

**CDSSES 2020****IV International Scientific Conference "Competitiveness and the development of socio-economic systems" dedicated to the memory of Alexander Tatarkin****TRANSFORMATIONS IN THE SETTLEMENT SYSTEM OF THE REGION**

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**Abstract**

Against the backdrop of economic recovery, population decline remains one of the critical Far East trends. Regional spatial policy plays a crucial role in solving demographic problems, an essential element of improving the settlement system. The choice of forms and methods of regulation requires taking into account the inherited differentiation of settlements and differences in the prospects determined by their role in the further socio-economic development of the region. This circumstance determines the need for monitoring emerging processes. The purpose of this work is to analyze the transformations in the settlement system of the region, caused by socio-economic changes determined by the crisis processes and transformations in the state policy of the Far East. As an object of research, the Amur Region was chosen to develop which all the main features of the regional development of the macro-region are present. The analysis is carried out based on a database on the Amur Region settlements based on the results of population censuses and data of current statistical reporting. The results obtained indicate an increase in asymmetry in the position of the region's settlements. Based on the study results, measures are proposed to improve the strategic plans for the spatial development of the region.

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## **1. Introduction**

One of the most important consequences of spatial development inequality is a high level of differentiation in the state of regional settlement systems and the dynamics of the current processes, while an increase in intraregional differences is becoming more widespread. The transformations in various regional settlement systems indicate that inequality, significant differences, are manifested at the level of individual settlements within the same municipal district. The successful development of some is combined with the degradation of others, predetermining an increase in asymmetry, differentiation in the population's position, which is acquiring extreme negative forms. This situation is becoming less and less bearable since its direct consequence is the escalation of the most acute problems in the sphere of the well-being of the population, in particular, the formation of a significant circle of spatially localized disaster zones, where poverty of the able-bodied working population is widespread.

## **2. Problem Statement**

The ongoing changes in the settlement system helped attract the attention of representatives of various scientific fields. In economic scientific works, significant steps have been taken to study economic space and the ongoing processes of integration and disintegration (Kuznetsova, 2019; Lavrovsky & Shiltsin, 2009; Minakir, 2015; Minakir, 2019). In Gritsay and Treyvish (1990) and Zubarevich (2019), have received detailed research the division of economic space into "center" and "periphery", the development of -periphery relations. Lappo (2019) and Shmidt et al. (2016) investigate the rapid growth of cities, the creation of agglomerations and the growth of their importance. The further development of this process is associated with the development of the polycentrism trend, when agglomerations of the second order become the structural elements of the spatial organization of the regional economy (Karachurina, 2018). The subject of research by Alexeev and Safronov (2017); Dyachenko & Lazareva (2020); Nefedova et al. (2015); Rumjancev et al. (2019); Shcherbina and Gorbenkova (2018) is the emerging acute problems in rural areas, affecting various aspects of the processes developing in the system of the rural population. An important result of the analysis Tkachenko (2018) and Vikhryov et al. (2016) was the identification of settlements in the settlement system, which are the centers of the surrounding territory, or centers of settlement.

## **3. Research Questions**

In some periods, regional settlement systems may develop tendencies that are fundamentally different from the widespread ones. Accordingly, the approaches developed based on taking into account the general laws of spatial development, firstly, are not universal, applicable to all "places" and in all cases, and secondly, they by no means exhaust the entire range of issues and problems that should be the subject of consideration of the national spatial strategy. The emerging diversity makes it necessary to focus in scientific research on the definition of general patterns and the fixation and comprehension of the features that determine the effectiveness of management decisions. The significance of assessing the features is especially great in relation to the processes taking place in the settlement system of regions that

have significant differences in natural and climatic conditions, the degree of development of the territory, and types of economic activity. The set of such differences in the country is most typical for the North Caucasus, the zone of the North and the Far East.

#### **4. Purpose of the Study**

In this work using the example of the Amur Region, an attempt to assess the transformations in the regional settlement system occurring at the level of various types of settlements in the region is made, taking into account the possible relationships that develop within individual localities. The choice of the Amur Region is determined by the fact that in its development and state there are all the main features of the regional development of the Far East, which is characterized by the incompleteness of the process of economic development, the presence of vast unpopulated spaces, a sparse settlement network, low density of settlements and population density, and limited transport accessibility. At the same time, we considered the internal diversity of the listed characteristics of the territory, the presence of both localities with significant specificity, and those that are mostly similar to ones that are characteristic of the old-developed regions.

#### **5. Research Methods**

To analyze the current situation in the region, a database was formed that includes all settlements that have existed since the 1939 census. The results of the censuses of 1970, 1979, 1989, 2002, 2010 were taken as points of fixation of changes and statistical data in subsequent years based on the resources of the Amurstat Database, the Dynamic Series of Statistical Indicators, the Database of Indicators of Municipal Formations and specially carried out passportization of settlements in the region. At the same time, when forming the types of settlements, the following were taken into account: the population size, the status of the settlement in the administrative-territorial structure, economic specialization, the internal status of the located industries, the remoteness of the settlement from the district center and the center of the rural council, belonging to the natural and climatic zone.

#### **6. Findings**

By the beginning of 2019, the Amur Region includes 286 municipalities, including: urban districts - 9, municipal districts - 20, municipalities within districts - 257, of which: urban settlements - 15, rural settlements - 242. A feature of the settlement support frame in the Amur Region is the low level of development of the network of urban settlements. Only a quarter of all residents of the region are concentrated in Blagoveshchensk, the regional center. Belogorsk and Svobodny are medium-sized cities. The remaining 6 cities are small with a population of 10 to 35 thousand people. Under these conditions, the role of district centers is played by 5 urban-type settlements and 7 villages. Of the 18 urban-type settlements, most are oriented towards the maintenance of the railway, some of them are oriented towards electric power enterprises; their population formally is rated as the urban type, but in fact the urban way of life in these "industrial settlements" has not been formed.

Rural settlements differ in the nature of population dynamics. It depends, first of all, on their functional structure. A significant part of rural settlements in the region (over 25%), according to the 1989 census, are not associated with agriculture. 27.2% of the rural population lived there. These are mainly settlements at industrial and construction enterprises as well as enterprises associated with the exploitation of communication means and communication lines. Most of them (62.6%) are concentrated in the northern and northern taiga zones.

The results of population censuses make it possible to assess changes in the settlement system of the region. So, in the period of 1939-1959 861 rural settlements disappeared in the region, then 221 settlements appeared. Subsequently, the mobility of the settlement system tended to decrease. In 1959-1970. 310 disappeared from the map of the region and 91 settlements arose. In the 1970s, 35 new settlements arose in the region (most during the construction of the BAM) and 107 were liquidated. As a result, the total number of settlements decreased by 70 and reached 665 by the time of the 1979 census. In the 1980s, the process of reducing the number of rural settlements continued, but to a lesser extent than in previous periods. 56 villages disappeared, and 8 appeared.

At the same time, in the north, this process was more active - if the number of settlements in the region as a whole decreased by 53, then in the two northern zones - by 29. The transition to market reforms was marked by cardinal changes in the demographic situation. After the 1989 census, several periods can be distinguished in the socio-economic development of the region, significantly differing in their dynamics. The most acute and painful crisis processes were manifested in the results of the 2002 census, when the growth in the population of the region due to the massive closure of some enterprises and the decline in the activities of others caused a sharp decline in living standards, massive unemployment and an outflow of the region's population.

In 1989-2002, the settlement system of the region underwent minor changes - 16 settlements of various sizes disappeared, and one appeared. The period after 2010 saw the processes of intensification of economic activity, which were reflected in a significant decrease in the outflow of the population, a weakening of the degradation of the settlement system. Finally, the period after the 2010 census to date is characterized by noticeable positive shifts in the economy, among which the increase in agricultural production and the implementation of a number of large investment projects in the region stand out.

We consider the current dynamics of processes in the regional settlement system in details using the example of various types of settlements.

### **6.1. Changes in settlements with different administrative status**

In modern conditions, among a wide range of factors that determine transformations in the regional settlement system, an important role belongs to changes in the administrative structure.

Although the administrative status of settlements, as a rule, remain unchanged, the functions and powers of the governing bodies can significantly change, largely determining the service potential of settlements, and at the same time their attractiveness as place of permanent residence. In addition, settlements with one or another administrative status act as service centers for the population of peripheral settlements associated with them (Table 1).

**Table 1.** Changes in settlements with different administrative status, %

Administrative status	Number of settlements			Population		
	in 1989 compared with 1970	in 2019 compared with 1989	in 2019 compared with 2010	in 1989 compared with 1970	in 2019 compared with 1989	in 2019 compared with 2010
regional center	100	100	100	157,3	110,5	105,3
city of regional subordination	100	100	100	166,9	69,9	92,2
city of district subordination	100	100	100	123,4	54,2	92,6
district center that does not have city status	100	100	100	128,0	76,1	92,0
the center of the rural council	108,8	99,3	100	130,2	60,7	91,6
the center of settlement council	118,2	107,7	100	113,4	73,5	89,2
peripheral settlement	70,0	86,1	97,1	69,3	64,7	93,9
total	84,0	92,5	98,5	132,6	75,4	95,4

In the developed in the region administrative hierarchy of settlements the overwhelming majority is concentrated on its lower floors. The centers of the rural council make up 44.8% of the region's settlements, peripheral villages - 49.4%. In the distribution of the population, the hierarchy looks different. The regional center population was 28.5% of the population of the region; the cities of regional subordination - 26.6%, another 20.1% of population live in settlements that are the centers of rural councils. With the stability of cities and district centers that do not have a city's status, there was a significant reduction in the number of peripheral villages. In the period from 1970 to 1989, 148 villages with a peripheral status were abolished, in 1989-2019 48 peripheral villages disappeared from the map of the region, including 9 disappeared in 2010-2019.

In contrast to the period from 1970 to 1989 which was rather prosperous in terms of population size, reduction of peripheral settlements were more than 2 times greater and amounted to 30.0% of those available in 1970. Thus, the crisis processes, intensifying migration outflow of the population, contributed to the strengthening of stability in the world of the settlement structure.

The ongoing demographic changes show that the stability of the majority of various elements of the settlement system remains at a low level. The period 1970-1989 was characterized by an increase in the population in all settlements in terms of administrative status, except for peripheral villages. In the period 1989-2019, there was a loss of population in all groups, except for the regional center. The dynamics of demographic processes makes it possible to reveal other problems in the structure of

settlement. The analysis shows that, if in peripheral settlements for the period from 1989 to 2019, the population loss was 35.3%, then in the s of rural councils it was 39.3%, and in cities of district subordination it was 45.8%. The population losses were significantly lower in the centers of settlement councils (26.5%) and in district centers that do not have the status of a city (23.9%).

The dynamics of demographic processes in settlements with different administrative status is interesting not only from the point of view of its stability, but also from the point of its contribution to the dynamics of changes in the region generally. The cities of district subordination with the highest outflow of population contribute only 5.9% to the total number of losses; another 10% are losses of peripheral settlements, while the contribution of cities of regional subordination was 32.5%.

It should be noted that the growth of the population of the regional center is not comparable with the decrease in the number of residents of other settlements in the region, accounting for only 7.7% of the population loss in these settlements. The current degradation of small towns, in our opinion, is one of the most important processes that have a significant negative impact on the socio-economic development of the region.

A natural process for the rural periphery is the sequential decrease of settlements, accompanied by the closure of social infrastructure facilities. Thus, the living conditions of villagers are increasingly dependent on the service potential of regional centers which are represented by the cities of district subordination. Their degradation leads to a deterioration in the situation of not only the townspeople, but also the entire rural population. As indicated by the ongoing transformations in the regional settlement system, the exclusion of innovations from the system of state support for the modernization of the economic complex of small towns leads to the growth of spatially localized areas of poverty and low living standards.

## **6.2. Dynamics of changes in settlements of different economic specialization**

To assess the impact of changes in the position of economic entities on the settlements in which they are located, the typology in this work is based on the allocation of settlements that are centers of the development of industry, agriculture and railway transport.

Taking into account the specifics of the region, within the typology the gold mining and forest industries were separately distinguished, the development of which led to the formation of a territorially separate system of settlements. In addition, for each type of economic activity, the status of the placed production was taken into account (Table 2).

**Table 2.** Changes in settlements of different economic specialization, %

<b>Economic specialization</b>	<b>Number of settlements</b>			<b>Population</b>		
	<b>in 1989 compared with 1970</b>	<b>in 2019 compared with 1989</b>	<b>in 2019 compared with 2010</b>	<b>in 1989 compared with 1970</b>	<b>in 2019 compared with 1989</b>	<b>in 2019 compared with 2010</b>
multi industry settlement	100,0	100,0	100,0	144,1	94,6	100,6

center of industry and agriculture	100,0	100,0	100,0	150,3	82,6	94,6
center of industry and transport	111,8	100,0	100,0	112,2	71,5	90,7
industrial center	110,0	109,1	109,1	126,2	70,2	89,0
agricultural center	89,2	95,4	98,2	100,6	69,4	95,3
agricultural and transport center	100,0	100,0	100,0	95,2	65,4	87,7
transport center	83,8	78,4	100,0	238,4	48,9	88,4
gold mining	58,1	88,9	94,1	74,6	47,3	82,0
forest industry	55,6	75,0	100,0	78,4	36,6	82,5
others	38,6	88,2	100,0	66,7	201,2	105,4
total	83,9	92,6	98,7	132,6	75,5	95,6

The overwhelming majority of settlements in the region (91.0%) are single-industry. Moreover, only 40.7% of the region's population live there. This situation develops with the decisive role of small settlements, the specialization of which is agriculture and railway transport (18.6% and 11.4% of the population,). From the given data it is clear that this group of settlements is the least attractive as a place of permanent residence. For the period from 1989 to 2019, the population loss was 63.4% in the centers of the forest industry, 52.7% in the centers of the gold mining industry, and 51.1% in transport centers.

Along with the population decline settlements are becoming smaller so that they are deprived the prospects of improving living conditions through the development of the service sector. At the beginning of 2019, the average population of settlements that are centers of the gold mining industry amounted to 528.6 people, agricultural centers - 338.25 people, forest industry centers - 276.4 people.

### **6.3. Dynamics of changes in the system of agricultural rural settlements**

The settlement of the Amur region was mainly of an agrarian nature, determining the dominant position of rural settlements in the regional settlement system. In the course of the urbanization process, the share of the rural population in the region was consistently declining, having been fallen from 40.4% in 1959 to 32.0% in 1989. At the same time, it is important to emphasize that during that period the number of rural residents in absolute terms grew at a high rate. The increase was 46.8 thousand people, or

16.2% of the 1959 level. This positive trend is facilitated by both natural growth and a positive balance of interregional migration, provided during the use of organized forms of resettlement.

With the beginning of market transformations in the system of rural settlement, significant negative transformations took place, which were a consequence of the reduction of agricultural production in the region, the termination of the activities of most agricultural enterprises. The reduction in acreage, the refusal of agricultural organizations from the production of fruit and vegetable products, the development of animal husbandry, led to a large-scale reduction in employment, the spread of unemployment in rural areas. Since in the majority of settlements are ones with agricultural specialization, other types of economic activity did not develop, the possibilities of maintaining family incomes were limited to employment in personal subsidiary plots, leading to the spread of poverty (Table 3).

One of the trends of the emerging dynamics was, in particular, the change in the average size of rural settlements in the region, which amounted to 512 people in the 2002 census, and in 2010 - 473 people. An important negative consequence of this process is the increase in the number of rural residents living in the smallest settlements, where living conditions, due to their small size, are the worst.

**Table 3.** Changes in settlements of agricultural specialization, %

Agricultural specialization	Number of settlements			Population		
	in 1989 compared with 1970	in 2019 compared with 1989	in 2019 compared with 2010	in 1989 compared with 1970	in 2019 compared with 1989	in 2019 compared with 2010
agricultural center	89,2	95,4	98,2	100,6	69,4	95,3
center of industry and agriculture	100,0	100,0	100,0	150,3	82,6	94,6
agricultural and transport center	100,0	100,0	100,0	95,2	65,4	87,7
total				105,4	71,2	95,0

#### 6.4. Dynamics of changes in settlements of gold mining specialization

The northern areas of the region, despite the formation of developed settlement centers, largely retain the features of the primary development forms. The development of the settlement system in the northern districts of the region is mainly associated with the deployment of gold mining enterprises, which does not provide with the increase of population and the settlement of the territory. The exception is the few that play the role of either regional centers or relatively large transport hubs. The largest settlements (from 1 to 5 thousand people) serve as the base for mines, and for the organization of work on small remote deposits, smaller settlements are deployed, the existence of which is limited by depletion of the raw material base (from 200 to 1000 people). Thus, there is a stable production system with a



developed periphery, represented by relatively independent production units, organizationally and technologically connected with the base centers that perform the function of supporting production and service base.

In recent years, significant changes have taken place in gold mining. On the one hand, the range of enterprises engaged in gold mining has expanded significantly. According to Rosprirodnadzor in the Amur Region, about 250 gold mining enterprises operated in the Amur Region in 1989, and about 700 licenses were issued. At the same time, the dominant position in the industry is shifted to the mining of ore gold carried out by large enterprises. Three mines of the Petropavlovsk group of companies: Pokrovsky, Malomyrsky and Albynsky, provide 60% of the production of precious metals in the region. Currently, due to the seasonal nature of the work, the deployment of gold mining on a rotational basis without the creation of settlements is becoming more widespread. As a result, more than half of the settlements created for work on the sites have ceased to exist, and new ones are no longer being created. Thus, the development of the material and technical base of production has significantly reduced the labor intensity of work, stimulating a reduction in personnel, which is reflected in a decrease of the population in settlements with gold mining specialization.

#### 6.5. Dynamics of changes in the settlements of transport specialization

The role of railway transport is very significant in the formation of the settlement system. The railway branches within the Amur Region include 148 stations and sidings. A tangible new impulse for the development process for the region was associated with the construction of the BAM, which caused the creation of new settlements in the north of the region, which serve as railway stations.

Despite the positive role of the development of railway transport in the development of the region, an increase in the stability of the current regional settlement system, we cannot miss that at the local level, in a significant number of cases, a different trend is developing (Table 4).

**Table 4.** Changes in settlements of transport specialization, %

Transport specialization	Number of settlements		Population	
	in 1989 compared with 1970	in 2019 compared with 1989	in 1989 compared with 1970	in 2019 compared with 1989
railway station	117,2	88,2	155,4	78,6
railway siding	60,0	66,7	40,4	32,8
others (checkpoint, barracks, etc.)	27,8	50,0	14,2	22,3
total	88,7	83,9	154,8	78,6

The ongoing modernization of railway transport, the improvement of transport and logistics systems, ensuring the development of high-speed traffic, cause the need to optimize the transport infrastructure.

One of the consequences of modernization at the regional level is the introduction of technologies that ensure a reduction in the need for personnel and a decrease in the number of railway stations and sidings, which leads to a decrease in the number of settlements, the loss of the town and settlement-forming base for settlements and a decrease in the population. In connection with the increase in the equipment of the sites, the most significant reduction affected units located in small settlements.

When assessing the decline in the population in the settlements of railway specialization, it should be taken into consideration that a significant part of them are remote stations located in uninhabited places, which sharply reduces their attractiveness as a place of permanent residence. The least stable are stations and sidings of the mountain taiga sparsely populated part of the region (Magdagachinsky, Skovorodinsky and Shimanovsky districts) with a population of 11-45 people.

## **7. Conclusion**

The analysis of transformations in the regional settlement system shows that throughout the entire period under consideration, the dominant trend is urbanization, accompanied by a gradually slowing down the reduction of the number of settlements. The increase in the number of small settlements and their share in the settlement system leads to an increase in the number of inhabitants living in the smallest settlements, with low living conditions, with a steady tendency to turn into disaster zones. The most critical role in the degradation of the settlement system is played by small towns and villages, which are regional centers, the decline of the service potential of which significantly limits their ability to perform service centers for the rural population.

The analysis carried out shows that the decrease of the population and significant changes in the settlement structure of economic nature are associated with negative and positive economic activity processes, which determine a reduction in the need for labor. In these conditions, counteraction to destructive processes can reduce the severity of problems by complementing the current policy with state support measures for depressed territories, stimulating the intensification of economic activity.

Support for small settlements presupposes the formation of their economic base for their existence, ensuring the population's year-round employment. In the absence of it, such settlements are likely to disappear. There is no alternative to the conservation and termination of the existence of small settlements created at the mining enterprises

in the North. Significant opportunities for improving the rural population's living conditions are associated with developing the service sector of district centers, which can be facilitated by a particular preferential policy.

The experience that has developed to the current moment shows that regional spatial policy's improvement presupposes the inclusion of the rural settlement system's optimization among the most critical issues, which implies the identification of settlements to be resettled.

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