Regional differences and factors of spatial population distribution of the Central Federal District of the Russian Federation

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Abstract

The purpose of this article is to identify regional differences in the spatial distribution of population in the subjects of the Central Federal District and factors that determine them at the present stage. The study of the contrasts and factors of interregional differentiation is aimed at finding problems and solutions in the territorial aspect, ensuring demographic balance between subjects. The results of the study show that the spatial distribution has significant contrasts. Considerable differentiation of regions by population density and level of urbanisation has been revealed. The qualitative and quantitative characteristics of regional populations are influenced by such demographic factors as fertility, mortality, marriage rate, and international migration. In most regions, the birth and marriage rates decrease, population decline continues, and its ageing is observed. Negative trends in the demographic development of most subjects are aggravating, and regional differences are becoming more and more significant. In the conditions of further deepening of the demographic crisis, irrevocable international migration becomes an important factor in the demographic development of regions, capable of compensating for the population decline and ageing as well as contributing to the birth rate. Therefore, in depressed subjects it is recommended to create the necessary conditions for attracting immigrants and their subsequent integration into regional community.

Keywords

Spatial population distribution, regional differences, demographic factors, demographic development of regions, fertility, mortality, marriage rate, international migration, demographic crisis

Региональные различия и факторы пространственного распределения населения Центрального федерального округа Российской Федерации

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Аннотация

Цель настоящей работы – выявление региональных различий пространственного распределения населения в субъектах Центрального федерального округа и факторов, определяющих их на современном этапе. Исследование различий и факторов межрегиональной дифференциации нацелено на поиск проблем и решений в территориальном аспекте, обеспечивающих демографическое равновесие между регионами. Результаты исследования показывают, что пространственное распределение имеет существенные различия. Выявлена значительная дифференциация субъектов по плотности населения и уровню урбанизации. На качественные и количественные характеристики населения регионов воздействуют такие демографические факторы, как рождаемость, смертность, брачность, международная миграция. В большинстве регионов снижаются рождаемость, коэффициент брачности, продолжается убыль населения, наблюдается его старение. Негативные тенденции в демографическом развитии большинства субъектов усугубляются, региональные различия становятся все более существенными. В условиях дальнейшего углубления демографического кризиса безвозвратная международная миграция становится важным фактором демографического развития регионов, способным компенсировать убыль и старение населения, а также внести вклад в рождаемость. Поэтому в депрессивных субъектах рекомендуется создавать необходимые условия для привлечения иммигрантов и их последующей интеграции в региональное сообщество.

Ключевые слова

Пространственное распределение населения, региональные различия, демографические факторы, демографическое развитие регионов, рождаемость, смертность, брачность, международная миграция населения, демографический кризис

INTRODUCTION

Demographic development of the regions of the Central Federal District (hereinafter referred to as CFD), proceeding in the conditions of demographic crisis, has significant territorial differences. The relevance of the study is due to complication of the socio-demographic situation, which manifested itself in deterioration of quantitative and qualitative characteristics of the population because of the negative consequences of the pandemic COVID-19 as well as because of the consequences associated with geopolitical aggravation of the Russian-Ukrainian conflict in border regions, in particular, in the Kursk and Belgorod regions.

Heterogeneity of socio-demographic development of the subjects is particularly alarming. The question arises: is this a consequence of a low level of development, lack of stability, or are there other, hidden factors influencing this imbalance? What is behind these figures and is there still hope for improvement of the situation?

The foundations of the population theory, containing regularities of demographic development in interrelation with socio-economic development, were laid in the 60–80s in the Soviet Union. This period is associated with activities of such scientists as D.I. Valentei, B.D. Breev, A.Ya. Kvasha, N.V. Zvereva [1; 2].

The laws of population development are the object of research of a wide range of specialists: demographers, economists, sociologists, among whom we can highlight V.N. Arkhangelsky, V.A. Iontsev, S.V. Ryazantsev, L.I. Bardakova, V.A. Bezverbny [3; 4]. Under the population development (demographic development) we understand its quantitative and qualitative changes caused by demographic and social processes that occur in society. Researchers consider population size as an important factor that determines not only viability of the state, but also its place in the global space. This is natural, since demographic factors influence economic and social spheres. However, no less important are qualitative characteristics of the population. It is qualitative changes in the population that become an actual direction of modern demographic research.

Unfortunately, researchers are still not ready to offer universal recommendations for action in the conditions of the demographic crisis, when scale and consequences of population decline are such that they become a threat to future of the Russian Federation (hereinafter referred as RF, Russia). In this context, the problem related to demographic situation in the CFD acquires new urgency. The demographic crisis, which has led to a significant reduction in the population, devastation of certain regions, ageing of the population and many other problems, raises serious concerns. The peculiarities of the RF's territorial structure determine the fact that the demographic crisis manifests itself differently in its various subjects, acquiring its own specific character, deepening at the regional level. Regional specificity of demographic processes is determined by both national trends and regional differences.

The relevance of the study is due to complication of the socio-economic and demographic situation in the subjects of Central Russia and consequences of the demographic crisis that have already occurred and that we can expect in the future.

The working hypothesis of the study is based on the assumption that spatial distribution of the population of the subjects has significant differences, influencing their demographic and social development. The main objectives are to identify demographic features of the development of the regions in relation to each other; to determine factors of territorial differentiation affecting the development of the regions.

The study of factors and trends of interregional differentiation is aimed at finding problems and solutions in territorial aspect, ensuring demographic balance between the subjects. Along with social factors, demographic ones are the most important factors of social development.

We have identified the following demographic indicators and processes affecting the population, its qualitative and quantitative characteristics: population size, density, and type of distribution, birth rate, mortality, marriage rate, migration.

The study analyses 18 constituent entities of the CFD. The information base of the study has been made of official data of the Federal State Statistics Service (hereinafter referred to as Rosstat), materials of population censuses of 2002, 2010, 2021.

RESEARCH RESULTS

DIFFERENTIATION OF THE CFD REGIONS BY POPULATION DENSITY

To analyse the spatial distribution of the population on the CFD territory, data from the last three population censuses are taken. As a result, we identify 5 regions with the highest and lowest population density. The obtained data are presented in table 1.

Table 1

CFD regions with the highest population density

Census of 2002		Census of 2010		Census of 2021	
Territory	Population density, persons/km²	Territory	Population density, persons/km²	Territory	Population density, persons/km²
City of Moscow	3,954.09	City of Moscow	4,491.8	City of Moscow	5,080.09
Moscow region	118.40	Moscow region	160.06	Moscow region	192.30
Tula region	53.23	Tula region	60.51	Tula region	58.46
Ivanovo region	44.28	Belgorod region	56.48	Belgorod region	56.77
Vladimir region	41.74	Vladimir region	49.64	Lipetsk region	47.54

Compiled by the author on the materials of the sources[1,2,3]

Among the regions with the highest population density, three subjects are leading in all years – the city of Moscow, Moscow and Tula regions. Obviously, the greatest crowding tends to occur in the most economically developed regions. However, the question arises: why do other subjects have high population density and what is it connected with? Having analysed the statistics of the Tula region, we see that for the period from 2002 to 2023, the total population loss is 369.8 thousand people, while migration growth is 35.67 thousand people, the migration factor is also indicated by representatives of the media of the Tula region[4]. The Belgorod region, which ranked 4th in the population censuses in 2010[5] and 2021[6], is also of interest. For the period from 2002 to 2023, the total population loss in this subject was 109.6 thousand people, while the migration growth was 106.7 thousand people[7]. If it were not for the influence of external factors, the migratory population growth could compensate for the entire natural population loss in the region.

Next, let us turn to the subjects with the lowest population density (table 2), which include the Kostroma, Tver, Smolensk, Ryazan, and Tambov regions.

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[1] All-Russian population census of 2002. Official website. Access mode: http://www.perepis2002.ru/index.html?id=11 (accessed 15.04.2025).

[2] Census book. Results of censuses. All-Russian population census of 2010. Access mode: https://www.statmuseum.ru/ru/results/2010/ (accessed 15.04.2025).

[3] Federal State Statistics Service. All-Russian population census of 2020. Access mode: https://rosstat.gov.ru/vpn/2020 (accessed 15.04.2025).

[4] Tula Pressa. Population growth in the Tula region has increased at the expense of migrants. Access mode: https://tulapressa.ru/2024/01/v-tulskoj-oblasti-vyros-prirost-naseleniya-za-schet-migrantov/?ysclid=m3ab2oe4c9310271896 (accessed 15.04.2025).

[5] Federal State Statistics Service. All-Russian population census of 2010. Access mode: https://rosstat.gov.ru/free_doc/new_site/perepis2010/croc/perepis_itogi1612.htm (accessed 15.04.2025).

[6] Federal State Statistics Service. All-Russian population census of 2020. Access mode: https://rosstat.gov.ru/vpn/2020 (accessed 15.04.2025).

[7] Territorial body of the Federal State Statistics Service for the Belgorod region. Population. Access mode: https://31.rosstat.gov.ru/ (accessed 16.04.2025).

Table 2

CFD regions with the lowest population density

Census of 2002		Census of 2010		Census of 2021	
Territory	Population density, persons/km²	Territory	Population density, persons/km²	Territory	Population density, persons/km²
Kostroma region	8.24	Kostroma region	11.09	Kostroma region	9.65
Tver region	12.78	Tver region	16.07	Tver region	14.61
Smolensk region	14.94	Smolensk region	19.8	Smolensk region	17.85
Tambov region	19.56	Ryazan region	29.14	Ryazan region	27.85
Ryazan region	21.37	Tambov region	31.69	Tambov region	28.52

Compiled by the author on the materials of the sources[8,9,10]

The anti-leader subjects remain practically unchanged between the censuses. They are characterised by high population decline. Thus, during the analysed period, the population loss in the Tver region was 290 thousand people, in the Tambov and Ryazan regions – 205 and 214 thousand people. Low population density in the Tver region is due to the fact that this subject has the highest share on the CFD territory – 12.95%. In also has a low level of migration, the migration growth for the analysed period is 3.7 thousand people.

The population density is uneven, ranging from 9.65 persons/km2 in the Kostroma region to 5,080.1 persons/km² in Moscow. If we consider the CFD without Moscow, maximum values of the indicator are observed in the Moscow region – 192.3 persons/km².

According to the All-Russian population census of 2021, there were 24,751 settlements in Russia in which no one lives[11]. Another 23.5 thousand villages and hamlets have a population of 6 or fewer inhabitants. Between 6 and 10 inhabitants live in 11.7 thousand such settlements. Mostly, these settlements are located in the central regions of the RF.

DIFFERENTIATION BY LEVEL OF URBANISATION OF THE POPULATION

According to A.S. Puzanov, General Director of the Foundation "Institute of Urban Economics", the period of extensive urbanisation is over in Russia at the moment[12]. This is also noted by A.G. Vishnevsky, E.A. Kvasha, T.L. Kharkova, E.M. Shcherabkova in their publication[13]. It is impossible not to agree with them, but the situation in the regions of the CFD, in our opinion, is ambiguous. Over the period we have analysed, the share of urban population in the CFD as a whole has increased by 2.3%, remaining at the same level for the last 5 years, and makes 82.2% in contrast to 17.8% of rural population. We have also identified the regions at the time of 2023, where the level of urbanisation is the highest and lowest. The data are shown in table 3.

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[8] All-Russian population census of 2002. Official website. Access mode: http://www.perepis2002.ru/index.html?id=11 (accessed 15.04.2025).

[9] Census book. Results of censuses. All-Russian population census of 2010. Access mode: https://www.statmuseum.ru/ru/results/2010/ (accessed 15.04.2025).

[10] Federal State Statistics Service. All-Russian population census of 2020. Access mode: https://rosstat.gov.ru/vpn/2020 (accessed 15.04.2025).

[11] Census book. Results of censuses. All-Russian population census of 2002. Access mode: https://www.statmuseum.ru/ru/results/2002/ (accessed 16.04.2025).

[12] Puzanov A.S. Alexander Puzanov – The period of extensive urbanisation in Russia is over. Access mode: https://urbaneconomics.ru/en/node/18214?ysclid=mdoazcby6e451025611 (accessed 16.04.2025).

[13] Vishnevsky A., Kvasha E., Kharkova T., Shcherbakova E. Russian village in the demographic dimension. Part 2. Access mode: https://www.demoscope.ru/weekly/2006/0255/tema03.php (accessed 16.04.2025).

Distribution of the CFD regions by level of urbanisation in 2023

Most urbanised subjects		Least urbanised subjects	
Region	**Share of urban population, %**	**Region**	**Share of urban population, %**
Ivanovo region	82.1	Moscow region	28.0
Yaroslavl region	80.9	Tambov region	60.4
Vladimir region	77.6	Lipetsk region	62.9
Tver region	76.3	Belgorod region	65.3
Kaluga region	74.8	Orel region	66.6

Compiled by the author on the materials of the source[14]

The most urbanised subject was the Ivanovo region with urban population share of 82.1%, which is almost identical to the total for the CFD. In general, it is above 60% in all subjects except for the Moscow region. In general, we can conclude that urbanisation in most regions of the CFD is at a high level and the share of urban population is over 60%. In some subjects it has remained unchanged, and in recent years it has slowed down considerably. We should also highlight the Tula, Moscow, Kaluga, Belgorod regions, where the process of suburbanisation is taking place. The Tula region is the leader in terms of rate of suburbanisation. If in 2002 the share of rural population here was 18.47%, by 2023 it has increased by 8.43% to 26.90%. The question whether other regions will follow its example remains open.

IMPACT OF DEMOGRAPHIC FACTORS (FERTILITY, MORTALITY, MARRIAGE RATE, MIGRATION) ON REGIONAL DEVELOPMENT

Demographic factors become a threat to the country's long-term development and sustainability. Russia undoubtedly faces serious challenges in the sphere of demography. President of the RF V.V. Putin explicitly states that improving the demographic situation and strengthening family values and foundations is a national priority. Putin explicitly states that improving the demographic situation and strengthening family values and foundations are priority national tasks[15].

One of the most acute problems in the sphere of demography is catastrophically low birth rate. Fig. 1 shows dynamics of the total fertility rate for the period from 2002 to 2023. Fertility in all subjects has been steadily declining in recent years, the lowest rates in 2023 were shown by the Tambov region – 5.8 children per 1,000 people, Yaroslavl and Voronezh ones – 6.4.

Having analysed fertility indicators, impact of the demographic crisis on the birth rate in the regions of the CFD becomes evident. In most regions, value of the total fertility rate is very far from the level of simple reproduction, and no preconditions for the situation to improve in near future are expected. Despite the measures taken by the state to stimulate the birth rate, the indicators have returned to the indicators of the early 2000s. In 2023, 12 out of 18 regions of the CFD had a value of the total fertility rate below 1.3 children per woman[16].

Growth in the birth rate demonstrated by the regions of the CFD between 2007 and 2016 is attributed to government support measures, primarily maternity capital. However, at the moment this support does not work

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[14] Unified Interdepartmental Information and Statistical System. Number of permanent population on average per year Unified interdepartmental. Access mode: https://fedstat.ru/indicator/31556 (accessed 17.04.2025).

[15] RIA Novosti. Putin called the improvement of the demographic situation a priority task. Access mode: https://ria.ru/20240703/demografiya-1957212830.html (accessed 17.04.2025).

[16] Ibid.

to the extent that it did before, so it is necessary to analyse reasons for the decline in the birth rate. Undoubtedly, the COVID-19 pandemic had its impact as stated by S.V. Ryazantsev, A.E. Ivanova, V.N. Arkhangelsky [5] alongside with the second wave of depopulation, which began in 2016 and by its nature is clearly different from the first one as stated by L.L. Rybakovsky and N.I. Kozhevnikova in their work [6]. These two factors are very important at the current stage of Russia's demographic development in the context of the demographic crisis.
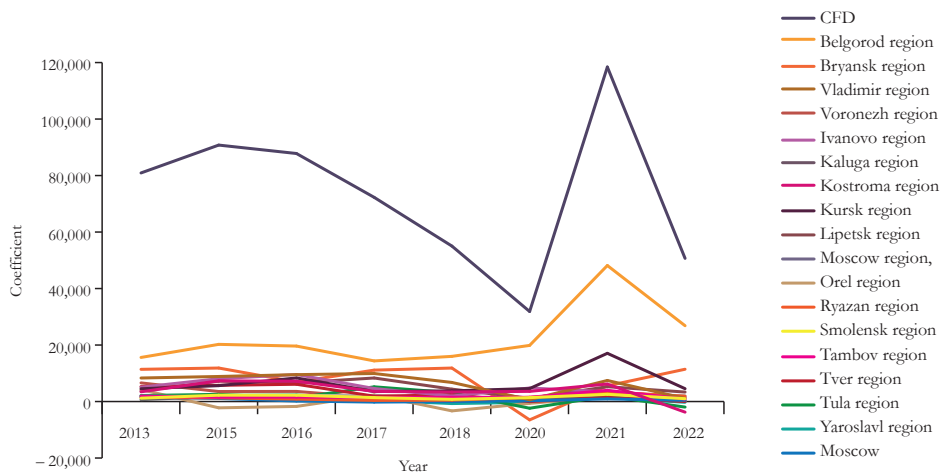
Compiled by the author on the materials of the source[17]

Fig. 1. Dynamics of the total fertility rate for the period from 2002 to 2023

When analysing the subjects of the CFD, we would like to dwell on the Kostroma region. Despite the fact that this region is not large in terms of area, its population is 566 thousand people, and its population density is one of the lowest among others, in this subject, the measures to support fertility, judging by statistics, have been the most effective. By 2016, the total fertility rate here reached 1.96 children per woman, which is very close to the rate of simple reproduction that should be 2.15 children per woman. Therefore, it is necessary to study this area in more detail in order to assess the indicators on which the state's measures here have shown the best effect. In this regard, there is a need for targeted support for each region based on the mechanisms that can work in these specific conditions.

Mortality rate in the CFD subjects over the analysed period exceeds number of births. In all regions there is a negative natural increase, with the exception of Moscow, where for 10 years the birth rate exceeded the mortality rate, but for the total analysed period the natural population loss was 174 thousand people. In total, from 2002 to 2023, the natural decline in the CFD reached 4,252,663 people.

Differences in population reproduction caused differences in its age structure (table 4).

Table 4

Population under working age in the regions of the CFD in 2023

"Oldest" regions of the CFD	% of total population	"Youngest" regions of the CFD	% of total population
Bryansk region	7.72	Tver region	20.26

[17] Unified Interdepartmental Information and Statistical System. Total fertility rate. Access mode: https://www.fedstat.ru/indicator/55407 (accessed 17.04.2025).

"Oldest" regions of the CFD	% of total population	"Youngest" regions of the CFD	% of total population
Lipetsk region	7.80	Moscow region	18.48
Tambov region	14.04	Kostroma region	18.32
Tula region	14.36	Yaroslavl region	17.46
Smolensk region	15.53	Kursk region	16.79
Ryazan region	15.56	Kaluga region	16.77
Moscow	15.87	Belgorod region	16.37
Vladimir region	15.91	Voronezh region	16.13
Ivanovo region	15.94	Orel region	16.07

Compiled by the author on the materials of the sources[18,19]

All the youngest subjects are those far from the centre, with the exception of the Moscow region. Elderly population is concentrated in capitals and the Russian historical core – in the Tula, Moscow, Ryazan, and other regions. Among the subjects where the share of the population below working age has increased are the city of Moscow (from 12.82 to 15.87%), Yaroslavl region (from 14.55 to 17.46%), Tver region (from 17.79 to 20.26%), Kaluga region (from 14.28 to 16.77%). Based on the results of the analysis, we can conclude that these subjects become the most attractive for young people.

One of the important components of the demographic crisis, determining qualitative changes that occur in the population, are reproductive attitudes and attitude of citizens to marriage and family formation. There is a close relationship between marriage and fertility as fewer children are born in unregistered marriages [7]. To analyse such qualitative changes we have taken marriage structure of the CFD regions on the basis of census data. The data are presented in table 5.

Marital structure of the CFD population

Citizens aged 16 and over who indicated married status	Population census data, persons.			Difference (2002–2021), persons/%
	2002	**2010**	**2021**	
Married, of them:	17,763,145	17,803,388	15,781,254	−1,981,891 / −11.2
– in a registered marriage	16,576,545	15,970,768	14,536,930	−2,039,615 / −12.3
– in an unregistrated marriage	1,186,600	1,832,620	1,244,324	57,724 / + 4.9

Compiled by the author on the materials of the source[20,21,22]

As we can see, the number of married persons has decreased by 11.2% over the last 20 years. In a registered marriage the reduction occurred by 12.3%. The only form of marriage the share of which increased by 4.9% is an unregistered one. In 2020, marriage rate (number of registered marriages per 1,000 inhabitants) in the CFD

[18] Unified Interdepartmental Information and Statistical System. Number of permanent population – women by age as of 1 January. Access mode: https://fedstat.ru/indicator/33459 (accessed 17.04.2025).

[19] Unified Interdepartmental Information and Statistical System. Number of permanent population –men by age as of 1 January. Access mode: https://fedstat.ru/indicator/31548 (accessed: 17.04.2025).

[20] All-Russian population census of 2002. Official website. Access mode: http://www.perepis2002.ru/index.html?id=11 (accessed 15.04.2025).

[21] Census book. Results of censuses. All-Russian population census of 2010. Access mode: https://www.statmuseum.ru/ru/results/2010/ (accessed 15.04.2025).

[22] Federal State Statistics Service. All-Russian population census of 2020. Access mode: https://rosstat.gov.ru/vpn/2020 (accessed 15.04.2025).

was 6.2 – according to Rosstat, this is minimum since the beginning of this century. Even in the 1990s it was noticeably higher: for example, in 1995 – 7.51.

Based on the data we can conclude that the demographic crisis has further developed in the regions of the CFD aggravating the demographic development of the subjects. The second demographic transition in the regions is in active phase and, unfortunately, there are no prerequisites for overcoming it at the moment [8]. If this trend continues, we should expect new consequences of the demographic crisis, which will have a negative impact on the demographic development.

At the same time, influence of international migration is growing as an effective factor in the socio-demographic development of the CFD. Fig. 2 shows dynamics of the migration growth in the regions of the CFD for the period from 2013 to 2023. The greatest contribution of the international migration to the demographic dynamics is observed in the Moscow, Kaluga, Tula, Voronezh regions, the least one – in the Tambov, Ivanovo, Kostroma, and Yaroslavl regions.
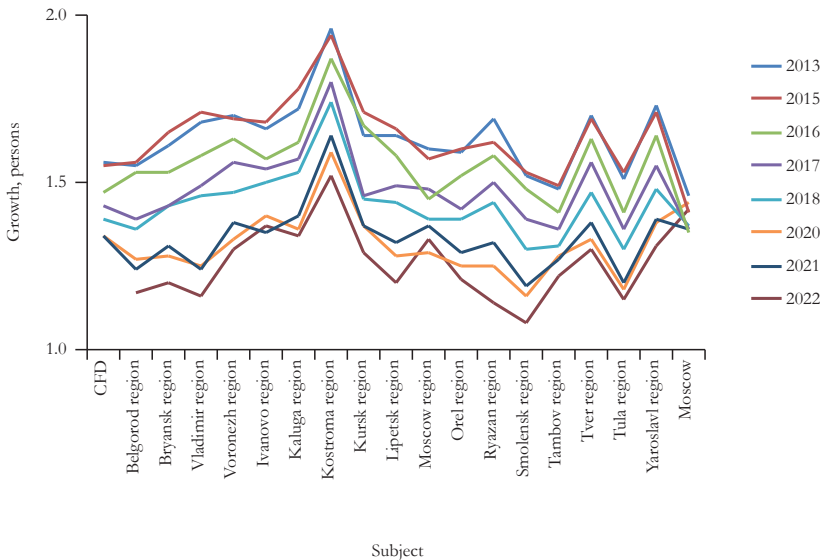
Compiled by the author on the materials of the source[23]

Fig. 2. Dynamics of the migration growth in the regions of the CFD for the period from 2013 to 2023

The international migration is an important factor of the demographic development and in some regions can compensate for population decline. Therefore, it is necessary to apply measures in certain regions to stimulate the international immigration, especially since there are successful examples of such stimulation.

CONCLUSION

Thus, there are regional differences in the spatial distribution of the population: uneven density and distribution across the territory of the district, high level of urbanisation of the population, concentration of in large cities and regional centres. The interregional differentiation in population density is high, the gap in the population density between individual subjects appears to be significant.

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[23] Unified Interdepartmental Information and Statistical System. Migration growth. Access mode: https://www.fedstat.ru/indicator/46162 (accessed 15.04.2025).

Negative trends in the demographic development of the regions have been noted for a long time, but the situation is aggravating, and regional differences becomes more and more significant. In most subjects, the population and birth rate are declining, the marriage rate is decreasing, and the trend of population ageing is intensifying. Such significant regional differences and their prolonged negative dynamics in some subjects are threats to further demographic and social development of the CFD.

It is necessary to smooth interregional differences, which requires a comprehensive approach and variety of tools, but the main ways are advanced development of demographic processes and structures of the CDF subjects that are lagging behind and ensuring demographic balance between the regions. In this regard, it is necessary to take measures that would be able to contribute to reduction of mortality and growth of fertility in the long term.

In the conditions of further development of the demographic crisis, the role of such a demographic factor as international migration is increasing. Population migration, or rather permanent, irrevocable international migration, is the only factor in the demographic development of the CFD regions, which can compensate for loss of population, slow down its ageing due to inflow of younger citizens, and have a positive impact on birth rates. Using it as a way to mitigate depopulation in the context of the demographic crisis, it is desirable to improve migration attractiveness of depressed regions by providing conditions for integration of immigrants, which will contribute to their demographic development.

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