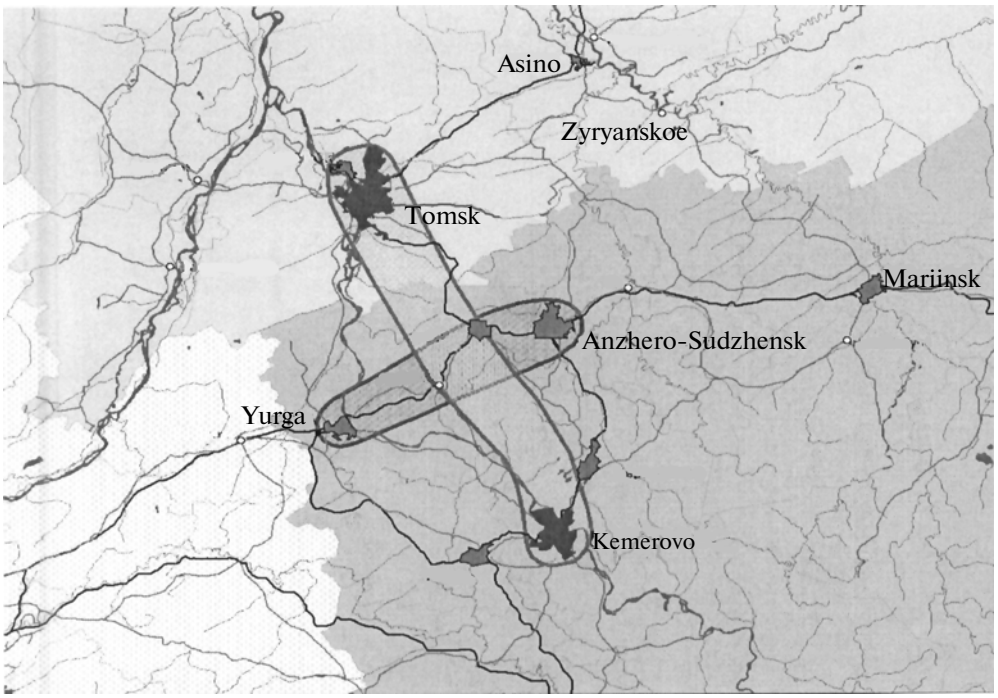

Fig. 3. Communication corridors between Tomsk and Kemerovo.

the Kuznetsk Basin. Within such a zone, it is reasonable to build an international airport, which would service Tomsk, Kemerovo, and the surrounding area; railway center; and a river port. Here, it is also a reasonable location for many enterprises in the cluster's profile, for example, a production plant of liquefied gas, which is planned by Vostokgazprom; storage terminal; and productive bases and piers on the bank of Tom.

Land in Tomsk and Kemerovo should be allocated in order to place the main innovative enterprises and centers of the innovative infrastructure. Good land for the placement of innovative centers is situated next to the biggest universities of in Tomsk [29]. The grounds of tech parks, which are situated on the right bank of the Tom river, on the territory of KuzNIIShakhtostroi, and Lenaya Polyana (Forest Park), are allocated in Kemerovo. The location of the above-mentioned specialized centers, project institutions, laboratories for research in the field of prospecting of specific and mineral raw materials, are considered perspective on these grounds (in addition to the existing RIs and universities). Taking into account the concentration of the country's oil and gas complex on the easterly direction and the high oil and gas perspective of the right bank of the Ob river, it is reasonable to place the headquarters of big corporations and organize the necessary infrastructure of management here. At least, within this project, all the objective factors exist, which usually motivate a similar choice of business structures [30].

The formation of this cluster is a continuation of the process of creation the Tomsk economic and innovation zone (TEIZ).

Thus, for the formation of an innovative cluster of the effective natural resource use in the region, the following is necessary:

—creation of centers of innovative technologies of subsoil usage in Tomsk and Kemerovo, interconnected with the functioning scientific complex;

—reservation of land to establish related objects, such as offices, financial structures, hotels, and residential properties;

—public support of new projects;

—creation of an engineering infrastructure to remove the transport and energetic limitations of the production;

—training and arrangement of territories to establish production and logistics.

The results of the conducted analysis allow for making conclusions that it is necessary to correctly develop territorial plans for the development of Tomsk, Kemerovo, and related regions, as well as to develop a common scheme for the territorial planning of the region, which is possible under the Town-Planning Code (articles 10 and 14).

Further questions related to the development of the cluster are contained in [31].

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Ryumkin, Aleksandr Ivanovich Dr. Sci. (Tech.), professor