
Article

Current Challenges to the Sustainable Development of Rural Communities in Russia's Central Chernozem Region

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ABSTRACT: The rural community system in the Central Chernozem Economic Region in Russia is undergoing a radical transformation under the interrelated influence of fundamental factors that have rendered the development of many communities unsustainable. This paper analyses the role of urbanisation processes in population changes and transformation of rural community systems in the region; determines the level of horizontal mobility among the rural population, as well as its impact on settlement evolution; assesses the share of small and extremely small communities in settlement composition; and outlines these communities' future development prospects. The authors believe that the socio-demographic "desertification" of peripheral municipalities can pose challenges to rural development: a shortage of labour resources, changes in population quality, and problems of innovation diffusion. The study recommends improving the comfort of the living environment and accelerating the technical re-equipment and automation of agricultural production.

Keywords: Resettlement; Rural population; Depopulation; Population mobility; Settlement system; Region; Sustainable development.



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1. Introduction

Global trends in urban development have led to the evolution of settlement's territorial structure, made urban systems more complex, and intensified the development of metropolisation and suburbanisation within metropolitan agglomerations. All of this has led to the radical restructuring of rural settlement patterns. In rural areas, agriculture has receded into the background. Meanwhile, technological progress and industrial methods of agricultural production are "luring" the surplus of the unemployed population out of villages, thus leading to the depopulation of many small communities and the emergence of ghost towns. In the light of new challenges, such as the COVID-19 pandemic, it should be noted that rural areas, which often have certain restrictions on the availability of emergency medical care, are among those regions where excess deaths from COVID-19 were observed [1]. As peripheral territories in Russia lose population, while various villages and hamlets are shrinking and dying out, this poses an acute threat to the progressive development of Russian society. These processes form social development challenges [2] that can have a serious negative impact on the economy, society and the environment [3,4], while making rural communities even less sustainable.

In the developed countries of the world, the problems of rural development have been grouped into two areas: "sustainable development" with a bright environmental focus and "rural development", which is associated with a social orientation and the complexity of rural area. From the standpoint of a systematic approach, the sustainable development of rural areas is seen as a process of changing various spheres of the life of the rural community (social, economic and environmental), but with the obligatory consideration of mechanisms for influencing the process of development of rural areas (financial and investment strategy, mandatory participation of local initiatives, effective actions of authority's local self-government, etc). [5]. The instability of rural areas is a consequence of the processes of urbanization, and increased mobility of the population, which is caused by the penetration of the achievements of scientific and technological progress into agriculture during the transition from an agrarian type of society to an industrial and post-industrial one. And the cumulative impact of the noted processes creates challenges and problems, which is reflected in the radical transformation of the countryside (changes in the economic basis of the

village, its functions, and the growth of territorial mobility of rural residents) [6]. The worldwide search for practices of transformation in rural areas through community empowerment is becoming a key strategy. At the same time, the transformation process of a rural municipality towards sustainable development should be accompanied by the activation of local productivity that helps to eliminate the effects of rural depopulation [7]. The Spatial Development Strategy of the Russian Federation for the period up to 2025 as a strategic planning document based on the territorial principle, which proclaims an increase in the sustainability of the national settlement system through the socio-economic development of cities and rural areas, was adopted in the context of the revival of spatial planning in the country. An example of solving these problems at the regional level is the updated Strategy for the Development of the Voronezh Oblast “Modern public administration: A new stage in the implementation of the Strategy-2035”, section “Demography. Improving the demographic situation in the region” [8].

To optimise the settlement system and make effective institutional decisions, it is necessary to identify problems in regional settlement systems, single out specific community categories that are in acute crisis, and determine ways for their further development.

Russia’s Central Chernozem Region (CChR) has been undergoing a number of both lingering and intense processes. Specifically, even though the natural conditions in the region are favourable for living and farming, this has not demotivated the rural population from moving to cities. Thus, the transformation of territorial patterns has become even more entrenched. The transformation of rural communities in Russia’s CChR goes back to the 1960s and 1970s. At present, the transformation processes are slowing down, but the rural population size and distribution continue to shrink, under the joint impact of demographic factors and new socio-economic factors. Globalisation processes are reaching deep into the country, including the Central Chernozem Region, and in the process, the people’s values and notions of living standards are changing. This is leading to increased migration from the countryside to large cities and urban agglomerations, and shrinking the network of peripheral communities, which eventually begin to degrade until they turn into more and more new ghost towns.

Rural community issues are explored by professionals from different research fields. Rural settlement is a phenomenon and is the subject of a number of interesting papers that examine the current trends in its transformation [9–11]. The radical changes in people’s lives [12] due to uneven development and globalisation, polarisation and “compression” of the developed space [13,14], and finally, the modern economic and social components of rural development do not contribute to the growth of the rural population, especially in areas that are far removed from big cities and the local administrative centers.

The authors of this paper spent several years studying rural areas and settlement patterns and reviewing demographic, ekistics, and socio-economic processes in the Central Chernozem Region, with a particularly in-depth analysis of Belgorod Region [15–19].

The study aims to: (1) analyse the results of urbanisation processes as a settlement factor that has changed the local population size, transforming the rural community systems in the Central Chernozem Region; (2) determine the level of horizontal mobility among the rural population, and define its impact on settlement evolution and changes in the human capital; (3) assess the share of small and extremely small communities in settlement composition and outline their prospects; (4) the establishment of challenges to the rural settlement of the Central Chernozem Region, which became the result of the unsustainable development of peripheral, deep municipalities, small settlements and the attractive force of metropolises.

2. Materials and Methods

This study covers the Central Chernozem Region (including Belgorod, Voronezh, Kursk, Lipetsk, and Tambov Regions), located in an area of 167,856 km² in the well-developed European part of Russia with a population of 7.12 million people (4.85% of Russia’s population), of which 32.3% reside in 9201 rural communities [20].

Rural area is the inhabited territory of the country, region, district, which are outside urban settlements. Interspersed rural areas, sometimes significant, stand out in the composition of agglomerations. Rural territories play a special role in the preservation and development of the inhabited space of Russia. Under the resettlement of the population in a broad, social sense is understood as a spatial form of organization of society, in the second, and in a narrow sense, the totality of settlements within a certain territory. Rural settlement is the framework of the inhabited territory of the country, which reflects the contribution of many generations of people. The study is based on official statistics and long-term studies of rural areas, which included expeditionary surveys, combining various sources of statistical information with materials from expert interviews and their subsequent analysis using comparative geographical, statistical methods and geoinformation mapping.

The information for the study was derived from the materials provided by the Federal State Statistics Service and its local offices in Belgorod, Voronezh, Kursk, Lipetsk, and Tambov Regions, as well as from field experiments and long-term studies by researchers from the Central Chernozem Region. For expeditionary research, grassroots territorial cells were chosen, that is, rural settlements of the municipal districts of the Central Chernozem Region. One of the research methods was expert interviews, which were taken from the heads of rural settlements and employees of rural administrations, who had information about the state of the socio-demographic situation in their settlement. The method of combining the materials of expert interviews with employees of the administrations of rural settlements and the balance method is widely used, which made it possible to assess the

structure of the population, and changes in the population. The territorial mobility of the rural population was estimated according to the indicators of the balance of migration. In some cases, the necessary information on rural areas was obtained on the basis of a rural settlement passport (the so-called municipal statistics), which describes the composition of the population, but, unfortunately, there is no unified passport model, a universal methodology for compiling passports for one region. The combination of different sources of information made it possible to obtain an up-to-date assessment of the processes of transformation of rural settlement, to determine the main trends in the development of different population groups of settlements, depending on the center-peripheral position. The main idea when determining the methods and sources of indicators for the study's calculations was that the indicators obtained are changing over time and thus should be consistently monitored. Our study uses the conceptual foundations of the space-time approach, as well as the achievements of the new chronogeography, which is being formed in connection with the development of information and communication technologies and the strengthening of their role in the life of modern society [21]. Spatial statistics enhance analysis by quantifying the most important spatial patterns in geographic data. The system of indicators made it possible to identify the development features of individual phenomena and the specifics of their manifestation in the areas under study. The authors meet this study's main objectives by applying the methods of spatio-temporal analysis, comparative geographical analysis, statistical analysis, and a combination of official statistics with sociological surveys. A major part of the study is dedicated to GIS-mapping, which made it possible to visualise a time-lapse for various processes and phenomena.

The authors performed mapping of the territorial structures of the rural population in the ArcGIS 10.5 environment, using the database and previously obtained technological advances [22–24]. The basic materials for creating vector maps were data from the data.nextgis.com service, tables of attributes and spatial data, which were verified and supplemented with statistical data on the size and migration of the population. Scales that allow you to reflect the mapped processes with the greatest clarity were developed to create maps. The scale, which reflects the gradation of the population, takes into account, according to the classification adopted in the country as a small town, settlements with a population of up to 50 thousand people (10–30 and 30–50 thousand people). Six cities with a population of more than 100 thousand people are shown by large-scale puncheons, and the largest city is Voronezh (more than 1 million inhabitants since 2021) within its borders with an area of 596.5 km². The method of icons with a conditional stepped scale was used to visualize the number of inhabitants by settlements. Whereas the quantitative background method was used to display migration processes and display municipalities with a certain number of settlements, which differed in different populations.

3. Results

3.1. Rural Settlement's Role in the Urbanisation Results in the Central Chernozem Region

Community populations and settlement patterns are largely kept sustainable by positive or neutral population dynamics. The Central Chernozem Region is among the regions of the Russian Federation that have not experienced population growth for a long time. On the contrary, its entire population size, and the size of the rural population in particular, has been declining.

The current state of the settlement system's spatial patterns emerged during the previous historical period. Its development is determined by a number of factors: socio-economic, demographic, infrastructural, natural, and institutional. Urbanisation, a global socio-economic process that not only leads to the growth of cities and urban populations, but also makes urban systems more complicated and brings urban lifestyles to the countryside, has played a dominant role in the transformation of rural communities. As a result of urbanisation, fuelled by industrialisation (and a number of institutional and socio-economic factors in the 50s through the 70s, which were bifurcation points in the history of settling in the Central Chernozem Region), the rural community system changed radically and continued to change throughout the Soviet period. These changes were accompanied by a decline in population.

In the post-reform era of Russia, the outflow of rural residents continued, illustrating a pattern for which the term “path dependence” proposed by P. David [25] can be applied. The processes of urbanisation and globalisation, along with their projection onto the countryside, were supplemented by technological transformations in agriculture and new social realities, which intensified the demographic and migratory processes in the regions (the processes of suburbanisation are not considered in this paper). From 1970 to 2021, the number of rural inhabitants of the Central Chernozem Region decreased by two million people, with the Kursk (67% decline) and Tambov (58% decline) Regions suffering the greatest losses. Figure 1 visualizes the intra-district differences in rural population changes (Figure 1).

It should be noted that the gradual population uptick noted in the early 1990s (with the exception of the Tambov Region) was short-lived, lasting merely until the mid-90s, as it was formed by the inflow of forced migrants from the former Soviet republics (repatriation migration). After the migration ended, the number of residents continued to dwindle due to natural decline and population outflow, which contributed to the instability of the rural settlement system, especially the network of small rural communities.

Rural community population density indicators are of great importance to settlement analysis, as they provide much insight into settlement transformation. The average population density in rural communities the ratio of the region's total rural population to the number of communities in the region, measured in people per community (Table 1).

Table 1. Average population of rural settlements in the regions of the Central Chernozem region. According to the population censuses 1989–2021.

Region	1989	2002	2010	2021
Belgorod	311	341.9	330	340.3
Voronezh	526	519	494	428.7
Kursk	201	176	142	123.2
Lipetsk	285	282	266	263.7
Tambov	317	304	275	251.9

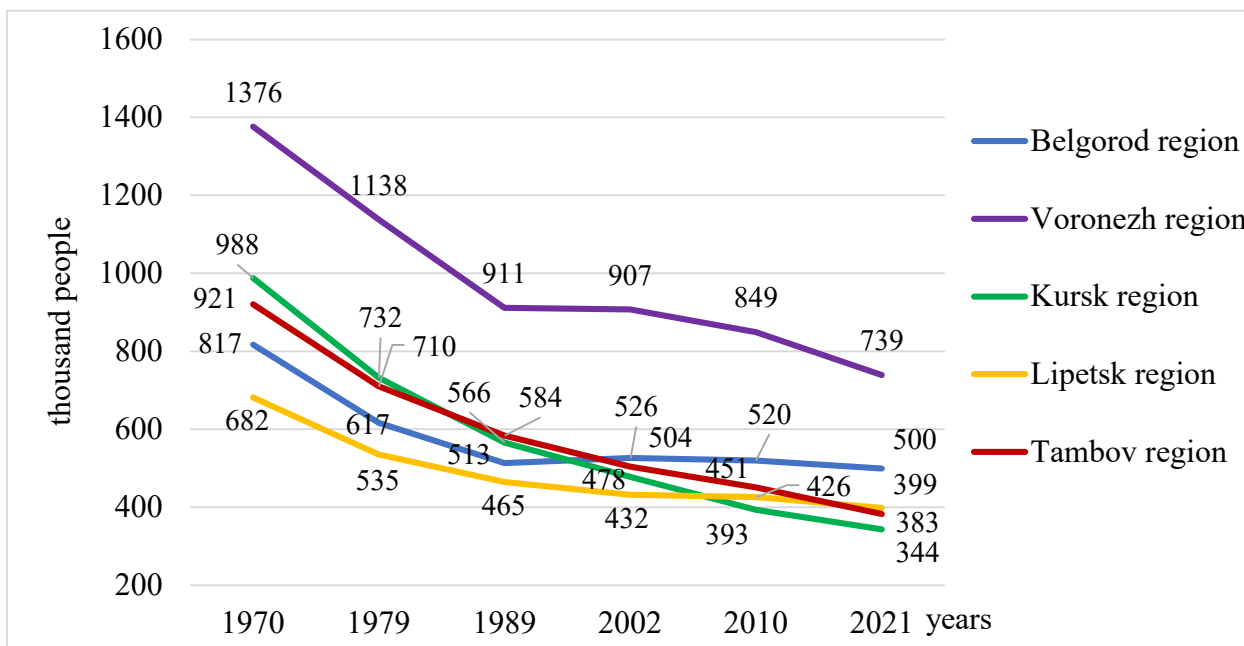


Figure 1. Dynamics of the rural population of the regions of the Central Chernozem region for 1970–2021 (thousand people). Compiled from census data.

3.2. Depopulation of Rural Settlements in the Last Decade

The process of depopulation in the countryside is of a long-term nature and forms the socio-demographic desertification of the periphery of administrative territories, the instability of settlement, and the increase in the concentration of the population in suburban areas [8].

Based on the official data of the 2010 and 2021 censuses, we compiled a table that represents the quantity dynamics among “zero-population” rural communities. (Table 2).

Table 2. Rural settlements of the Central Chernozem region (CCR) “without population” in 2010 and 2021.

Region	Total Rural Settlements		Rural Settlements without Population		Share of Rural Settlements without Population, %	
	2010	2021	2010	2021	2010	2021
Belgorod	1574	1573	69	104	4.4	6.6
Voronezh	1717	1699	74	118	4.3	6.9
Kursk	2770	2773	172	335	6.2	12.1
Lipetsk	1600	1601	110	135	6.9	8.4
Tambov	1638	1555	122	98	7.5	6.3
CChR	9299	9201	547	790	5.9	8.5

Compiled and calculated according to [20,26].

In all regions of the CChR area, the average population in rural communities exceeds the national average of 245 people (Kursk Region is an exception), reaching as high as 428.7 people in Voronezh Region in 2021. The general trend is community shrinkage: a decrease in the average population caused by natural decline and migration outflow. The data in the Table 1 shows an increase in the average rural community average population in Belgorod Region in 2002 and 2021 (due to the influx of displaced persons).

4. Discussion

4.1. The Change in Population and Settlement Configuration

The decline in human population is a consequence of many factors that determine the development of settlement patterns in rural areas, as outlined above. Particularly significant is the shrinkage of communities located on the periphery of regions that make up the CChR area. The Centre and the Periphery are becoming more and more opposed to one another. Within the Centre vs Periphery model, the Periphery acts as a factor limiting the development of the respective areas.

The social “desertification” of municipal districts, which serve as suppliers of agricultural products, may create a labour shortage in the foreseeable future, which will be a challenge for certain sectors of agricultural production. This process can be partially (economically) compensated for by the acceleration of technical re-equipment and automation in agriculture, and by the quality of life improvements in rural communities.

During the inter-census period, the number of CChR rural communities continued to decrease in Voronezh and Kursk Regions and stabilised in Belgorod and Lipetsk Regions. All regions experienced a significant increase in the number of zero-population ghost towns. Tambov Region was the sole exception, which, as we believe, occurred for technical reasons, as the first symbol out of three was lost. In Kursk Region, the number of ghost towns doubled, indicating the loss of well-developed land.

Two indicators contribute to the change in population and settlement configuration: (1) natural dynamics (since the 1990s, the population has been declining) and (2) migrations. Since natural decline is characteristic of all regions of the CChR, migration scale and balance became a dominant factor.

4.2. Migrations in the CChR Rural Settlement

Migrations are considered as a type of social mobility of the population, as well as a sign and factor in the development of urbanisation. They combine both vertical aspects (progress along the hierarchical ladder) and horizontal aspects (movement in geographical space). This section explores horizontal migrations (territorial or geographic mobility). According to our calculations, a high positive balance of horizontal mobility is typical only of regional metropolises and their suburbs, with the exception of Tambov Region (Figure 2).

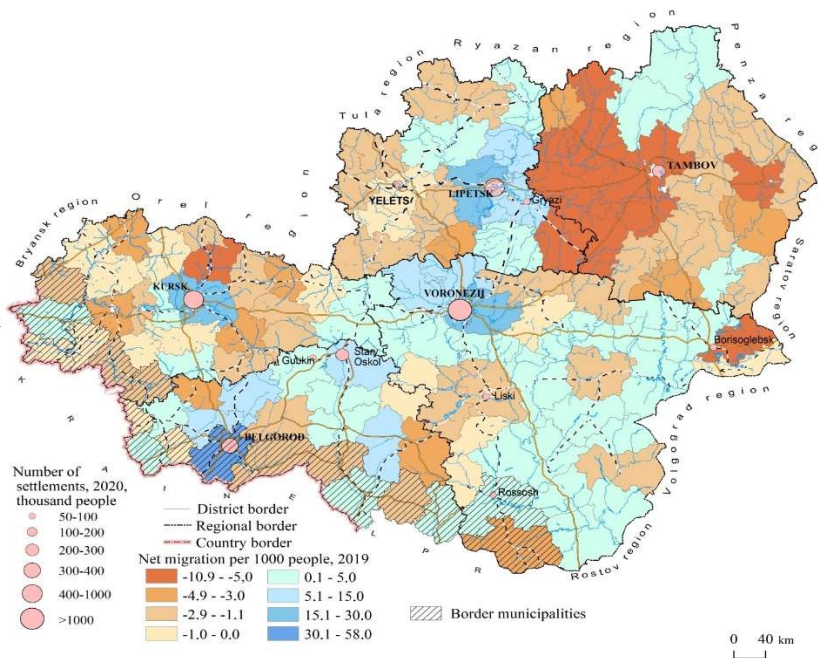


Figure 2. Balance of migration per 1000 people (2019).

Tambov Region displays the worst indicators in the CChR: only three districts have a positive migration balance, as opposed to 2/3 of all districts (68%) in Voronezh Region and a quarter of all districts (26%) in Kursk Region.

Indicators of migration loss reflect the socio-economic advantages or disadvantages in the municipalities of the areas under study. The impact on dynamic development tends to differ. The outflow of active, educated people reduces the labour potential, worsens the quality of human capital, affects the territorial management structure, and poses a certain challenge when it comes to the diffusion of innovation.

The non-diversified structure of the rural economy, unemployment, insufficient improvement and development of the social environment, and the attractive image of the big city increase the people's motivation to leave their rural communities. Small towns share this experience with villages. The population of peripheral districts tends to move to regional centers (Belgorod, Voronezh, Kursk, Lipetsk, Tambov). Therefore, in the future, metropolitan areas will continue receiving new residents from villages and small towns in peripheral municipalities, while the “hinterlands” will keep on losing entire villages.

4.3. Rural Settlement as Reflected by Small and Extremely Small Communities

Our previous studies of rural settlement, analysis of statistical materials, and field surveys allow us to assert that the most radical changes concern (and will concern) the growth and change of status among communities that we classify as “vanishing” (including small communities, of 26 to 50 people, and extremely small communities, of 1 to 25 people). A community can be classified as “vanishing” on the basis of the following criteria: a consistently depressed socio-economic state, a decrease in population, and the ongoing transformation into a ghost town (with zero population). The 2021 census data on territorial differences among rural communities that are part of the local municipalities has not yet been published, so we rely on the 2010 census. The share of extremely small communities is the highest in Kursk (31.4%) and Lipetsk (29.2%) Regions and lowest in Belgorod Region (16.8%). Within the entire CChR, the number of such communities is 2,325, or 24.8% of the entire rural community network. We created a cartogram to visualise the differences in the spatial distribution of extremely small rural communities (Figure 3).

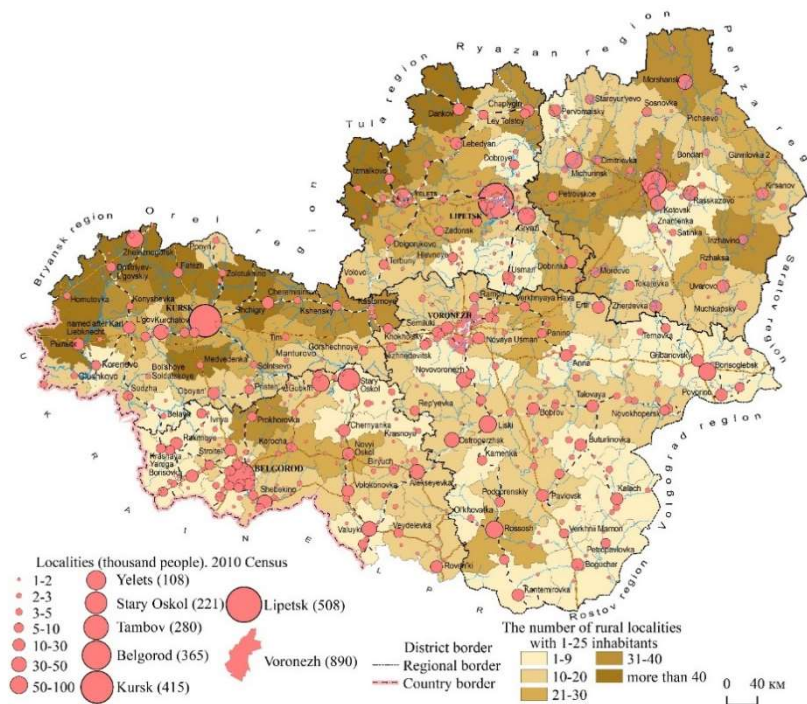


Figure 3. Distribution of rural settlements of the Central Chernozem region with a population of 1–25 people (calculated according to [20]).

The number of small communities is not as high but remains notable: 1080, a tenth of all rural communities in the Central Chernozem Region (Figure 4).

Voronezh Region is the most “fortunate” in this regard, with small communities amounting to only 8.7%. Kursk Region is the most “problematic”, with 13.4%, while Belgorod, Lipetsk and Tambov Regions have found the “sweet spot” in the middle.

According to the census, there were 3405 vanishing communities or 36.4% of all rural communities. Since then, some of them have already regressed into the ghost town category, as confirmed by our 2020–2022 field surveys. This disappearance is a natural evolution of the small rural community network when impacted by globalisation, scientific and technological progress, the penetration of urban quality of life standards into the countryside, and poor social environment.

As shown in the example of the rural area in China [27], while the importance of the effects of rural transportation infrastructure can be ambiguous. In the region that we have studied, the degradation of rural settlement is exacerbated by the destruction of the social infrastructure in rural areas. The 21st-century “optimisation” of infrastructure in Russia had negative consequences that are reflected in the socio-economic living conditions of rural residents and their resulting outflow to metropolitan areas. The likely result of such “reforms” will be a further shrinkage of space, which will keep diminishing the inhabited, economically active territories created by the labour of many generations.

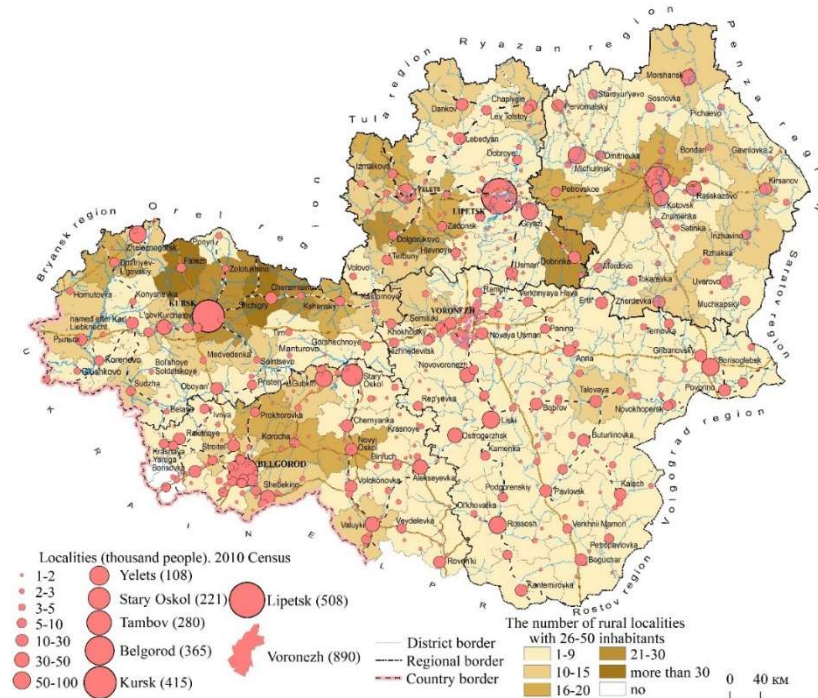


Figure 4. Distribution of rural settlements of the Central Chernozem region with a population of 26–50 people (calculated according to [20]).

5. Conclusions

The demographic forecast indicates a further reduction in the population in the Central Chernozem Region, while maintaining the trend of population growth in suburban areas due to suburbanization processes.

The study made it possible to come to the following conclusions:

- from 1970 to 2021, the number of the rural population has significantly decreased, the demographic potential of the economically and innovatively active population. It is noted that in the Kursk, Tambov regions, the decrease in the number of rural residents has reached a critical situation;
- factors limiting the development of the outlying districts of the regions are patterns of behavior of the population, the periphery of municipalities in the center-periphery model;
- a high territorial mobility of an active, educated population in the direction of “village-city-metropolis” has been established, which reduces and worsens the quality of the remaining human capital and also makes it difficult for the digital economy to penetrate;
- the refinement of settlements was determined, the decrease in the average population, which changes the structure of the organization of the territory, increases the degree of polarization in the center-periphery gradient;
- the growth of “disappearing” settlements on the periphery of the regions of the region (more than a third of settlements) was noted as a natural evolution of the network of small settlements in the context of globalization, penetration into the countryside of the achievements of scientific and technological progress, urban standards of quality of life, low social environment, which as a result, become factors limiting the development of the periphery.

The identified changes are challenges to the sustainable development of rural settlement in the Central Chernozem Region.

The authors came to the conclusion that overcoming rural development challenges are possible through three main blocks in the implementation of management decisions: (1) optimizing the population’s social environment; (2) supporting small-business, consumer cooperation, and the development of infrastructure; (3) accelerating the technical and technological re-equipment and automation of agricultural production and diversification of the rural economy.

The obtained results of the work confirm the relevance of studies of rural settlement and provide government institutions with a practical opportunity to improve the territorial system of settlement, to prevent the threat of intensification of the instability of rural settlements.

Prospects for further research may be related to the need to identify emerging new challenges, problems and trends in the development of rural settlement in the Central Chernozem Region in an unstable geo-economic situation.

Author Contributions

Conceptualization, methodology, N.C. and T.P.; software, visualization, A.N.; validation, writing—review and editing, F.L. All authors have read and agreed to the published version of the manuscript.

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Not applicable.

Informed Consent Statement

Not applicable.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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