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Editors

Humans in the Siberian Landscapes

Ethnocultural Dynamics and Interaction
with Nature and Space

Editors

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Economic Development of Siberia: From Nonlinear Presence to an Indefinite Future



Anastasia V. Myadzelets and Lilia F. Lubenets

Abstract Fundamental differences in geographical conditions, historical and contemporary economic, social and cultural peculiarities of various territories show significant heterogeneity, inequality and nonlinearity of spatial–temporal development districts, regions, states other territorial formations including vast parts of Siberia. A deeper understanding of local internal and global external conditions impacts on forming stages, trends and different vectors of territorial development is achieved by considering environmental factors in these processes. The research analyzes not only economic and investment processes and resource cycles but also shifts in cultural and social values. The chapter illustrates the opportunities of theoretical-mathematical approaches and models and qualitative comparative-geographical methods for studying the geocultural development heterogeneity and nonlinearity of Siberia. The methods reveal stagnant and active states of socio-economic systems, their stereotypic and innovative behavior models, different cyclic and fluctuation processes and give them geographical and historical definition. A fundamental factor of heterogeneity forming and nonlinear development is an activity that is demonstrated with the example of different nature-economic complexes and differentiation of territorial management modes in Siberia. Herewith the role of natural and geographical as well as geohistorical development factors remains leading. The same factors are essential for the organization of ethnical nature management for indigenous population that is shown as the example of a local community lifestyle at the Uimonskaya depression. In current conditions, nonlinear and heterogenic territorial development character allows both to different ethnoses keeping their traditions and modern postindustrial economic society to coexist harmoniously. However, it does not bring any distinctness in the economic modes of different territorial systems. The result showed that different territories are at different economic development stages in terms of their types such as resource economy, investment economy and innovation economy. Several economic behavior trends of regional

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economics are determined according to the types. It is mainly raw (resource) and transitional behavior types for the Siberian regions. They are associated with a certain stereotypical way of conducting economic activity when even creating technical, technological, infrastructural and other conditions is not enough to factor for the successful implementation of innovations.

Keywords Regional heterogeneity · Investment process · Investment cycle · Economic age · Ethnogeosystem · Ethno-nature management

Glossary

Regional heterogeneity

differences in the character of spatial–temporal socio-economic development of territories of the same hierarchical level (regions, states, etc.) that connected with geographical, historical, economic, cultural and other factors of environment.

Mountain ethnogeosystem

a type of territorial social systems, representing a part of the geographical environment formed as a result of the interaction of natural and socio-ethnic subsystems. Mountain geosystems are the natural subsystem, and the ethnosystem is the social-ethnic one. The contact zone of the subsystems determines the features of nature management system (Klimov 2006; Lubenets 2010; Zavyalova 2004).

Geosystem

a special kind of material system consisting of interdependent geographical components interrelated in their location and developing in time as a part of the whole (Isachenko 1980; Sochava 1978); in application to mountainous areas it receives a leading aspect of the study related to the geographical features of mountain depressions.

Ethnosystem

a historically formed group of people with common ethnic features and relations (language, components of culture, religion, ethnic knowledge of the environment, etc.), acting as an autonomous unit of society. The ethnosystem is most often based on the one “system-forming” ethnos, which may be in close connection with other

Mountain-depression geosystems

ethnic groups (subethnic groups) occupying a certain “ethnic” territory (Gumilev 2004; Klimov 2006).

System of mountain ethno-nature management

an independent class of geosystems, the general features of which are: a negative form of relief, isolation or almost closure and clear isolation, very dry and continental climate compared to the environment, the presence of a drier version of the landscape of this zone (Fadeeva 1996).

a historically and genetically interrelated natural-economic organization of space, the system-forming components of which are mountain geosystems and ethnic communities, which develop the territories in their cultural traditions and forms of farming (Lubenets 2009; Ragulina 2000).

1 The Role of Regional Specificity in the Formation of Nonlinearity of Economic Behavior of the Territory

Natural inequality of the geographical and socio-economic conditions of the territory, a different type and history of development, infrastructure peculiarities, differentiation of population groups, availability of public goods and other factors determine the regional specificity of different regions’ development. It is very clearly manifested in the territory of Siberia. The development of various scales territories is a multi-aspect and multifactorial process, the direction of which is determined by natural and socio-economic conditions. The regional and local specificity of their manifestation has particular importance in the study of these conditions. This specificity intensifies the disproportions in the territorial development to the north–south and east–west direction.

Establishing patterns, key characteristics and problems of the territory are the basis for analyzing the transformation of the economic and geographical space in the current conditions. It is important to identify local features of the economic and geographical systems formation; to establish geographical, historical, economic, political and other reasons for space imbalances and to specify normal and abnormal regions as opposite poles of territorial innovation or stagnation development. The authors use a set of modern objective (mathematical models) and subjective (qualitative and expert analysis) methods.

Regional inequality is mainly considered in terms of spatial heterogeneity, especially in large states (Friedmann 1966; Zubarevich and Safronov 2014). The spatial

development is always uneven and the spatial inequality arises as an objective consequence of the concentration of competitive advantages in some territories and their absence or deficiency in others (Krugman 1991). With the development of the regional economy and economic geography, other reasons for the heterogeneous development of regions began to be considered. It is political, social and economic inequality. Thus, Krugman (1991) (Krugman 1991) proposed to single out two groups of fundamental factors in identifying the causes of uneven development of regions. These are factors of the first nature independent of human activities and the second nature factors, created by human and social activities. The first one is resources and geographical location. They can be attributed to the reasons for spatial inequality. The seconds are agglomerations, institutions and infrastructure. They cause socio-economic and political inequality. Both groups of factors for some territories can simultaneously be advantages and hindrance obstacles to activity for others. They should be objectively taken into account in regional development plans. The role, significance and configuration of the factors can be changed over time. For example, when the territory develops, the role of first nature factors decreases, and the importance of second group factors increases, affecting the spatial inequality and regional heterogeneity character. Porter 2005; Tatarkin and Minakir 2012 have the same ideas. They note that spatial heterogeneity and regional development are associated with the emergence of various competitive advantages and their reproduction and the formation of the appropriate infrastructure supporting.

There are many research results with a quantitative and qualitative assessment of the regional inequality degree in recent scientific literature (Novikov 2013; Zubarevich 2010; Zubarevich and Safronov 2014). But these studies have some disadvantages as the final assessment of heterogeneity is given at the national level, therefore, interregional similarities and differences in the socio-economic situation remain outside the spatial analysis' scope.

Besides, the northern and Siberian regions of Russia are an object of innovative development and a subject of special attention in recent years. The study of their territorial organization and related changes in the socio-economic situation has particular relevance (Pilyasov 2014; Pilyasov and Zamyatina 2015; Zamyatina and Pilyasov 2018). For example, Pilyasov (2014) considers the northern futurology issues and the development of the northern periphery and highlights several scientific problems of their development. He notes that, first of all, it is necessary to take into account the peculiarities of the northern geographical position, the peripheral location, climatic discomfort and transport inaccessibility. It is necessary to work out several unique zone-sensitive statistical indicators to access and analyze the socio-economic situation, the life quality, the relationship of factors, spatial differences, etc. Concerning the Siberian and northern territories, the authors agree that modern economic and political processes can lead to rapid natural and socio-economic changes. It requires unique approaches to analyze the corresponding regional situation, which is reflected in works on assessing innovative processes of development of northern territories by quantitative and qualitative methods and analysis of their role in forming social processes (Zharov 2017).

The variety of natural, social, economic, political and other conditions and factors of Siberia regions makes significant the scientific problem of identifying a specific geohistorical and socio-economic situation. The objectivity of the decisions made in planning and forecasting the socio-economic development of the territory, the creation of an appropriate investment, political, social, recreational image and other territory management issues depend on the correct description of these situations. The quantitative assessment of local and regional conditions and environmental factors is carried out, various situations for the regions of Siberia are identified and typified. The comparative approach based on mathematical methods makes it possible to identify some nonlinear patterns of economic development of Siberia at the regional level. The results obtained are used for quantitative evaluation of the socio-economic inequality degree of the regions.

2 Geohistorical Projection of Regional Medium for Defining Territorial Spatial–Temporal Basis and Its Impact on Social and Economic Development Peculiarities of Siberia

Regions are at different organizational stages of industrial and investment processes, therefore study of interregional heterogeneity depending on their investment efficiency level is essential. Regional differentiation is significantly appointed by distinctions of internal investment and production volumes, as well as the difference of the medium characteristics such as investment climate, geographical location factors, nature-climate and resource potential, the development level of local infrastructure, and the efficiency of territorial management policy. Together they form the so-called geohistorical projection of economic development for a particular region.

The economy of the regions forms a chain of evolutionary stages due to variation of spatial–temporal development. Given local conditions, it is a basis for the prediction of its future. In this regard, the evolution paradigm of investment activity underlies the research idea, when the history of production investing and the statement that different regions are on the different evolution stages of their development is considered. Their economy are not stable. It keeps phased changing, improving and then shifts in a new other states (Nelson and Winter 2002).

The study of spatial–temporal heterogeneity based on mathematical modeling methods, indication functions, envelope curve analysis, Bayesian methods, differential geometry approach and others (Aivazian 2008; Myadzelets and Cherkashin 2016, 2017). Available ratios and their changes for industrial and agricultural production and internal investment volumes of the regions of the Russian Federation are analyzed for data time series taking into account proportions of natural resource sector of regional economics.¹ Investments are calculated per square unit of a region. Such

¹ Socio-economic characteristics from the reports of the State Statistics of Russian Federation from 2000 to 2015.

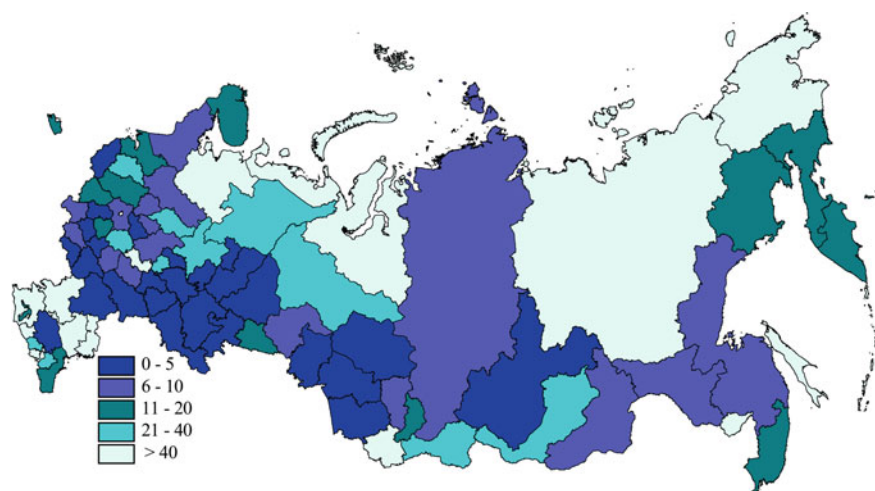


Fig. 1 Spatial heterogeneity of economic development of the Russian regions in the interregional similarity criteria of investment processes

meaning expresses the investment density and reflects the investment activity level of a territory.

The character of investment response on the volume changes of industrial and agricultural production underlies comparative analysis of Russian regions' socio-economic situations (Myadzelets and Cherkashin 2016). It reveals peculiarities of territorial development heterogeneity of the Russian Federation in the context of interregional similarity of investment processes (Fig. 1). All regions are divided into five groups. Similar investment regimes of economic activity are evidently represented for many Siberian regions. These are the Irkutsk, Novosibirsk, Tomsk, Omsk Regions and Altai Krai. The same situation is in some European regions of Russia, such as the Belgorod, Volgograd, Samara Regions and others. The Krasnoyarsk Krai situated nearby is not much different but can be assigned to the same economic type. In Fig. 1 the regions of the industrial belt of Russia are defined. The belt goes from the central regions of the European part of Russia through the Urals to the south of Siberia and the Far East. The Siberian regions situated along the belt form a united investment-territorial complex. The complex has common financial-economic and transport infrastructure with defined city agglomerations.

On the other hand, peculiarities of the spatial-temporal heterogeneity of investment processes and development characters of different territories can be reflected in terms of the calculated conditional age of economic development of different regions called conditional economic age (Myadzelets and Cherkashin 2017). It is characterized by comparative constancy of its value in time for every territory and depends on its development features and resource, innovation, investment and another potential. Obviously, Moscow and Saint-Petersburg have the highest calculated comparative

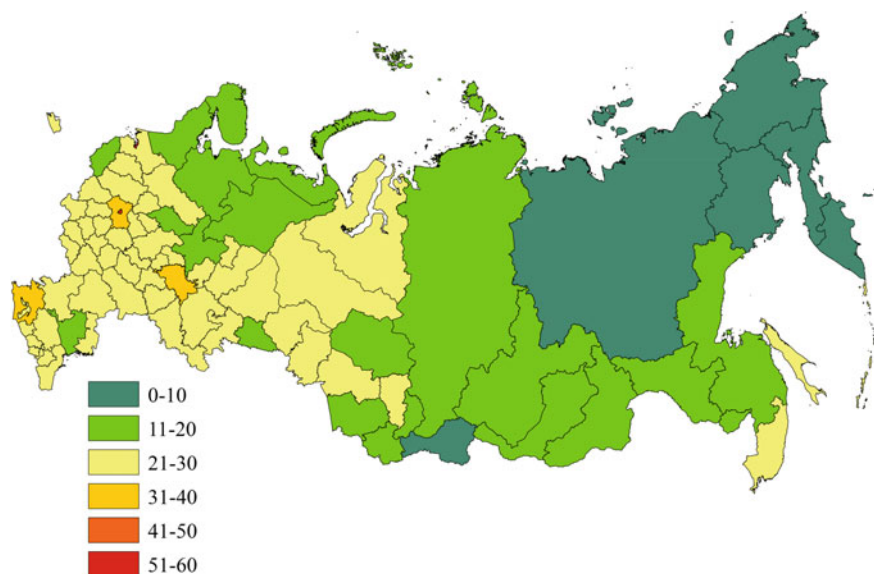


Fig. 2 Temporal heterogeneity of economic development of the Russian regions in the context of conditional age of territorial economic development (years)

values of this parameter—53 and 51 years respectively. The lowest values correspond to the northern areas, such as the Chukotka Autonomous Okrug (four years), Kamchatka Krai and the Republic of Sakha (Yakutia) (ten years) (Fig. 2). In general, the economy of the Siberian regions is young and characterized by low values of conditional economic age, for example, the Krasnoyarsk Krai—13 years, the Irkutsk Region—15, the Republic of Buryatia—13 years, and the Republic of Tyva—seven years. However, some Siberian regions with a long history of industrial development can be comparable to the central regions of Russia in type of economic development. It is reflected in characteristics of the calculated conditional age of the regional economy, for instance, the Kemerovo Region with the age of 27 years (see Figs. 1 and 2).

Generally, the size of the Siberian regions and their resource potential do not correspond to investment volumes in their economy. There are two main geographical groups (Fig. 2) are the northern, east-northern and far eastern regions with age from 6 to 20 years and the western Siberian and European regions of Russia with age from 21 to 35 years. Stable regional parameters of the conditional economic age (or the age of territorial development) are associated with the level of natural resource specialization of a particular region and its economic development potential.

Geohistorically, the Siberian regions form the territory having a traditional raw material orientation of the economy. Local production and the historically organized economic activity style freeze realization of investment and innovation processes. At the same time, they show a strong dependence on internal domestic factors including planned management which is now expressed in subsidies and various government

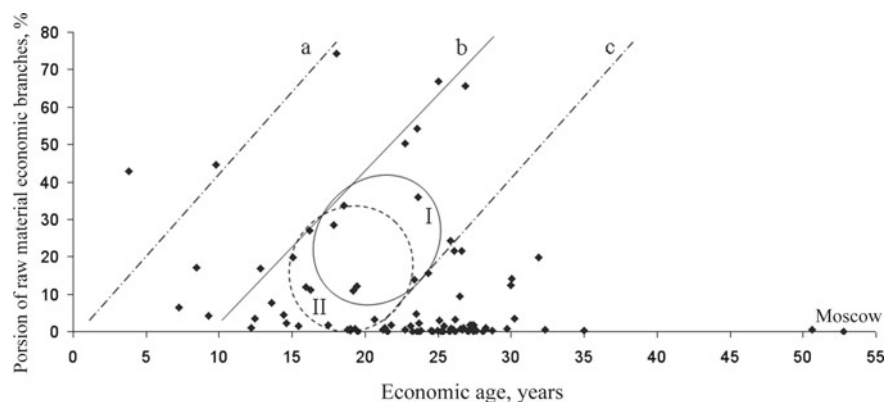


Fig. 3 Dependence of the share of the raw material economic branches on the calculated economic age for the Russian regions. Points—regional data, lines—boundaries of investment cycle *I–II*, and economic trends *a–c*, enveloping the cycles

support programs. The description of the evolution of the investment process can be clearly shown by the example of the development of investment cycles (Myadzelets and Cherkashin 2017) and comparison of the values of the conditional economic age with the proportions of raw materials, mining, and processing industry in different regions (Fig. 3).

There are two main trends. The first one is the decrease in the share of extractive industries in economic time, that is the nature of the transition from raw materials extraction to its deep processing. The second one is an increase in the share of extractive industry with an increase of conditional economic age. The latter one matches to raw-material economy. The Sakhalin, Tumen, Arkhangelsk, Irkutsk, Tomsk regions, Khanty-Mansi Autonomous Okrug, the Komi Republic, Krasnoyarsk and Kamchatka Krajs are near the primary linear trend *b*. This trend characterizes the boundary between the extensive and intensive types of economic growth. In these regions investment is directed to the raw material industry in the sufficient size. There are low developed northern and several Siberian regions to the left side of this trend. These are the Republic of Sakha (Yakutia) and Tyva, Magadan Region, Nenets and Chukotka Autonomous Okrug. The regions whose development is aimed at non-raw material development scenarios are situated to the right side from the trend *b*. The points show parts of the resource-investment cycles and are the place of tangent lines of the revealed trends in the graph. Different regions have different stages of these cycles. At the first stage, there is an increase in regional investments from external sources or income received due to the use of resources. They are spent on infrastructure and industrial development of the territory. This contributes to the accumulation of capital and the growth of the processing industry. The depletion of natural resources, the shortage and outflow of financial resources, the current changes in the external and domestic markets with a decrease in the production of primary industries and regional income, return the economy to a lower level of a raw

type, allowing the region to survive. Such behavior is typical for the economy of the Irkutsk Region, which has lost several high-tech processing industries over the past decades for various reasons.

The geographical medium is a material basis for territorial development, improving economic activity and the life quality of the population. The Siberian regions form the territory with a traditional raw material orientation of the economy in the geohistorical context, including underdeveloped peripheral areas. The emergence of internal social and technological innovations is directly connected with a self-development based on traditional lifestyle types and synchronous separation from these environmental-conditional established modes. There is a resource determinism for the Siberian regions, which for a long time ensures the sustainable existence of the region, but not its sustainable development. Sustainable development requires constant investment from internal and external sources and a proper favorable investment medium that does not eliminate income. It is provided by higher meanings of the economic age of local production. This age satisfies the limit conditional age of economic development and infrastructure facilities of Siberia.

3 Ethnogeosystems of the Uimon Depression

Mountain depressions as the most convenient areas for human settlement and activity in the mountains are often characterized by poly-ethnicity, i.e., they are the territories of coexistence of various ethnic communities with their inherent farming features. The Russian Altai is characterized by the presence of depressions, which differ in morphometric parameters, conditions and factors of formation, methods of their development, current economic use, and the degree of resistance to anthropogenic factors.

The Uimon depression is located in the Central Altai physical-geographical province of the Altai Mountain Region, within the Ust-Koksinsky administrative region of the Republic of Altai (Atlas Altayskogo Kraya 1978). It is bounded from the north by the Terektinsky ridge, and from the south by the Katun ridge. The depression is located at an altitude of 900–1200 m above sea level, has a width of up to 10 km, and stretches along the Katun riverbed for more than 30 km. The depression is represented by erosion-accumulative gentle-oval plains composed of loamy-sand-pebble deposits with the humus and meadow-humus soils prevalence, where forb-grass meadow steppes are formed (Lubenets and Rotanova (2017).

Favorable agro-climatic and soil conditions have contributed to the relatively rapid development and settlement of this territory. In 1798, the Old Believers founded the first permanent settlement—Verkh-Uimon. From the late 19th to early 20th centuries, 13 new settlements appeared both Russian and Altaian. There are 16 settlements within the basin, representing four types: Russian, Altaian, Old Believer and mixed (Fig. 4) (Kuchuganova 2000; List of Settlements of the Siberian Region 1928; Lubenets 2011a, b; Ustinova 1947).

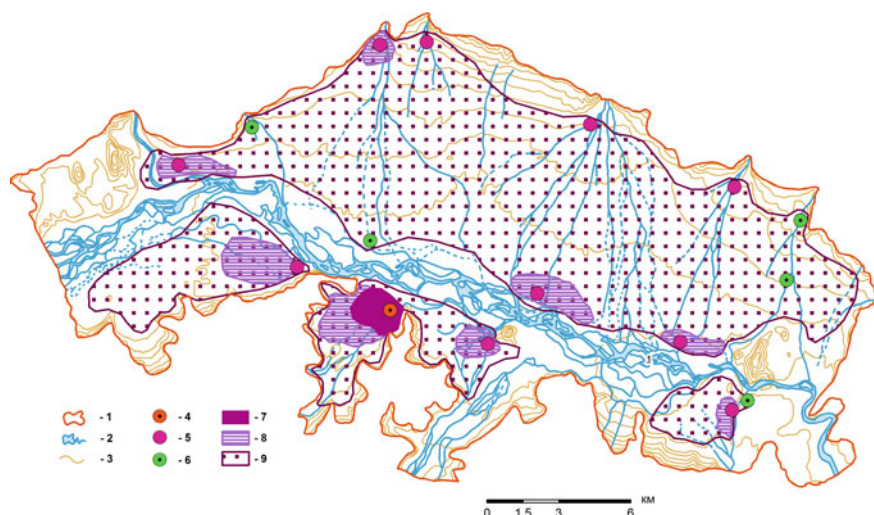


Fig. 4 Stages of development of the Uimon depression: 1—boundary of depression; 2—rivers; 3—isolines of the relief; the foundation of settlements: (4–6): 1—late 18th century, 2—19th century, 3—20th century; territory development (7–9): 4—late 18th century, 5—19th century, 6—20th to the beginning of 21st century

Based on the developments of Zavyalova (2004) and Klimov (2006) and taking into account the conditions of the location and ethnic peculiarities of the territory, the concept of mountain ethnogeosystem is accepted as the basic one. The basis of the ethno-economic impact on the environment is nature management.

The analysis of the state of ethnogeosystems is based on the study of a complex of integral indicators—natural potential, stability and variability of geosystems resulting from economic activities of individual ethnic communities. The assessment of the natural resource potential is carried out by clustering geosystems according to indicators separately for agriculture and grazing: shallow, low, medium and high. The variability of the geosystems is determined by calculating the ranking factor using the range of development, workload and degree of disturbance. It is determined for four categories: relatively constant, slightly modified, moderately modified and heavily modified (Lubenets 2010).

The nature management system of the Uimon depression is characterized by ethno-nature management and ethno-oriented farming (Lubenets 2011a). The development of traditional forms of economic management of ethnic communities is confined to their residence places, i.e., the corresponding settlements and slopes of nearby ridges (Table 1) (Bukhtueva 2006). The ethnogeosystems of the Russian and Altaian, Russian Old Believer and poly-ethnic groups have been adopted as part of the ethno-nature management system.

The impact of the elements of ethno-nature management on geosystems has territorial differences within the depression, depending on the living ethnic group. This is connected both with the natural resource potential, and approaches to its use,

Table 1 Types of ethno-nature management in the Uimon depression (%*)

Types of nature management	Settlements				
	Gorbunovo village	Terekhta village	Kurunda village	Multa village	Verkh-Uimon village
	Dominant ethnic (subethnic) groups				
	Russians	Russians, Altaians	Altaians	Russians, old Believers	Old Believers
Farming	53	99	18	100	83
Cattle breeding	59	75	94	19	67
Hunting	12	6	12	25	6
Fishing	35	6	0	19	6
Gathering of wild plants	29	6	6	19	6
Beekkeeping	12	0	0	0	6

* Based on the results of a questionnaire survey

taking into account the ethno-ecological restrictions inherent in a certain ethnic group (subethnic group). Restrictions are manifested in the peculiarities of the settlement and economic use of the territory, in preserving traditional elements of the modern economic, cultural and household spheres (Lubenets 2011b).

The most stable is the ethnogeosystem of the Altai ethnos, which occupies the northern, most arid part of the depression. This area is characterized by an average natural resource potential for the development of agriculture and a relatively high potential for pasture cattle breeding (Bukhtueva 2006). The Altaians preserve traditions in the cultural and domestic sphere, lifestyle development, and in interaction with nature, the ethnos supports the traditional type of nature use—pasture cattle breeding. A significant share of the used geosystems is slightly or moderately modified (Fig. 5).

Representatives of the Russian Old Believers were the first to occupy the depression. They developed the most convenient and fertile lands. The natural resource potential of the geosystems used by the Russian Old Believers' subethnic community is estimated to be the highest. Due to traditions of nature-saving economy, geosystems developed by the representatives of subethnic groups are characterized by weak and moderate variability.

The ethnogeosystem of the Russian ethnic group in all spheres of life support is characterized by a low degree of preservation of traditional ethnic elements. The geosystems used in nature by the Russian ethnos are characterized by high natural resource potential for farming and grazing. In most cases, the change in geosystems is moderate, except for floodplains.

The appearance of collective and state farms in the 1930s, ploughing and development of virgin fallow lands in the 1950s played a unique role in transforming the nature management of the basin. Having adapted to the collective system of

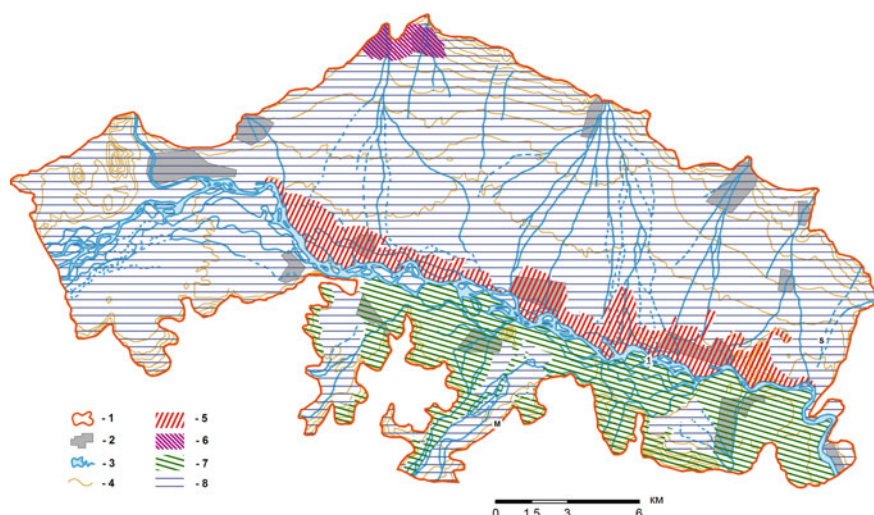


Fig. 5 Ethnogeosystems of the Uimon depression: 1—boundary of the depression; 2—settlements; 3—rivers; 4—isolines of the relief; ethnogeosystems (5–8): 5—Russian ethnic group, 6—Altai ethnic group, 7—Russian Old Believers, 8—poly-ethnic

farming, many residents were unable to use the traditional agriculture. This led to the predominance of the poly-ethnic ethnogeosystem in the area of development.

The current state of ethnosystems depends on the degree of preservation of ethno-economic traditions. Monoethnogeosystems, the Altai ethnos and the Russian Old Believers have preserved the nature-saving traditions for future generations of Siberia. In poly-ethnogeosystems, where different people live together, the traditional way of managing the economy is leveled. This is manifested in the form of a household plot and the set and number of nature management types.

The ethnogeosystem of the Russian ethnos within the depression took a priority position. It was characterized by the greatest transformation. This is due to the high adaptability of the representatives of Russian ethnos to changing external socio-economic conditions.

The Soviet collective farming caused significant destruction of the traditional elements of the economic management of ethnic groups and territorial predominance of the poly-ethnic ethnogeosystem within the basin.

4 Prospects for the Development of the Siberian Regions of Old and New Development

The study of changes in the socio-economic situation associated with innovation processes, the analysis of the stereotypical behavior of socio-economic systems,

the search for the causes of stagnation and ways to combine traditional types of the economy with the trends of new economic requirements, is critical now. The direction and intensity of the investment processes determine the rate of economic development.

The regions are at different stages of organizing the reproduction investment process. Their differentiation in terms of socio-economic development is determined by the difference in the volumes of intraregional investment. They depend on the investment climate, which consists of factors of geographic location, nature resources provision and the degree of the local infrastructure organization and effectiveness of administrative management. Due to the uneven development of the regions, they form a sequence of development stages. It can be shown using the evolutionary paradigm of investment activity (Yuzvovich et al. 2016). These issues are also considered in the evolutionary economics (Nelson and Winter 2002), when economic processes are considered spontaneous, open and irreversible, generated by the interaction of external and internal factors and manifested in a change in the economic structure and agents operating in it (Avtonomov et al. 2002).

The modern economic and political processes can lead to rapid natural and subsequent socio-economic changes in the corresponding regional situations. These aspects are reflected in papers on assessing innovative processes of regional development using quantitative and qualitative methods, analyzing their role in evolving social processes (Zharov 2017). Also, there are some publications where the special attention is paid to the problems and development of monotowns (Didyk and Ryabova 2014) and urbanized centers (Makhrova et al. 2016; Nefedova and Treivish 2010; Vorobiev et al. 2016), traditionally opposed in socio-economic research as depressive (crisis) and innovation poles.

In general, there are two main approaches to the formation of the theory of innovation. These are classical and alternative directions, presented by different schools (Varenik 2013). The classical theory connects the formation of the innovations with their economic and scientific-historical content. Alternative theories explain innovation by analogy with other spheres of life, for example, with biological communities (Pilinkienė and Mačiulis 2014). The theory of economic growth is considered neoclassical (Barro and Sala-i-Martin 2004; Lucas 1988), in which mathematical models and methods of data analysis are widely used (Sala-i-Martin et al. 2004). In particular, the phenomenon of convergence of countries and regions is described, due to which emerging countries grow economically faster than rich ones (Barro and Sala-i-Martin 1992). Lucas (1988) developed a model that assumes the individual accumulation of physical and human capital. It is believed that the main drawback of his model is that it does not explain the differentiation of growth rates between countries (Trofimov 2000). This is the main mistake of many modern approaches. They consider the economic sphere without considering their fundamental basis of development, such as the geographical environment and its transformations (Golts 2002).

The approach considers the innovation process and its economic participants as a system with a unique environment of regions (Nesterov 2006; Raikhлина 2017). In this case, the territory represents the unity of the innovation system and its environment

(Wessner 2005) and forms the so-called innovation ecosystem (Nikonorova 2018) which is a favorable environment formed by the direct participants (subjects) of the process and in which their interaction takes place, aimed at creating and developing innovations.

The criterion for innovation effectiveness is the quality and efficiency of produced and consumed products. Then, there is a problem with the quantitative assessment of these indicators. Various evaluation functions are proposed, but necessarily concerning quality and efficiency indicators (Azgaldov and Kostin 2008; Barro and Sala-i-Martin 2004; Koritsky 2013). Their weakness is that they suggest absolute values. Nevertheless, we need to find relative meanings, which are comparative and correlated with the current world or state level.

The special calculated indices of regional economic age and economic efficiency of the regional economy were used to classify the regions by the nature of economic behavior (Myadzelets and Cherkashin 2016, 2017). Additionally, the human development index (data for 2015) was considered (Report on Human Development in the Russian Federation for 2017(2017)). It comprehensively reflects the features of the quality and standard of living, human potential, education and other social characteristics that affect the formation of an innovative environment in the region. Territories with stereotyped, stereotypical cyclical and innovative economic models of behavior were identified based on the associations between the considered indicators (Fig. 6).

The innovation type is a classic example of the spiral evolutionary development of the economy. Such territorial systems are characterized by high economic age index (see Sect. 2), medium or high values of the indices of the investment efficiency and the quality of life of the population. Such regions gravitate towards the country's central part and have close logistic and industrial links with the capital.



Fig. 6 Classification of the Russian regions by the type of economic behavior. Behavior types: 1—innovative; 2—transitional (stereotyped cyclic); 3—stereotyped (raw); 4—stagnant

There are technological industries, information, scientific and educational centers in these regions. All these factors show the high potential for self-organization of these socio-economic systems.

Transitional behavior is typical for old-developed regions with average or above-average values of the economic age index. Usually, they gravitate towards Russia's central part, have a long history of assimilation and industrial development. The leading resource and investment cycle of these regions has finished, but their economics has not transitioned to the next innovation investment level for various reasons. These territories do not have such rich raw material base, which would allow them to be developed within the previous resource cycle. Therefore why they are forced to play catch-up and increase their lagging, stereotyped behavior and stagnation of the economic processes. These features also harm the social sphere. It should be noted that in this group the time of the region development is essential. For example, although the Novosibirsk, Omsk and Tomsk regions belong to this group, they are actually in the final stage of their previous cycle, at the bifurcation point and have a high potential to complete their cycle and transition to the next innovative type of economic development.

The regions of stereotyped behavior usually have a rich natural resource base and many sectors of the economy. They often have a sufficiently high intellectual potential, developed infrastructure, good connections with the center, but this is the feature which complicates the technological development of the economy of these territories and the transition from raw materials specialization of the industry to manufacturing. Therefore, they can also be conditionally called the regions with a stereotypical raw material type of behavior. These territories are also subsidized, characterized by low indicators of life quality. One of the stereotyped regions' features is a strong difference between the regional center development level and the rest of the region territory in favor of the center. It should be noted that this trend also characterizes the Russian economy as a whole.

In contrast to innovative ones, the regions with stagnating economic behavior types belong, as a rule, to the far periphery, have low investment attractiveness and efficiency, but are deeply subsidized. They cannot be actively engaged in resource investment and production cycles and establish stable economic ties with other regions because of the poor resource base.

In general, the Siberian regions do not have a single linear behavior and are divided into two main groups. In general, the eastern part has a trend of the raw stereotypical type of the economic behavior (Irkutsk region, Krasnoyarsk, Altai Krai and the Republic of Khakassia), and the western one corresponds to the transitional type (Novosibirsk, Tomsk, Kemerovo and Omsk regions). Traditionally characterized as a deep periphery with a low population life quality, low investment efficiency, a poor resource base the Republic of Tyva and the Republic of Altai belong to the regions with a stagnating economy.

5 Conclusion

During the restructuring and transformation of the Siberia regions' economy, the primary principle of innovative transitions to sustainable development should be implemented—the irreversibility of the process and the acceleration of development, the result of such upgrading is the transition to another level of sustainable development. The question is why some regions do not naturally move to the next stage of economic development, i.e. from the resource to an investment, and then to an innovative one. Why is there no qualitative restructuring of the regional economy in order to make an innovative transition? It is assumed that the main reason for the stable stereotypical behavior which does not allow the Siberian regions to get out of the established cycle (“traditional way”) and move to an innovative type of development is the properties of the geohistorical environment of the regions, the features of its exploration and development, an extended stay in one state and subsidized support. These factors slow down innovative internal activity. Now, despite several objective and subjective circumstances which include historically later inclusion in economic activity, poorly organized infrastructure, the state equalization economic policy and strengthen support for depressed territories, some Siberian raw economics regions of new development are growing faster than the old industrial areas that determine the typical geohistorical character of unequal, nonlinear and indefinite development trends for Siberia in the future.

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