Economic specialization and demographic development of settlements in the Northern region

Andrey V. Smirnov[1], Uliana V. Lytkina[1]

1 *Komi Science Centre of the Ural Branch of RAS*

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Abstract

The article is devoted to the analysis of impact of economic specialization of settlements in the northern mining region on their demographic dynamics. The object of the study is 58 urban and 725 rural settlements of the Komi Republic in 1897-2020. Use of highly detailed data made it possible to identify spatial and sectoral patterns in demographic development of the settlements. The authors have proposed periodization of economic and demographic development of the Komi Republic in the XX-XXI centuries based on production structure and population movement. The study has identified specifics of demographic dynamics in settlements specialized in coal mining, natural gas and oil production, timber, transportation and multifunctional settlements in northern Russia. The authors show that relationship between the volume of production and demographic dynamics varies depending on the settlement specialization. The relationship between the population size and phase of the natural resource extraction cycle is most pronounced in coal mining settlements. As to rural settlements, in addition to economic specialization, the dominant ethnic group was taken into account. The study shows that the smallest outflow of population is registered in agricultural settlements, as well as settlements with Komi being the dominant ethnic group or settlements with mixed ethnic composition. Impact of spatial remoteness of northern settlements on population size in different time periods has been determined. The results obtained make it possible to predict future changes in population distribution in the northern and Arctic regions.

Keywords

demographic development, population size, economic specialization, settlements, population distribution, historical demography, the Russian North

JEL codes: J1, J11

Introduction

The relationship between economic development of territories and demographic processes is of great interest to researchers (Treivish 2019). It is strongly pronounced in conditions of the Russian North and the Arctic, where the economy is based on large-scale extraction of natural resources, and settling the remote territories is closely associated with organizing extractive industries (Heleniak 2014). The study of demographic processes in the North is complicated by high mosaicness of both its economy and population (Bogoyavlenskiy, Siggner 2004; Dmitrieva, Gibezh 2008). Large industrial cities are adjacent to indigenous settlements, where traditional economy prevails, or settlements, in which mining has long been discontinued. The article analyzes demographic changes in the Komi Republic at the level of settlements, making it possible to take into account their economic specialization, spatial location and ethnic composition.

The Komi Republic is characterized by a high diversity of economic activities and ethnic structures. Population of the republic was formed in several waves. The indigenous population of the region was mainly engaged in agriculture and crafts. In the XX century, settlements specialized in logging were set up the first, followed by settlements specialized in coal, oil and natural gas extraction. Each wave of population settlement contributed to ethnic and demographic composition, changing population distribution, shifting economic activity to new areas of development. The purpose of this article is to identify features of demographic development of settlements with different economic specialization, both urban and rural.

The article answers the following questions: (1) What is the periodization of economic and demographic development of the Komi Republic? (2) How do economic specialization and production volume affect demographic dynamics in urban settlements in the northern region? (3) How do demographic processes in rural settlements depend on their economic specialization and ethnic composition? The object of the study was 58 urban and 725 rural settlements in the Komi Republic.

Demographics of northern localities

In most cases, statistical analysis at the regional and sub-regional levels provides a sufficient degree of detail to describe demographic trends. In Russia, constituent entities of the Federation, urban districts and municipal districts are usually studied (Petrosian et al. 2019; Smirnov 2020; Petrosian 2021). However, in the North, some municipal districts are so huge making such division sometimes insufficient. Thus, the Taimyr and Evenki districts of the Krasnoyarsk Territory surpass in area any European country except Russia. Economic specialization within districts is often heterogeneous, calling for more detailed data. There are two approaches to solving the problem. The first is the study of demographic processes in relation to geographic coordinates. The analysis is usually based on a graphical representation of demographic indicators – cartograms divided into equal areas. For example, the study of demographic processes in the Scandinavian countries used a square spatial grid (Stjernberg, Penje 2019), while in Russia – a hexagonal one was used (Zamyatina et al. 2020). The most ambitious project in this area was implemented with the support of the European Commission – Global Human Settlement Layer (Global Human...). The advantage of this approach is high accuracy of the phenomena representation, while its disadvantage is that most statistical indicators lack an exact spatial reference.

Another approach is to take localities as a unit of analysis: cities, towns, villages, hamlets etc. (Alekseev, Safronov 2015; Fauzer et al. 2016; Chaika, Mizerovskaya 2021). This approach is productive for the Russian North and the Arctic, since northern settlements lend themselves well to typologization, and usually have a clear specialization. Almost all urban settlements in the North were founded in the XX century, when regular statistical registration already existed, and population censuses were conducted. Therefore, it is possible to trace the entire history of their existence both in economic and demographic dimensions.

What are the main factors for demographic development of the northern settlements? First of all, it is economic specialization. Since the largest branch of the economy in the Russian North is extraction of natural resources, the demographic dynamics are greatly affected by the resource development cycles (Fauzer, Smirnov 2020). Large-scale mining requires a large number of workers, primarily young men, during the «boom» (primary development). If resources are not extracted on a shift basis, the main production is followed by the development of educational, healthcare, and social institutions and gender composition of the population is gradually levelling. Depletion of the resource reserves or reduced demand are followed by the period of «bust» with migration outflow and changes in age composition (Heleniak, Bogoyavlenskiy 2014; Shiklomanov et al. 2020). N.Yu. Zamyatina and A.N. Pilyasov divide the oil-producing territories into the following three groups according to the time of their development: pioneer development zones, old-developed zones, and district reserve zones (Zamyatina 2019: 181). Most often, mining settlements fail to change their specialization after decline in production. Due to their high distance from the centers, they do not have any competitive advantages for developing other sectors of the economy. However, sometimes it is possible to implement new projects in mining, which allows the settlement to last longer.

Demographic situation is strongly interrelated with spatial location factors. These are climatic discomfort, remoteness from other settlements, presence of transport routes, and agglomeration effects (Huskey 2005; Hamilton et al. 2016). Long distances lead to complication and increase in the cost of the settlements' functioning. All other things being equal, workers will prefer to live in a more favourable climate. Therefore, there is a system of benefits and preferences in the North. Remote settlements can be purposefully supported by the state and corporations because of their infrastructural or geopolitical importance. Even if the shift method of labour organization prevails, a certain number of backup settlements are required for the development of large northern spaces. The history of population settlement, closely related to ethnicity, has a great influence on the demography of northern settlements. Demographic behaviour of the indigenous population differs from that of newcomers. This concerns reproductive plans, self-preservation behaviour and migration preferences (Bogoyavlenskiy, Siggner 2004).

Thus, demographic dynamics in the northern settlements should be considered in the context of their economic specialization, stages of the natural resource development, geographic location, degree of remoteness from centers and ethnic composition.

Methods and data

The information base of the study was made up of statistical data at the level of settlements. 58 cities and urban-type settlements that existed in the Komi Republic at different times and recorded in censuses were identified. Among them, 10 currently have the status of a city. The data source on the dynamics in their population was population censuses of 1897-2010 (Population censuses…) and current statistical data as of the beginning of 2020 (Population

of the Russian...). Urban settlements are classified into six types according to the dominant industry: coal, oil and natural gas, forest industry, transportation, other industry, multifunctional centers[1]. The division is based on data on settlements published by I.L. Zherebtsov (Zherebtsov 2001) and G.V. Zagainova (Zagainova 2001).

Analysis of rural settlements is limited to the time interval from 1970, when the rural population size in the region was maximum. Throughout the analyzed period, the rural population of the Komi Republic has been decreasing, which is good for identifying patterns in data. The settlements that were transformed into urban or vice versa were not considered at all, and those that were merged or separated after 1970 were grouped and considered jointly. The resulting list contains 725 settlements and groups of settlements. Data on their demographic dynamics, classification by economic specialization and dominant ethnic group are obtained from population censuses of 1970, 1979, 1989, 2002 and 2010 (Rural settlements... 1990; Population of rural... 2004; Population, distribution... 2012). The following information is additionally collected about all localities: type of settlement (hamlet, settlement, village), status of the administrative center and the year of foundation / first reference (Administrative-territorial ... 2016; Zherebtsov 2001).

To assess the degree of remoteness of settlements, a special indicator has been developed – the remoteness index. The population settlement system has a hierarchical structure with a center at each level (Pumain 2006). The distance to each of these centers, as well as to any nearby settlements, is important for the development of the settlement.

Therefore, the index is measured as the average of the five values: distance to the capital of the Republic – Syktyvkar; to the administrative center of the city district or municipal district; to the center of the rural settlement where the settlement is located; to any nearest settlement; to ten nearest settlements (on average). The Julia 1.6 programming language, VegaLite.jl graphics package, spatial data of the Natural Earth project and the Geoportal of the Komi Republic (Geoportal of the Republic of...) were used for calculations and construction of charts and maps.

History of economic and demographic development of the Komi Republic

Let's consider periodization of the development of the Komi Republic in the XX-XXI centuries, which is based on the sectoral structure of production and population dynamics. *The first stage (agrarian)* lasted until the end of the 1920s. Agriculture was the main branch of the economy, its share in gross output was about 50% by the end of the period (Smetanin et al. 2011: 329). Forestry was developing, but the volume of logging remained insignificant. Crafts were also widespread, primarily leather. Two iron foundries produced only about 1% of gross output of the Komi Autonomous area in 1924-1925 (Turubanov et al. 2011). At the end of the period, geological exploration was actively carried out, determining the future shape of the region's economy. The population was mainly rural with Komi people being the dominant ethnic group (Table 1). Moderate population growth was mainly due to population natural increase. Southern regions of the Republic, better suited for agriculture were most populated.

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1 We define multifunctional centres as large settlements that do not have a dominant economic activity. They have a multitude of industrial, infrastructural and socio-cultural functions.

Table 1. Population of the Komi Republic by settlement type and ethnic group, 1897–2020, thousand people

Population structure	Year									
	1897*	1926**	1939	1959	1970	1979	1989	2002	2010	2020
Komi Republic	**170.7**	**207.3**	**319.0**	**806.2**	**964.8**	**1110.4**	**1250.8**	**1018.7**	**901.2**	**820.5**
Urban population, including:	4.5	6.8	29.2	475.4	597.4	786.5	944.4	766.6	693.4	641.7
Komi	3.7	3.6	18.0	64.8	91.3	117.2	136.4	118.5	94.7	…
Russians	0.7	3.1	9.5	281.5	376.3	509.4	609.1	514.3	472.2	…
other ethnic groups	0.0	0.1	1.7	129.1	129.8	160.0	198.9	128.2	82.4	…
those not indicating their ethnicity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	44.1	…
Rural population, including:	166.2	200.5	289.8	330.8	367.4	323.8	306.4	252.1	207.8	178.8
Komi	135.6	187.7	213.3	180.3	184.8	163.6	155.1	137.9	107.6	…
Russians	30.4	10.6	60.7	108.5	135.9	120.2	112.7	92.7	83.8	…
other ethnic groups	0.1	2.3	15.7	42.0	46.6	40.0	38.6	21.3	13.6	…
those not indicating their ethnicity	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2	2.8	…

1897-1989 –de-facto population, 2002-2010 – resident population, 2020 –population at the beginning of the year; * distribution by native language within the borders of Ust-Sysolsky, Yarensky and Pechora uyezds (an administrative subdivision of the Russian Empire), within the modern borders it is about 157 thousand people, including about 142 thousand Komi people and 15 thousand Russians; ** within the borders of Komi Autonomous area, within the modern borders, the rural population equaled to 218.1 thousand people.

Source: (Population censuses...).

The period from the 1930s and 1950s, which included industrialization, forced collectivization, large-scale forced migrations and the Second World War, can be attributed to the *second stage (active development and settlement)*. Forced labour was used to rebuild the economy. Three of the five largest GULAG forced labour camps in the Russian North in terms of the number of prisoners were located in the Komi Republic: Severo-Pechorsky, Severny Zheleznodorozhny and Vorkutinsky. The region was also in the lead in terms of the total number of prisoners. The camps in the Komi Republic mainly specialized in logging, railway construction and mining (System of forced labour camps... 1998). The total number of special settlers and exiles reached 286 thousand people or 48.4% of the population (in 1941) (Lytkina, Fauzer 2016: 98-99). A significant number of modern forest settlements are former special settlements and camp sites, while a significant share of the population are descendants of special settlers (Ignatova 2009). As a result, the population has almost quadrupled in just three decades. Russians have become the largest ethnic group in the population structure (48%), and the level of urbanization (the share of urban population) increased from 3 to 59%. By the 1950s, the coal industry and logging began to prevail in the economy (Table 2). Oil production was developing in Ukhta. The population settlement center shifted to the north due to the development of the Pechora coal basin. The Pechora railway to Vorkuta was built, becoming the main transport artery of the Komi Republic.
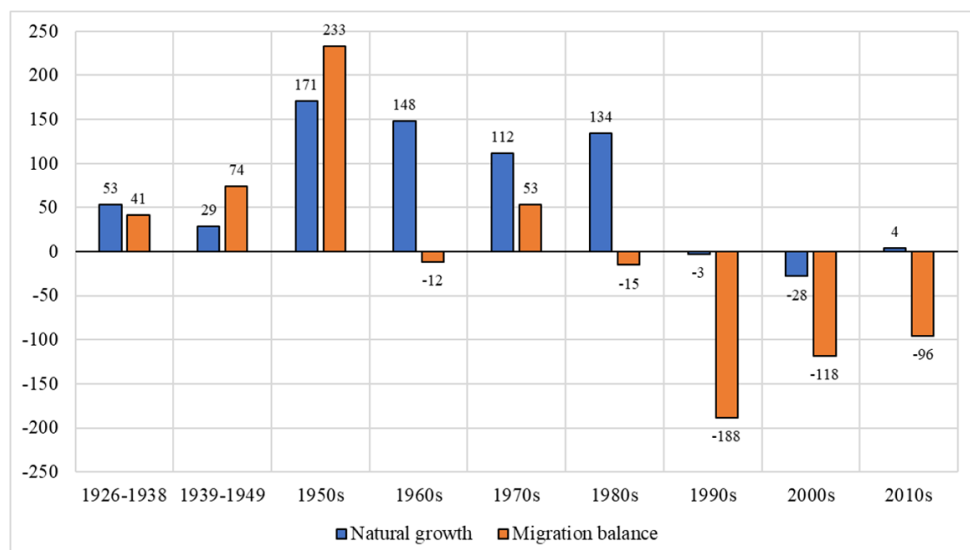
Table 2. Sectoral structure of industrial production in 1940-2000 in current prices of the corresponding years, as a % of total

Industry	Year						
	1940	1950	1960	1970	1980	1990	2000
Industry – total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Fuel, including:	13.4	39.3	44.7	41.6	41.0	39.4	60.9
coal	3.6	29.3	37.4	25.3	19.1	19.5	13.1
oil extraction	2.9	6.4	4.0	5.2	9.1	12.0	41.9
oil refining	6.9	2.8	1.6	5.0	5.5	5.1	2.3
gas	–	0.7	1.7	6.0	7.3	2.8	3.7
Forest, including:	35.2	32.0	27.3	30.4	27.4	27.9	21.9
logging	26.9	22.0	21.3	20.4	15.0	13.8	3.8
woodworking	8.4	10.0	6.0	7.4	6.5	6.2	3.4
pulp and paper	–	–	–	2.6	5.9	8.0	14.7
Electric power industry	3.0	3.6	4.1	2.7	3.1	5.9	8.9
Mechanical engineering and metalworking	8.5	6.7	6.5	6.4	6.5	7.0	1.2
Production of building materials	2.6	2.6	4.2	6.5	6.4	5.5	1.5
Light industry	2.8	2.7	4.0	3.5	5.1	5.7	1.4
Food	31.3	11.4	8.9	8.5	9.5	5.8	3.3

Source: (The Komi Republic – 90 years, 2011).

The third stage (late Soviet) – 1960-1980s – was characterized by high socio-economic stability, the industry was in its prime. By 1985, the volume of production increased 3 times compared to the 1965 level and 22.5 times to the 1945 level (Dmitrieva, Kubyshkina 2001). Almost all sectors of the economy have reached output limits by the late 1980s. By the end of the period, the oil and gas industry equaled to the coal industry in production volumes. The volume of gas production has especially increased. A new industry – pulp and paper has emerged (in the Ezhvinsky district of Syktyvkar). During workforce development, the methods of coercion were replaced by a system of preferences for the «conquerors of the North» (Fauzer et al. 2017). The population has reached a maximum of 1.25 million inhabitants by 1989, and the degree of urbanization added up to 75.5%. The share of the Komi ethnic group decreased from 30% in 1959 to 23% in 1989.

The fourth stage (post-Soviet or modern) began in the 1990s with a sharp reduction in production in almost all industries. Transformation of the Soviet economic system to cope with the market conditions resulted in increased social tension and a huge interregional migration outflow (Fig. 1). The share of oil production in the industrial structure increased (from 12 to 42% in just 10 years), the contribution of coal mining, logging, and manufacturing industries decreased. In 2020, oil and gas producing Usinsk accounted for a third of the volume of shipped goods (and 57% of production) of the Komi Republic. Decline in paper production and electric power industry was relatively small. The population of the region decreased by more than a third in three decades adding up to 820.5 thousand people. In 1993, for the first time since the Second World War, mortality exceeded fertility. The processes of urbanization continued with a decreasing share of Komi ethnic group in the population of the region. The largest decrease was recorded in the northern coal–mining territories (in the Vorkuta urban district, the population decreased by 66%, in Inta – by 62%). In Vorkuta, the number of coal mines decreased from 13 to 5, and coal mining came to a halt in Inta. The share of the capital city district (Syktyvkar) in the population increased from 18.6 to 31.7%.
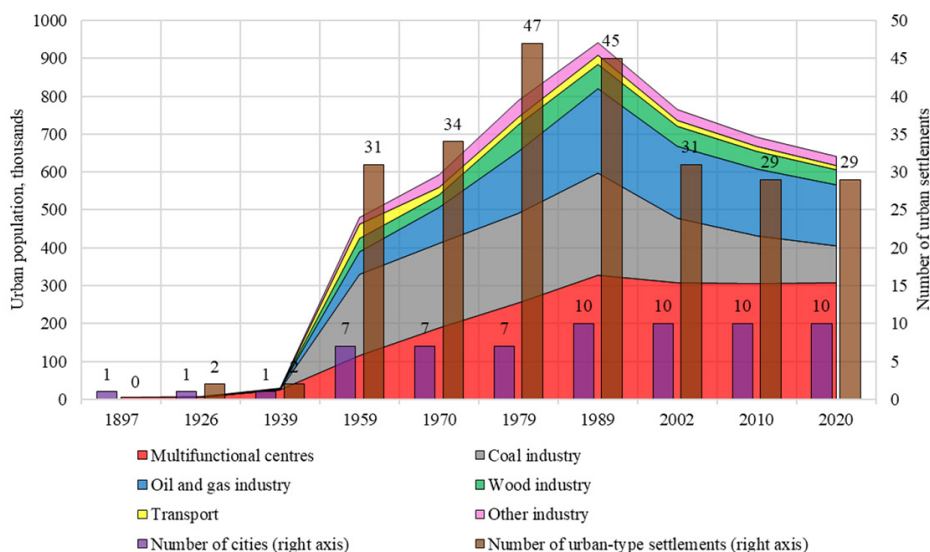

Fig. 1. Natural growth and migration balance of the Komi Republic by period, 1926-2019, thousand people. *Source*: (Population censuses...; Population of the Russian...).

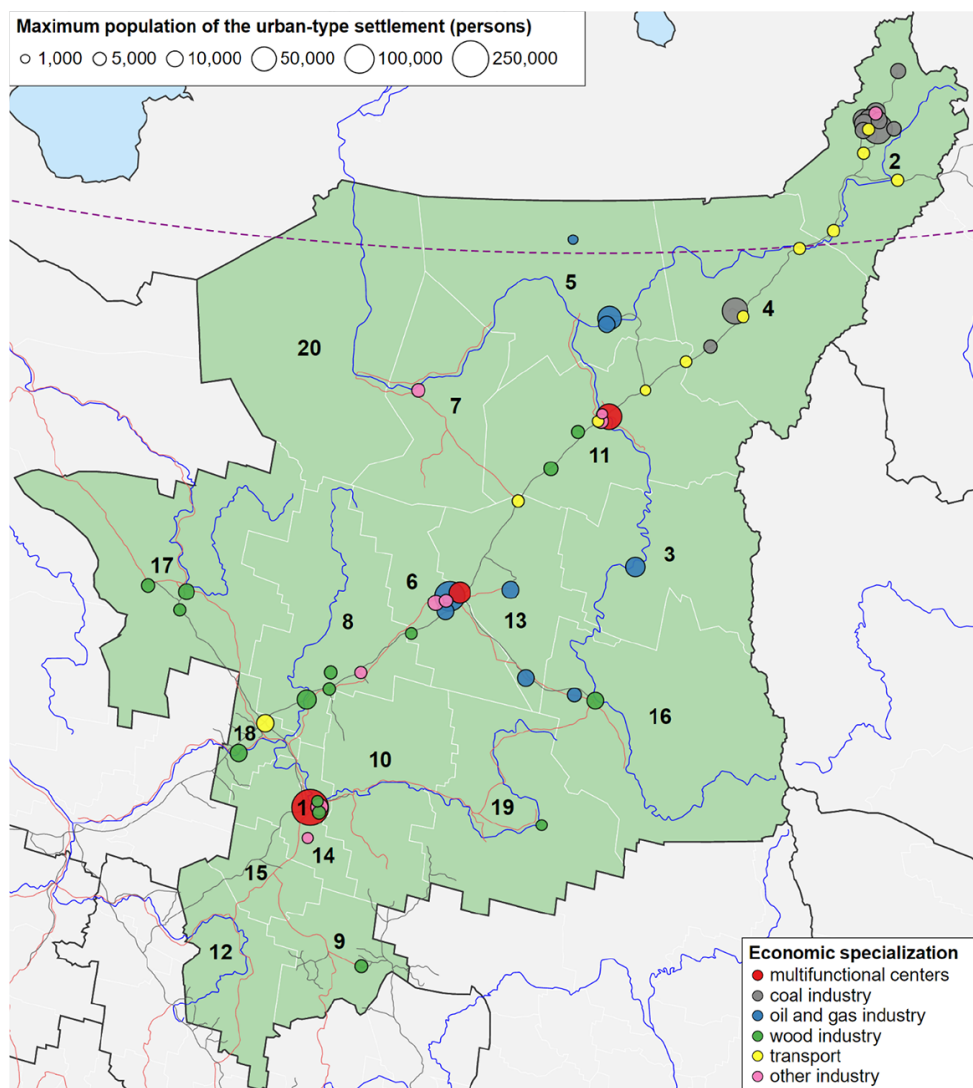## Economic changes and population
of urban settlements

Syktyvkar (formerly Ust–Sysolsk) was the first and for a long time the only city within the territory of the modern Komi Republic receiving the status of a city in 1780. Until the 1920s, it was comparable in population to large villages, but assumed administrative, educational and cultural functions. A vast majority of urban-type settlements in the Komi Republic were founded between 1939 and 1979 (Fig. 2). Changes in the industrial structure of production led to shifts in distribution of population by type of settlement. There has always been a high share of multifunctional centers. By 2020 it has accounted for 48.2% due to migration attractiveness of the capital of the region. In 1959, coal mining settlements were in the lead (44.6%), but by 2020 their share had decreased to 15.0%. Settlements with oil and gas specialization had outnumbered coal-mining settlements only by 2002 with their share equaling to 24.7%, and by 2020 it had grown to 25.1%. Timber industry settlements have never been among the leaders in terms of numbers, since a significant part of forestry (harvesting and transportation of wood) is associated with rural settlements rather than urban ones. The share of transport settlements reached its maximum (7.6%) in 1959, as this is the first population census after large-scale works on the construction of the railway to Vorkuta.

   Let's consider demographic dynamics in each type of urban settlements in the context of changes in output of the relevant sectors of the economy. Coal–mining settlements (2 towns and 9 urban-type settlements) are located in two urban districts in the north of the region (Fig. 3).
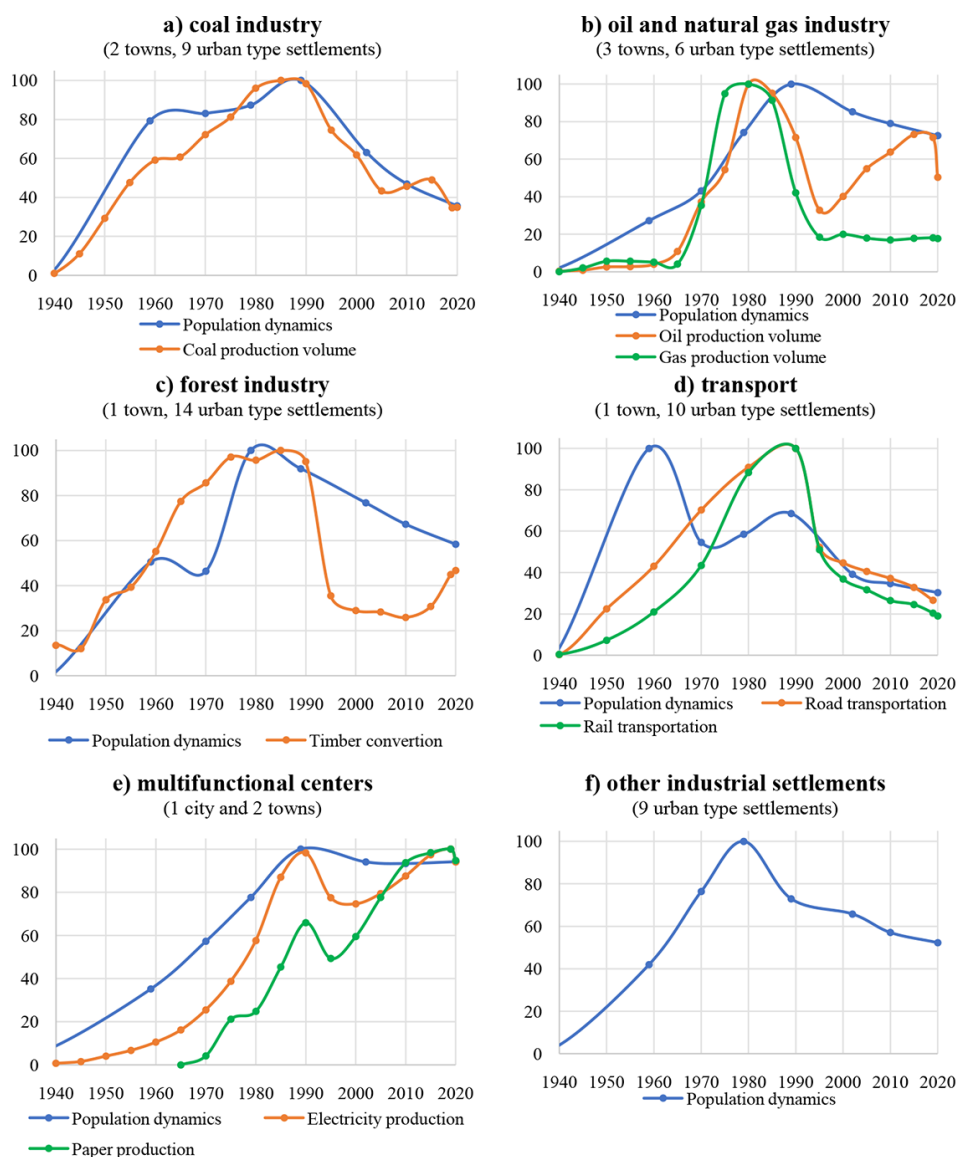

Fig. 2. Urban settlements of the Komi Republic: number and population by type, 1897-2020. *Source*: (Population censuses...; Population of the Russian...).

Fig. 3. Economic specialization of urban settlements of the Komi Republic. *Source*: (Population censuses…; Population of the Russian…; Zherebtsov 2001; Zagainova 2001).

Fig. 4. Population dynamics and output volume of the leading industries of urban settlements of the Komi Republic by economic specialization, 1940-2020, in % to the maximum level for the entire period. *Sources*: (The Komi Republic - 90 years 2011; Population Censuses...).

In the coal industry, the relationship between volume of production and population of specialized settlements is best traced (Fig. 4.a). The graph clearly shows various stages of the natural resource extraction cycle of. It is only natural that at first the population grew faster than the production volume, since huge human resources were required to organize production and create infrastructure. However, since the 1990s, the decline in production had already resulted in the outflow of population. Similarity in the dynamics in production volumes and population may lead to the conclusion that labour productivity in the coal

mining industry had hardly changed over those years. But this is not the case, because with the development of social infrastructure and other sectors of the economy, the share of population directly engaged in the extraction and transportation of coal had decreased.

The oil and gas industry is represented by 3 towns and 6 urban-type settlements in the central and northern parts of the region. In the oil and gas sector, there is no clear relationship between the production volume and population size (Fig. 4.b). A sharp drop in production did not cause a rapid migration outflow. There are several reasons for this. First, Ukhta, in addition to oil and gas specialization, has acquired many other functions, becoming the second center of higher education in the republic. Second, the technology of oil and gas production itself does not imply a strict linear relationship between the number of employees and the volume of production. Third, oil-producing Usinsk is the leader in the region in terms of wages, which allowed the town to maintain a high migration attractiveness. It should be noted here that in 1995-2015, the volume of oil production in the region, unlike gas, regained a significant share of the decline. The coal mining settlements have lost 64.4% of the maximum number, while the oil and gas settlements lost only 27.4%.

Forest industry settlements are represented by 1 town and 14 urban-type settlements. As a result of economic transformations of the 1990s, in the absence of state support, cost-effectiveness of the forest industry has decreased, leading to a sharp reduction in wood harvesting by the logging enterprises of the Komi Republic. From 1988 to 1995 the export of wood alone decreased by 70%, the production of lumber (timber) – by 67%, plywood – by 49% (Knyazeva 1996). The total number of their population decreased by 41.6%, which is better compared to some other industries (Fig. 4.c). This can be explained by the fact that the largest forest industry settlements specialize in timber processing –production of plywood and fiberboard rather than wood harvesting. The decline in production in the 1990s was lower in those settlements than in settlements specialized in logging. All 11 settlements specialized in transportation are located along the Northern Railway. They specialize in rail transport, but some of them are also connected with road and pipeline transport. Interestingly, this is the only group of settlements with the peak in population in 1959, not in 1979-1989, (Fig. 4.d). Due to introduction of new equipment in railway transport and improvement of methods of operation and repair of railways, the need for labour resources for infrastructure maintenance has decreased. By 2020 they have lost 69.7% of the population, which is a record among all industries. In 2010, 2.7 times less cargo was transported than in 1990, mainly due to decreased coal transportation. The structure of cargo transportation has also changed. In 1960 rail transport accounted for 40% of traffic, while in 2010 it was only 11%. The leading positions were now hold by pipeline transport (66%). Cargo transportation by inland waterway decreased tenfold in 1990-2010, and by air – one hundred times (The Komi Republic – 90 years 2011).

There are three multifunctional centers in the Komi Republic that do not have a clear specialization. These are the city of Syktyvkar, Pechora and Sosnogorsk towns. They demonstrated the best demographic dynamics among all groups, all together they have lost only 5.8% of the population, and the population of Syktyvkar has even increased by 5.5% since 1989 (Fig. 4.d). Since Syktyvkar has the only pulp and paper mill in the region, and Pechora has the largest power plant in the region, the graph shows dynamics in output in these industries. While indicators of paper and electricity production are much better than in other industries, these industries are not dominant in the total employment of multifunctional cities.

Other industrial settlements include settlements that specialized in ship repair, radium mining, electric ceramics, iron casting, and cement production. Their population almost halved (Fig. 4.e), as they had lost their former economic importance as a result of market
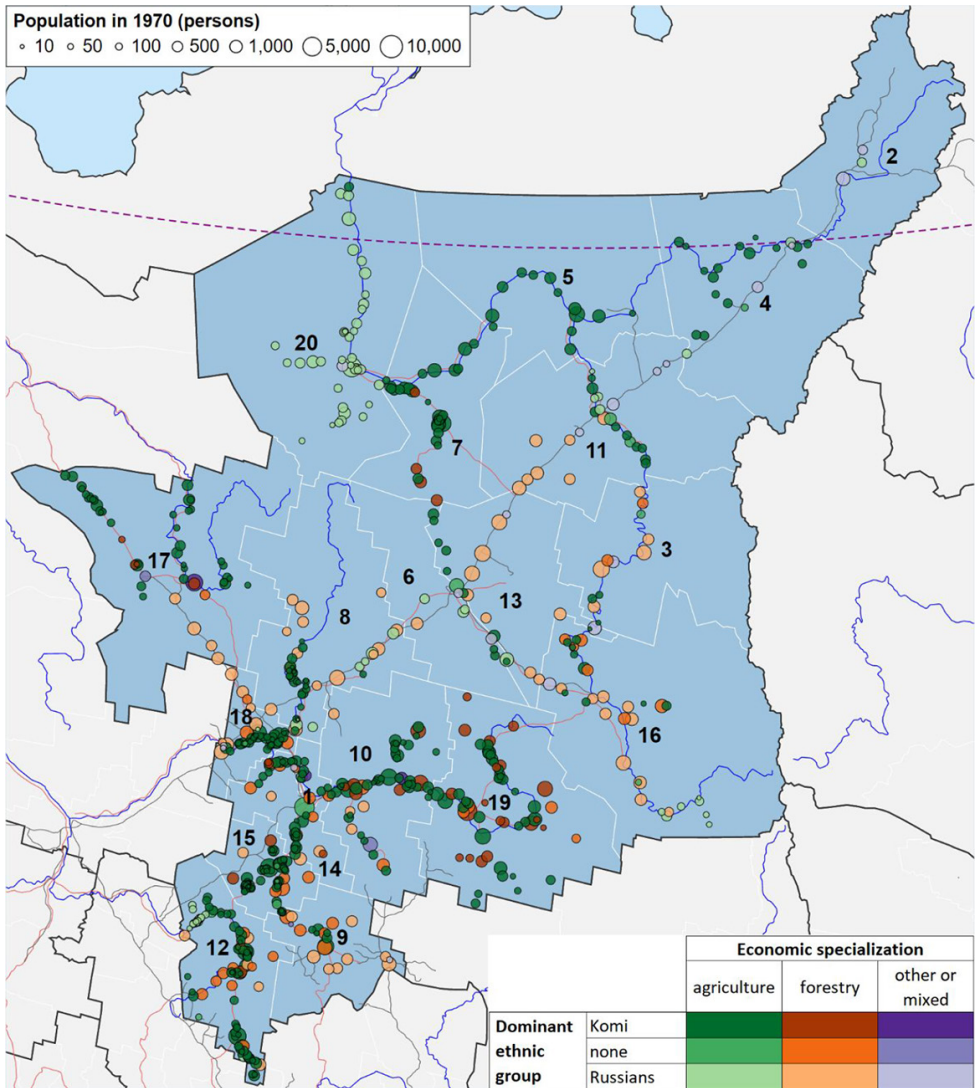
transformations (and in some cases even earlier). This was partly the result of a general decline in production, partly their products were displaced by competitors from outside the region due to their unfavourable geographical location, remoteness from suppliers and consumers. It can be concluded that the relationship between population of urban settlements of different specializations and volume of output in which they specialize is manifested in different ways. The most obvious relationship is registered in the coal industry.

Let's consider rural settlements next.

Ethnic and demographic processes in rural settlements

The Komi Republic is dominated by rural settlements specializing in agriculture (74.2%) and forestry (22.3%). Among other settlements, the majority are railway, there are also several oil industry, tourist and settlements with mixed specialization. In 66.9% of localities, Komi people are the dominant ethnic group, in 24.4% – Russians, 8.7% do not have a clear dominant ethnic group (Fig. 5). The rural population of the Komi Republic has already more than halved since the peak in 1970. The negative dynamics has dramatically increased after the collapse of the USSR. «The situation of falling out or exclusion from the new market economy has only developed the legacy of the Soviet past, in which the Russian countryside, despite the slogan of the smychka of the village and city (smychka, Rus.: смычка, means linking or joining two objects. «Smychka of the city and the village» was a Soviet political motto understood as alliance of proletariat and the poor peasantry), remained on the periphery of the state interests, and the villagers were among the least well–off Russians. ... the gap between the city and the countryside has become more obvious» (Yaroshenko 2004: 74).

The authors will show how various characteristics of rural settlements are related to demographic dynamics (Table 3). The analysis will cover two periods of approximately equal duration: the late Soviet (1970-1989) and the post-Soviet (1989-2010). A high number of population naturally makes large rural settlements more stable. Settlements with a population of over 3 thousand inhabitants are the only group of rural settlements whose population has grown since 1970. However, since 1989 it has somewhat shrunk. In tiny settlements (less than 50 inhabitants), the population has decreased by almost 90% over the period. Villages show better dynamics than settlements and hamlets, which is also due to their higher average population. In a particularly advantageous position were administrative centers of the municipal districts: Vylgort, Vizinga, Obyachevo, Ust-Kulom, Ust-Tsilma, Kortkeros, Izhma, Aikino, Koigorodok, Koslan. The average population in this group of settlements has grown by almost a quarter in 40 years. District centers provide their residents with better employment opportunities due to more diversified labour markets. They concentrate social, cultural and infrastructural functions. There is a relationship between demographic dynamics in the North and the year of settlement foundation. The older a group of settlements, the lower the population decline. The early settlements were founded not to support industrial development of the region, which allowed them to better survive collapse of the industry. T.S. Lytkina notes that the sources of social reproduction rest in preservation of the traditional basis of the economy and in traditional culture of people's daily life (Lytkina 2008). Indeed, the best demographic indicators among rural areas are demonstrated not in the south, with more favourable conditions for farming, but in the north, where way of life has changed to a lesser extent under the influence of industrial development of the region. These are residents of Ust-Tsilemsky district (mostly Russian Old Believers) and Komi-Izhemtsy.

Fig. 5. Classification of rural settlements of the Komi Republic by economic specialization and dominant ethnic group, 1989. *Source*: (Rural settlements... 1990). *Note*: The classification of 8 settlements ehat were not inhabited in 1989 is based on 1979 data, the remaining 717 settlements are based on 1989 data.

Table 3. Dynamics in average population size of rural settlements of the Komi Republic by type, 1970-2010

Classification of settlements	Number of localities and their groups	Average population, persons					Change in population, %		
		1970	1979	1989	2002	2010	1970-1989	1989-2010	1970-2010
Total	**725**	**483**	**430**	**407**	**320**	**265**	**-15.7**	**-34.8**	**-45.1**
By size:									
- large (3000 or more inhabitants)	10	4100	4720	5234	5154	4953	27.6	-5.4	20.8
- big (from 1000 to 2999)	60	1486	1431	1497	1147	949	0.7	-36.6	-36.2
- medium (from 200 to 999)	277	592	518	469	342	265	-20.8	-43.4	-55.1
- small (from 50 to 199)	182	214	145	105	78	58	-51.1	-44.3	-72.7
- tiny (less than 50 inhabitants)	196	87	46	20	13	9	-76.6	-56.6	-89.8
By type of locality:									
- village	119	1092	1087	1098	997	882	0.5	-19.7	-19.3
- settlement	199	719	622	583	376	286	-18.9	-51.0	-60.3
- hamlet	407	189	145	119	95	75	-37.2	-36.8	-60.3
By administrative status:									
- center of the municipal district	10	4008	4671	5198	5147	4979	29.7	-4.2	24.2
- center of the rural settlement	166	931	869	834	666	539	-10.5	-35.3	-42.1
- not a center	549	283	220	191	128	97	-32.6	-49.4	-65.9
By time of foundation: *									
- XIV-XVII centuries	188	590	573	570	518	463	-3.4	-18.8	-21.6
- XVIII century	144	393	351	309	255	210	-21.3	-32.3	-46.7
- XIX century	114	291	231	205	177	141	-29.6	-31.0	-51.4
- XX century	279	536	456	430	279	212	-19.7	-50.8	-60.5
By economic specialization:									
- agriculture	538	370	334	316	277	239	-14.6	-24.6	-35.6
- forestry	162	832	731	693	466	358	-16.8	-48.3	-57.0
- other (or mixed)	25	645	553	512	291	242	-20.5	-52.7	-62.4
By dominant ethnic group:									
- Komi	485	397	347	325	282	240	-18.0	-26.3	-39.6
- Russians	177	600	526	506	325	251	-15.6	-50.3	-58.1
- no dominant group ***	63	811	798	752	591	497	-7.3	-33.9	-38.7

Classification of settlements	Number of localities and their groups	Average population, persons					Change in population, %		
		1970	1979	1989	2002	2010	1970-1989	1989-2010	1970-2010
By dominant gender:									
- men	60	510	446	540	277	201	5.7	-62.7	-60.6
- women	37	350	248	202	164	133	-42.3	-34.3	-62.1
- no dominant gender **	628	488	440	406	333	279	-16.7	-31.3	-42.8
By remoteness index: ****									
- less than 10 km	208	420	407	414	376	341	-1.3	-17.7	-18.8
- between 10 and 20 km	218	519	461	428	345	286	-17.5	-33.2	-44.9
- between 20 and 50 km	281	503	426	386	267	202	-23.2	-47.8	-59.9
- over 50 km	18	457	390	388	204	131	-15.1	-66.2	-71.3

Sources: (Rural settlements... 1990; Population of rural... 2004; Population, distribution... 2012; Administrative-territorial ... 2016; Zherebtsov 2001; Geoportal of the Komi...).
1970, 1979 and 1989 – de-facto population; 2002 and 2010 – resident population. Data on distribution by size, specialization, gender and ethnic group in 1989;
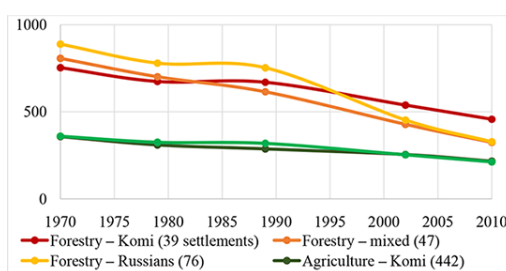* date of the first reference, last transformation, foundation or official registration of the settlement;
** the share of each gender does not exceed 55% or the difference between two sexes does not exceed 10 people; *** the share of each ethnic group does not exceed 50%;
**** average distance to the center of the settlement, the center of the district/okrug, the center of the republic, the nearest settlement and 10 nearest settlements (on average).

Settlements with agricultural economic specialization show better dynamics than forestry and railway ones. The decline in logging and rail transport was described in the previous section. At the level of individual rural settlements, the impact of logging volume was great in previous decades as well. G.V. Zagainova has identified five types of timber settlements: 1) settlements of forest sites; 2) settlements of forest posts; 3) settlements of lower warehouses; 4) floating settlements; 5) centers of timber conversion and processing. They correspond to the stages of wood production and transportation. It analysis shows that already in the 1960s there was a strong linear relationship between the population size of settlements and the volume of logging. This was especially true of the settlements of forest sites (Zagainova 1973). It should be noted here that today the majority of rural settlements in the Komi Republic are social in terms of employment structure. The main sectors of employment are education, health care and social security. Dependence of the population size on the dominant ethnic group has changed over time. In the late Soviet period the best dynamics were registered in settlements without dominant ethnic group, while in the post–Soviet period best dynamics were registered in settlements with Komi people as the dominant ethnic group. Komi people, as the indigenous inhabitants of the region, have a great attachment to the territory. Among Russian settlements, a similar situation is observed in the Ust-Tsilemsky district. According to migration patterns, the long-term residents of this area are more similar to Komi people than to Russians from other regions of the republic. For example, intraregional migration

accounted for 79% of the gross interchange in Ust-Tsilemsky district in 2012-2020. Such a high share of internal migration in the Komi Republic is mainly typical of settlements with Komi people being the dominant ethnic group. If we are to consider influence of economic specialization and ethnic composition separately, the revealed patterns remain unchanged (Fig. 6). Agricultural settlements turn out to be the most demographically stable with any ethnic composition, and settlements with Komi people as the dominant ethnic group and mixed ethnic composition – with any specialization.

Fig. 6. Dynamics in average population of rural settlements of the Komi Republic by economic specialization and dominant ethnic group, 1970-2010, people. *Source*: (Rural settlements... 1990; Population of rural... 2004; Population, distribution... 2012).

The population size of settlements with different gender composition has also changed over time in different ways. In the late Soviet period, the best dynamics were registered in predominantly male settlements, later – in the mixed ones. Male-dominated settlements were common in the Soviet North due to a high share of mining and forestry in the economy. Over time, such settlements either experienced gender levelling as a result of natural or migratory movement, or they retained a high migration mobility, that is, life there is considered as a mid- and long-term shift. Usually, the lifespan of these settlements is small and is determined by the economic interests of the state or mining companies.

The higher the index of remoteness of a settlement, the higher population decline (Fig. 7). However, in 1970-1989 this pattern was not observed in the most remote settlements. In a planned economy, the State policy was aimed at levelling natural economic disadvantages of the remote and isolated settlements. Despite high costs, they maintained an acceptable level of infrastructure, there was a system of incentives and preferences for residents.

In total, 68 (9.4%) of the 725 rural settlements under study have been completely depopulated over four decades, and 100 (13.8%) have lost over 90% of the population. Another 354 (48.8%) have lost from half to 90% of the population. The population increased only in 38 (5.2%) localities (or groups of localities). According to the estimates of the Ministry of Health of the Komi Republic based on data from medical institutions, by the end of 2019, the average population of rural settlements has decreased by another 19% compared to 2010 (Passport of a medical...). However, the 2021 population census will provide for more accurate estimates.

Trends in the outflow of population from rural areas are not limited to the Russian North but are global in nature. All northern regions share similar problems. First of all, the young and educated population is leaving, which makes the territories even less attractive for the remaining ones, encouraging further decline. The question arises: to what extent can these trends be reversed or at least slightly weakened? Studies conducted in the Nordic countries show that many young people also find benefits in rural life. These are opportunities for de-

Fig. 7. Population change in rural settlements of the Komi Republic, 1970-2010. *Source*: (Rural settlements... 1990; Population of rural... 2004; Population, distribution... 2012).

veloping entrepreneurship, tourism, new bioeconomics and smart specialization. The main problem is insufficient number of jobs for highly qualified specialists. Therefore, a number of municipalities have programmes to inform students who have left rural areas about opportunities to return after studying in cities, employment options and support measures (Karlsdóttir et al. 2020). The economy of some regions of the foreign North is less dependent on the extraction of natural resources and is based on knowledge (Petrov 2016). In the Russian North, it is necessary to disseminate best practices in territorial development aimed at stimulating local labour markets and rural entrepreneurship.

Conclusion

The settlement system of the Komi Republic has undergone many changes during the XX – early XXI century. Each wave of development of natural resources (timber, coal, oil and gas) caused serious shifts in the number, ethnic composition and settlement of the population. By 1989 the region population has increased 7 times compared to to the beginning of the century, and then has decreased by a third by 2020. About half of the urban-type settlements that existed at various times in the Komi Republic have been de-operationalized or have become rural settlements. Therefore, over 70% of rural settlements lost more than half of the population in 1970. The demographic situation remains relatively favourable in some cities (Syktyvkar, Ukhta, Usinsk), but their well-being in recent decades has been ensured by migration of young people from rural areas and small towns of the republic, and the potential of this migration has been gradually exhausting along with decline in total population. In the future, they are likely to shrink as a result of migration outflow and population ageing. The study results show that the nature of demographic changes in the North depends upon economic specialization of settlements. For all types of urban settlements, there is a relationship between economic and demographic development, however, it is most pronounced in coal mining settlements, where the volume of coal production is closely related to the number of workers. In rural settlements of the northern region, demographic dynamics is largely determined by the ethnic composition.

Factors for demographic dynamics in the North specified by the article continue to have a negative impact on population of the Komi Republic and provision of its economy with workforce. There is no reason to believe that migration trends will seriously change in the near future. Therefore, public administration should place a special attention to settlements that have experienced the greatest migration outflow and changes in age composition. It is important that the social support system efficiently functions to meet needs of the residents of these settlements. For the most remote settlements that do not have economic incentives for further development, it is necessary to boost resettlement programmes from the Far North. Future studies are planned to cluster settlements of the Komi Republic by fertility, mortality and migration movement, taking into account results of the 2021 All-Russian Population Census   to identify settlements in dire social and -demographic situation.

The results obtained characterize demographic processes in the North in general as well as in almost eight hundred settlements. Since development of the Komi Republic was initiated a long time age, all raw material regions may face similar demographic trends in the future. Therefore, the results can be used to work out documents related to spatial development, socio-demographic policy in the North, as well as to make demographic forecasts.

Acknowledgements

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Information about the authors

- Smirnov Andrey Vladimirovich, PhD in Economics, Senior Researcher, Laboratory of demographic and social management, Institute of Socio-Economic and Energy Problems of the North, Komi Science Centre, Ural Branch of the RAS. E-mail: av.smirnov.ru@gmail.com

- Lytkina Uliana Vladimirovna, Research Fellow, Department of Historical-Demographic and Historical-Geographical Studies of the Russian North, Institute of Language, Literature and History, Komi Science Centre, Ural Branch of the RAS. E-mail: ulytkina@yandex.ru