

## THE INTERCONNECTION OF DEMOGRAPHIC FACTORS AND INDICATORS OF THE POPULATION DENSITY IN THE REGION TERRITORY AT THE MESO-AND MICRO-LEVELS

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*Abstract:* In this article, main indicators characterizing density and the character of distribution of population on the territory of the country are studied, causes of the uneven distribution of population in different regions of the country are analyzed. The process of population reproduction is considered in terms of preservation of territory balance of labor resources.

*Key Words:* Labor resources, population density, index of territorial concentration.

### INTRODUCTION

In the framework of the organizational and economic mechanism of rationalization of the process of qualitative innovative and economic identifiers a regional socio-economic system at a given period of time, the interaction of human and intellectual resources should be, in our opinion, be rationalized and harmonized with other resources and technological elements of the regional socio-economic system, both in the scientific and industrial cycle of creating innovations, and in the cycle of long-time socio-economic systems development. In this connection, the conceptual statements are important, that define the real possibility of solving scientific problems of defining and rationalizing the structure of the human capital of various facilities and the national economy. With this purpose, we study a number of factors making for a high level of economic growth of industrial production.

Factors of distribution of industrial facilities are a totality of conditions for an optimal choice of the place for an industrial facility or a group of facilities, and a certain territorial organization of the economic structure and the industrial complex. All factors that have a great influence on the distribution of industrial facilities can be united into classification groups: natural resources that include an economic

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assessment of resources for development of separate economic sectors and regions, certain climatic conditions, socio-economic factors, historic and geographic factors. Demographic factors have a great influence on the evenness of distribution of the human capital and productive forces.

The main indicator that characterizes the distribution of population is its density, that is, the number of people per square kilometer. The average density of population on the Earth is 40 people per square kilometer (Ksenofontova 2013).

An important characteristic of the strategy of population distribution is such an indicator as the territorial concentration index  $K$ , which is calculated using the following formula:

$$K = \frac{1}{2} |S - P| * 100\% \quad (1)$$

$S$  is the specific weight of area and  $R$  is the specific weight of the number of population of the analyzed region relative to the corresponding indicators of the state as a whole.

Nowadays the unevenness of population distribution in different regions of the world is very considerable (see Table 1).

**Table 1**  
**List of Countries – Abridged Rating of Population Density**

<i>Rating</i>	<i>Country</i>	<i>Number of people per square kilometer</i>
1	Monaco	18700
2	Singapore	7437
3	Vatican	1910
12	South Korea	494
20	India	357
24	Belgium	340
25	Japan	335
34	Great Britain (England)	255
36	Germany	230
37	Pakistan	229
43	Italy	193
44	Luxembourg	192
46	North Korea (DPRK)	189
47	Switzerland	185
56	China (PRC)	139
57	Thailand	131
59	Czechia	129
60	Moldova	128
61	Denmark	128

*contd. table 1*

<i>Rating</i>	<i>Country</i>	<i>Number of people per square kilometer</i>
62	Indonesia	127
68	Cyprus	119
69	France	118
70	Portugal	116
77	Armenia	100
78	Turkey	100
127	Belarus	46
141	Latvia	32
142	United States of America (USA)	32
151	Brazil	23
156	Sweden	20
164	Finland	16
171	Norway	13
181	Russia	8,56
184	Kazakhstan	6
187	Canada	3
193	Austria	2
195	Mongolia	1

The average population density in the Russian Federation is 8,56 persons per square kilometer. Besides that, the imbalance of the number of population and the length of the borders of our country, of its gigantic territories that need colonization and development, is well known. Historically, the population density in the Russian Federation is low, but the problem of the lowering population density has become even more acute after the collapse of the USSR.

The population census in 2010 showed that the number of people in Russia is 142,2 million people. By the beginning of 2016 the population had grown to 146 million. Russia is in the list of the countries with rather a high death rate. High is the death rate of men in working age. Among those who died in 2014 about 30% are work age people (more than 560 thousand a year), and 80% of them are men (Ksenofontova 2013). Nowadays we observe lowering of the death rate.

Under market conditions, supply and demand of labor force is formed at regional labor markets according to specialty and qualification. The housing market being undeveloped, the problem becomes more acute in regions. The situation improves with supplement of work force (young people reaching work age and pensioners who still work). For towns and cities, country people become a source of labor force. Agrarian overpopulation in Russia has disappeared long ago, but at the end of the 20<sup>th</sup> century 1/8 of all working population was used in agriculture though the growth of farming is expected to increase. In the 1930s agrarian overpopulation helped to solve the problem of lack of workers for industrialization and creating many new industrial centers. In 1926 country people were 82% of the entire population of Russia (Golubtsov, *et al.* 2013; Savchenko, n. d.).

The semantic definition of the territorial balance of labor resources changes with passing to market economy. Over the past decades, Siberia and the Far East were short of labor resources, but now it is possible only in the conditions of quick growth of the productive base, especially the processing industry, if the market needs it (Bezdudnaya and Meyerman 2014). We should not forget political, state and strategic interests either.

The character of economic development that has been formed by now, has been inherited from the Soviet time. At that time, in the conditions of general lack of labor force, efforts were made to attract the maximal number of people, including women, to working for national economy. Because of the high employment rate of women and the physical labor women had little energy for other things: giving birth to children and bringing them up, doing housework or maintaining a healthy lifestyle. Eventually, their chronic fatigue made for bringing down population growth rate in the country.

However, some tendencies of the Soviet period heritage are positive, such as high quality of education and high educational level of labor force (Branding of Small and Medium Towns of Russia: Experience, Problems, Perspectives). According to the population census 2010, people with higher and uncompleted higher education constituted 19,3% of adult population, and people with elementary education (or lower) constituted only 7,7%. At the same time, the level of education of town people and its quality is still much higher than that of country people.

If we look at the map of Russia, we see that country people inhabit the territory up to the river Volga. The "zone of sufficient quantity" of country population does not spread further. The Southern Federal Area has most country people in this group of territories (The Role of Small Towns in the Development of a Region; The Role and Potential of Small Towns in the Stable Development of the System of Population Distribution of a Region).

According to the demographic map of the Russian Federation, the spreading of population over the territory of Russia is extremely uneven. Most people are concentrated in the main zone of population, that begins in the south-west of the Russian Federation, spreads over the West Russian plain and ends in the Northern Caucasus. In the East it ends at the Urals. On this territory, the population density is higher than the average in Russia. This is especially true, if we speak about the administrative centers, Moscow and St Petersburg.

It is not the same in West and East Siberia and in the Far East Federal Area, especially if the territory has no big rivers, such as the Yenisey, the Amur and the Lena, if it is not situated on one of the coasts on Eastern seas (Gregoritchev n. d.) (see Table 2).

**Table 2**  
**Abridged Rating of spreading of population density in Constituent Units of the Russian Federation (Density of Population in the Russian Federation)**

No.	Unit of RF	Population density, inh./ km <sup>2</sup>	All population, inh.	Territory, km <sup>2</sup>	Federal Area
1	Moscow	4910,44	12330126	2511	CFA
2	St Petersburg	3724,65	5225690	1403	NWFA
3	Sevastopol	481,79	416263	864	SFA
5	Ingush Republic	130,31	472776	3628	NCFA
6	Chechen Republic	89,10	1394172	15647	NCFA
8	Republic of Crimea	73,12	1907106	26081	SFA
9	Krasnodar Territory	73,05	5513804	75485	SFA
17	Belgorod Region	57,13	1550137	27134	CFA
18	Republic of Tatarstan	57,02	3868730	67847	VFA
23	Nizhniy Novgorod Region	42,55	3260267	76624	VFA
26	Chelyabinsk Region	39,54	3500716	88529	UFA
27	Kursk Region	37,34	1120019	29997	CFA
46	Astrakhan Region	20,78	1018626	49024	SFA
50	Novosibirsk Region	15,54	2762237	177756	SFA
52	Altay Territory	14,15	2376774	167996	SFA
53	Omsk Region	14,02	1978466	141140	SFA
55	Primorsky Territory	11,71	1929008	164673	FEFA
62	Sakhalin Region	5,59	487293	87101	FEFA
63	Murmansk Region	5,26	762173	144902	NWFA
64	Jewish Autonomous Region	4,58	166120	36266	FEFA
68	Irkutsk Region	3,11	2412800	774846	SFA
72	Tyumen Region	2,47	3615485	1464173	UFA
74	Amur Region	2,23	805689	361913	FEFA
81	Kamchatka Territory	0,68	316116	464275	FEFA
82	Magadan Region	0,32	146345	462464	FEFA
83	The Republic of Sakha (Yakutia)	0,31	959689	3083523	FEFA
84	Nenets Autonomous Area	0,25	43838	176810	NWFA
85	Chukotka Autonomous Area	0,07	50157	721481	FEFA
	RF	8,56	146544710	17125191	

In the Far East and North-West Federal Areas of Russia uncomfortable living conditions prevail (regions of the Far North), whereas there are practically no such territories in the South and in the Center of Russia. Between the Volga and the Amur most suitable for living territories are situated, but their population is not numerous. Regions with a clear “conditional deficiency are also large in the long inhabited zone of Siberia.

Many people see the way out in founding small towns and twin towns of historic industrial centers (Ksenofontova 2013). But do we clearly imagine, what they are going to be like? What will be the patterns of their development?

New towns have their own specificity of population growth and circulation. It is usually undulating and pulsating.

## METHODS

In the 1980s a source computer model of behavior of population of living organisms reproducing themselves (including people), was created in the Institute of Biological Chemistry of the Academy of Sciences of the USSR. After the analysis of the source model with the aim of adapting it to the tasks of modern development of regions with scarce population, the following algorithm of creating a source model of appearing and development of twin cities (MADTC) was formulated (Ksenofontova 2013; Ksenofontova and Neronov 2005).

0. An away team of living organisms of practically the same (reproductive) age is stationed on a certain territory. (In this MADTC: if a life lasts 64 standard units, the reproductive period lasts 16 units). The territory has an energy (food) supply, and the living organisms begin to inhabit it. The age dynamic of a new town created with the help of a so-called imitation model, is shown in figures 3 - 9.

$t=0$  (figure 3)

1. The beginning of the settlement. The height of a bar is proportional to the number of population, including children. The colonization of a limited territory is going on.

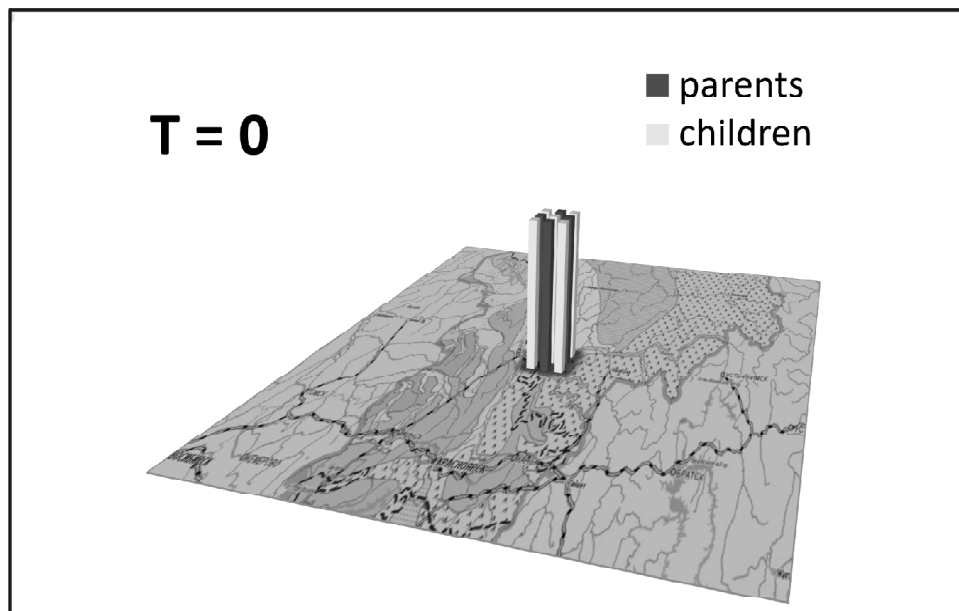


Figure 3: Beginning of colonization  $t = 0$

T = 25 years (figure 4)

2. 25 years later. In the center the number of inhabitants decreases, because the young (second) generation separates from “parents” and colonize the territory, so the second ring of colonization appears.

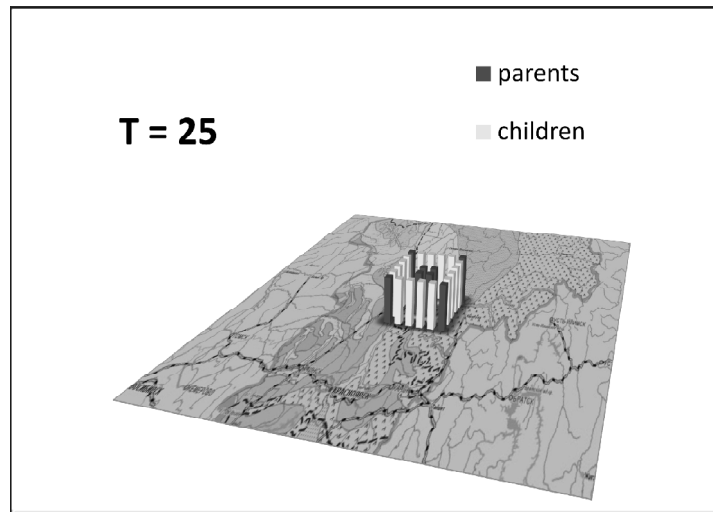


Figure 4: In 25 years t = 25

T = 25 years (figure 5)

3. In 50 years... “Grandchildren” come and the population begins to grow in the center, when a part of it migrate deep into the town to the

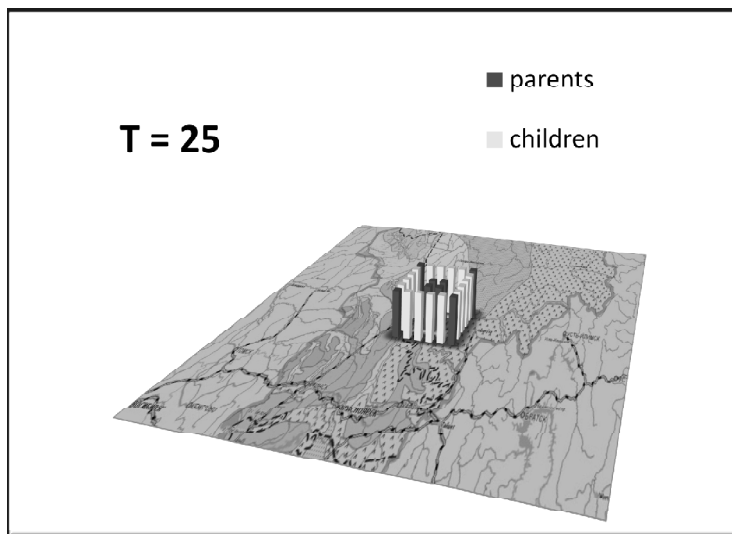


Figure 5: In 50 years t = 50

“grandparents”, and the other part inhabits another territory, forming one more ring of colonization.

T = 80 years (figure 6)

4. In 80 years... The population density grows in the center, because the “grandchildren” have given birth to “great-grandchildren”.

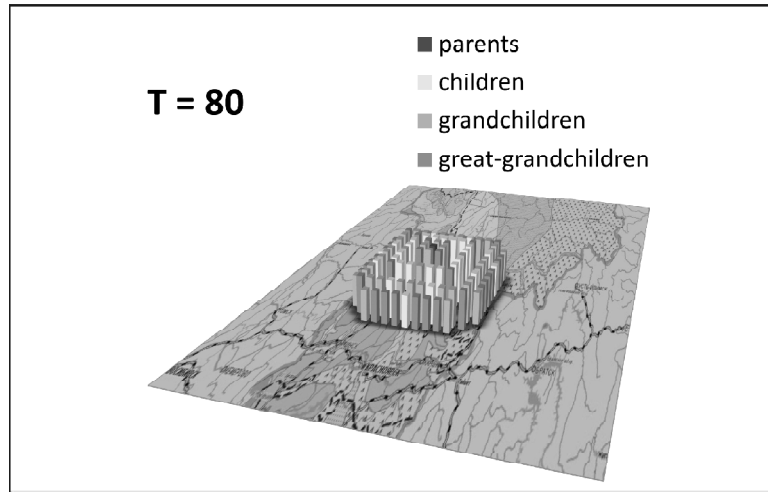


Figure 6: In 80 years t = 60

The following figures, 7, 8 and 9, show how this process of changing of the density of the population repeats.

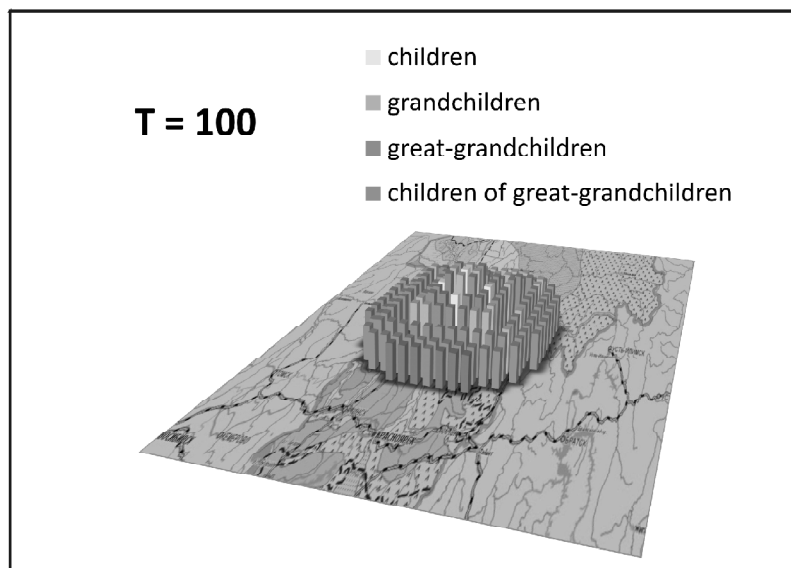


Figure 7: In 100 years t = 100



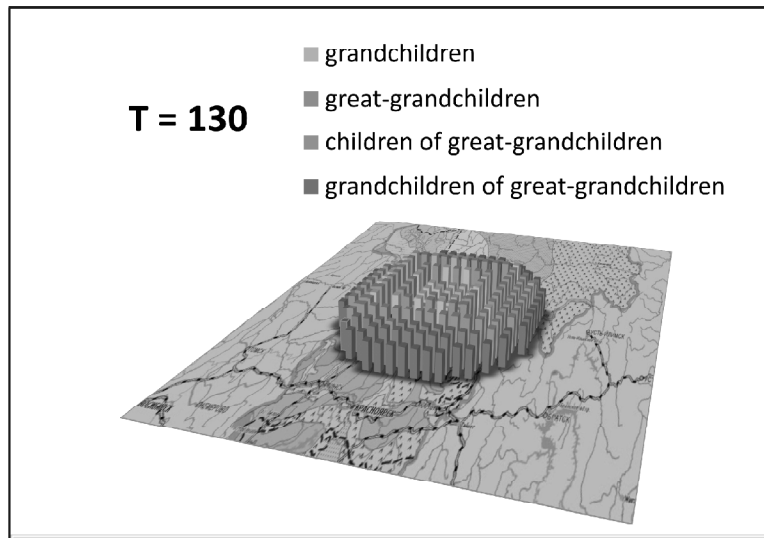


Figure 8: In 8 years  $t = 130$

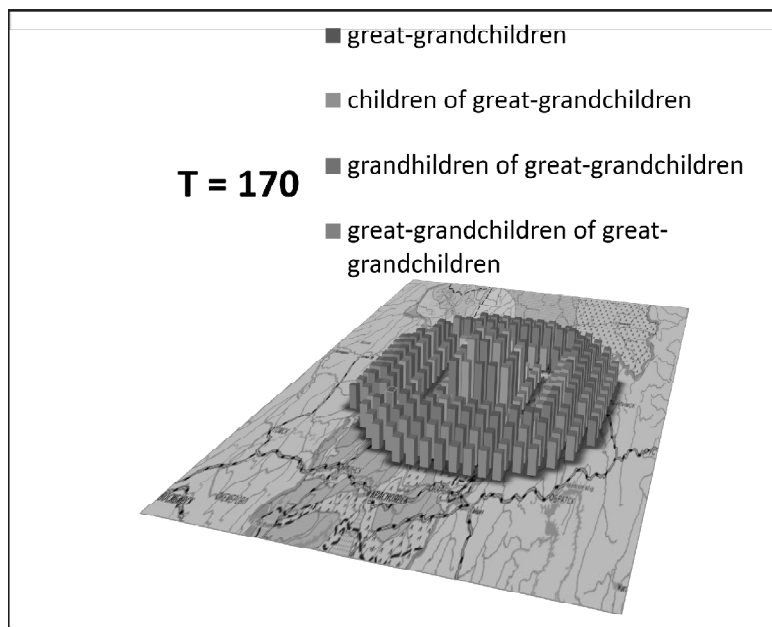


Figure 9: In 170 years  $t = 170$

So, what is interesting in the MADTC? If there is no out-migration, and the town grows naturally, there appears the following pattern: every 25 years there appear problems of boundaries between generations that have to be solved. How do they express themselves? The birth rate will decrease, and then grow again. If

possibilities to express oneself (say, at work) are limited, and the near future does not give possibilities for going further, out-migration of young people from such a town begins (Ksenofontova 2013; Future Development of Little Towns).

Development of a city is not only fulfilling of its industrial function, it is also creating conditions for harmonious living together.

A demographic forecast and the corresponding social phenomena should be known to planning organizations and be reflected in the plans of social development of cities. For example, in a number of new towns increase of the birth rate became the reason why 10 000 young children cannot have a place in a kindergarten. Town schools are overcrowded, when not 1200, but two thousand children study in them. It is natural, that in such conditions young families leave young towns.

But it would be a mistake to think that that it is necessary to build schools and kindergartens for 10 000 or more children. In five years the need for kindergartens will decrease again just on the order (Kosheleva 2015).

## RESULTS

The pulsating character of the graph of population distribution according to age with the average period of 25 years will stay for 150 – 200 years. Unwinding of these “waves” is very small in a little town. In other words, the mechanism of development of a new town is like waves of a well known periodic chemical reaction of Byelousov – Zhabotinsky (figure 10; figure 11) (Zhabotinsky 1974).

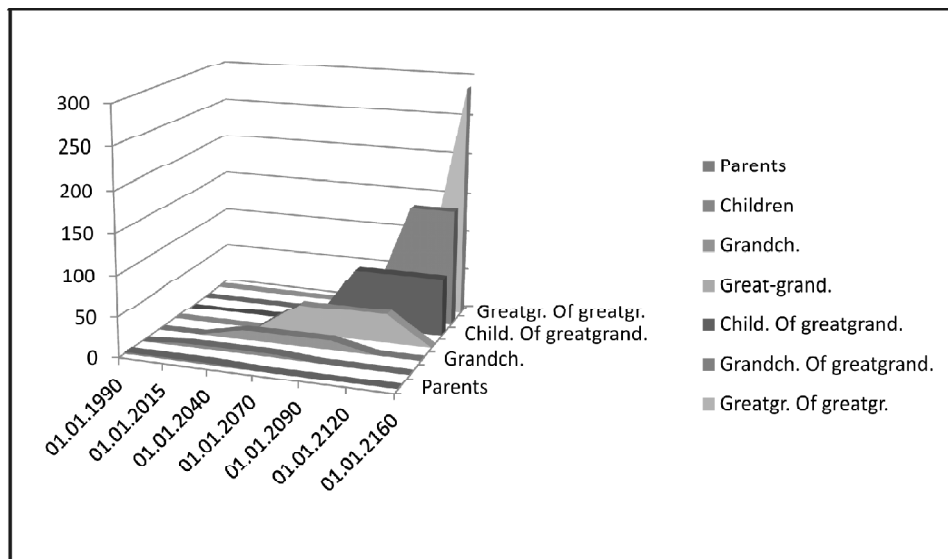
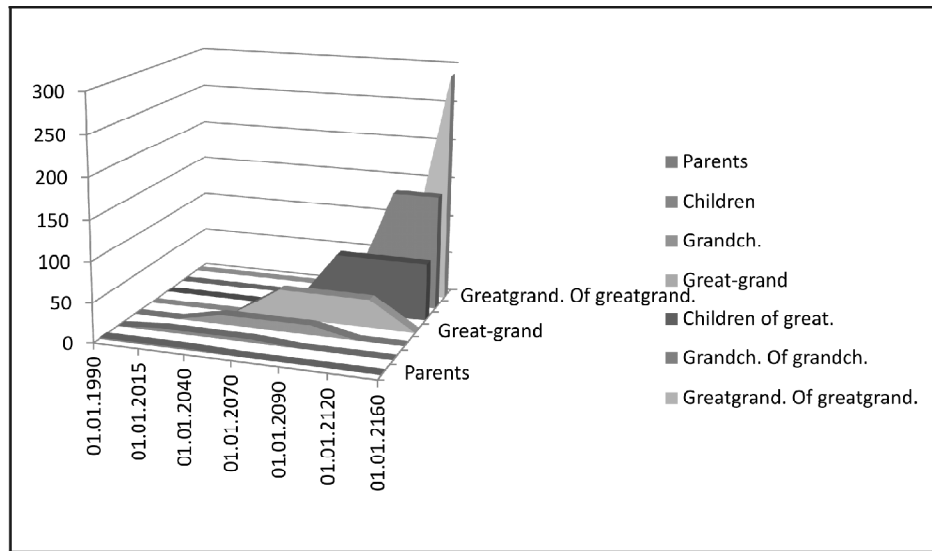


Figure 10: Demographic waves of development of a young town. Cut 1



**Figure 11: Demographic waves of development of a young town. Cut 2**

If we observe oscillations in every place of the environment, space waves can spread in such an environment.

It has turned out that oscillations of the number of population can, under certain conditions, lead to appearance of heterogeneity of changes of the density of their distribution on the territory and changing the density over time. Mobility of people grows with increasing if the density of population on the given territory.

This model makes it possible to forecast different situations in the population distribution.

A town is an ecosystem. It can be defined as a unity that has its borders in space and includes material values of the people living in it, and other organisms that inhabit it (animals, birds, etc.), physical characteristics of the climate and the soil, the interaction between people, various organisms and physical conditions (Distributin of Towns on the Territory of the Country).

Analyzing such complex systems with the aim of their effective management, we should keep in mind the informational and energetic (nourishing) cycles, in which all living and inorganic components of the environment are included. Such an understanding of the problem of optimal town construction appeared in Russia at the beginning of the XX century (V.I. Vernadsky), and later in the West, but the problem has not yet been practically solved.

It is necessary to create a conception that views a town as a component of nature. For this purpose we need development of new methods of planning, as we should take into consideration the components that are intangible and cannot be

quantitatively appreciated – the activity and way of thinking of a town inhabitant (Lebedyev, n. d.).

What are the perspectives and the future of such a program? We have reason to believe that it is possible to get rid of anxiety facing the complexity of the task, without extreme simplification, without being unscientific. The program must not be negative, that is, saying “no” to building, industrial development, intensive agriculture. It must become a scientific basis for planning, suggesting realistic and definite decisions to solve problems of towns.

The power of symbiosis of social studies and economics in their being able to capture the essence of real problems of our time, to be flexible and adaptive, not to surrender facing difficult situations that cannot be predicted, to insist on the main thesis: people should live in harmony with each other and with nature.

## CONCLUSION

Modern demography is an extremely complex science because of a great number of parameters that should be kept in mind considering this or that problem. Still there is an impression that some essential demographic indicators have not been considered. In this article we have made an attempt to attract the reader’s attention to some of these indicators.

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