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**ABSTRACT**

of the dissertation for the degree of Doctor of Sciences

**STUDY OF POPULATION SETTLEMENT IN GUBA-  
KHACHMAZ  
ECONOMIC REGION IN GIS ENVIRONMENT**

Specialty: 5401.01 – Economic geography

Field of Science: Geography

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## GENERAL CHARACTERISTICS OF THE RESEARCH

**Relevance of the topic.** The arrangement of settlements, sustainable regulation of the economic structure of settlements, the provision of their socio-economic and demographic development are significant tasks ahead. The steps taken to solve these issues, along with maintaining the demographic potential in the regions, have a positive impact on increasing the share of regions in the socio-economic potential of the country, the balanced development of the population and demographic potential within the country.

The use of new technological tools in the study of population and economy expands the possibilities of their analysis, helps to determine the relationship between natural-geographical and socio-economic factors that play a role in their development, as well as multidimensional methods of cartographic image of territories. It is important to study the settlement of the population and the distribution of demographic indicators in the territory, the dynamics for many years with the help of GIS (Geographic Information systems) computer programs and the preparation of cartographic images. Based on them, the creation of a database, which can be constantly updated by modern methods, covering all sectors of the population and the economy, simplifies the settlement process.

Despite the difficulties in the socio-economic and cultural development of the country since the first years of independence, the measures taken in a short period of time, along with ensuring the transition to sustainable development, also created conditions for significant progress in demographic development. At the same time, along with the restoration of existing production and service facilities, important steps are being taken to create a new network and open new workplaces.

To continue steps in this field, it is necessary to develop their scientific and theoretical foundations and, if necessary, to implement new measures. Therefore, it is necessary to conduct research in the field of population settlement, demographic development and their regulation. In these studies, it is of particular importance to increase attention to the study of regions. It is important to study the regions in order to make more efficient use of natural and geographical

conditions and natural resources, to ensure economic and social development and to increase the importance of these processes in the regulation of demographic indicators.

**Research aims and objectives.** The aim of the research is to study the population and demographic development trends in the Guba-Khachmaz economic region with the help of GIS method, to develop ways to manage and regulate them, to make suggestions and recommendations to solve problems in this direction.

In order to achieve this aim, the following objectives have been set:

- to determine the importance of using new methods in studying the population, to show their advantages;

- to determine the importance of economic reforms and measures taken during the years of independence in the regulation of settlements;

- to strengthen the economic and social base of settlement in the economic region, to study its role in the development of settlement, in raising the living standards, migration management, employment;

- to determine the advantages of maps prepared using the GIS method in the process of studying the population over traditional maps, to study settlement and demographic development trends using the information provided on them;

- To substantiate the need for active demographic policy in the regions of Azerbaijan, to show the importance of scientific research in determining its basic directions.

**The research methods.** In the preparation process of the dissertation, a historical and systematic approach, statistics, mathematical calculation, comparative analysis, survey, cartographic and other methods were used.

**Defended provisions.** The following can be attributed to the provisions defended during the analysis of the dissertation:

- Advantages of the results obtained using the GIS method in the study of the population and their importance in scientific research;

- The main trends and changes in the regions of Azerbaijan, including the Guba-Khachmaz economic region during the years of independence;

- The importance of the work done in the field of settlement and demographic development in the economic region;

- The main results of the study of population and demographic development using the GIS method;

- The main directions of the regulation of settlements in the economic region and the transition to sustainable demographic development and the importance of the implementation of effective demographic policy.

**Scientific innovations of Research.** It can be said that there are the following scientific innovations in the implementation of the dissertation:

- The main trends in demographic development and settlement of the population in the Guba-Khachmaz economic region have been studied from the economic and geographical point of view during the years of independence. It was determined that due to economic difficulties, the transition period, natural growth, population growth rate has significantly decreased, there have been setbacks in the socio-demographic base of settlements;

- In the study of the population, maps were prepared using the GIS method and a socio-demographic database was created. The constant updating of this database will serve to identify long-term dynamics, develop regulatory measures, and increase the role of settlements in demographic development;

- It was determined that the use of cartographic tools prepared on the basis of the GIS method allows to analyze the interaction of all indicators of settlement and demographic development, the aspects of complex solution of the problems were developed;

- The role of the State Programs implemented in the formation of the socio-economic base of settlement and demographic development has been determined. It has been shown that the transfer of created economic objects in cartographic tools is an important source in the study of regional territorial organization.

**Practical significance of the research.** The results obtained in the course of the research, recommendations and suggestions can be used in the development of measures in the field of socio-economic and demographic development in the Guba-Khachmaz economic region and its administrative regions. At the same time, studies for the preparation of maps based on the GIS method are important in terms of studying the population in other economic regions of the country.

The results of the analysis conducted in the dissertation play an important role in scientific research in the field of population geography, teaching in this direction in universities.

**The approbation of research.** The main provisions of the research conducted during the preparation of the dissertation were discussed at the following conferences and seminars:

- Conference on "National Security and Military Sciences", Baku, 2015.
- National Conference of Young Scientists, Baku-2015.
- Scientific conference on "Human and environmental relations". Baku, 2017
- Mountain geosystems of Azerbaijan: problems and prospects. Baku, 2017.
- Applicable features of geographical information systems in the study of population in Guba-Khachmaz economic region, Penza, 2022

11 scientific articles and theses on the topic of the research were published.

**Name of the organization where the dissertation work is carried out.** The dissertation work was carried out in the "Demography and Population Geography" department of the Institute of Geography named after academician H.A Aliyev of the Azerbaijan National Academy of Sciences.

**Volume, structure and main content of the dissertation.** Dissertation consists of introduction (5 pages), 4 chapters (chapter I (11 pages), chapter II (61 pages), chapter III (20 pages), chapter IV (17 pages), results (3 pages)), a list of 120 references, 29 tables, 17

sketch map and figures. The dissertation volume is 145 computer pages. It consists of 242820 characters.

## ABSTRACT OF THE RESEARCH

**The introduction** substantiates the relevance of the topic, defines the aim, objectives, subject of the research, indicates the scientific novelty and practical significance of the research.

The first chapter of the dissertation is devoted to **the importance and theoretical and methodological bases of studying the population**. Above all, the importance of studying the population and the role of this field in economic and geographical research are studied here. The demographic indicators of the population are constantly subject to the changes under the influence of socio-political, socio-economic and historical-geographical factors. In a short period of time, not only the number and composition of the population, but also other demographic indicators are subject to significant changes. Therefore, in order to maintain the compatibility of socio-economic and demographic development between the capital and other regions of the country, it is necessary to ensure an effective regional policy, sustainable development of demographic indicators. Therefore, in order to maintain the coherence of socio-economic and demographic development between the capital and other parts of the country, it is necessary to ensure effective regional policy, sustainable development of demographic indicators. This allows to pursue an active demographic policy in the regions and to take economic and socio-cultural measures when necessary.

**Study level of the problem.** In Azerbaijan, in the Guba-Khachmaz economic region, which is an important part of it, research in the field of settlement has been carried out since the 60s and 70s of the XX century, and expanded during the years of independence. In these studies, the natural-geographical conditions of the regions, natural resources, the importance of the socio-economic base in the settlement, methods of its regulation, the impact of economic reforms on demographic development were studied.

At the same time, the study of recent demographic development trends, its scientific-theoretical and methodological bases, the role of economic development in regulating settlements, determining the impact of migration on living standards and employment remains a scientific task. Although the regional policy pursued during the years of independence has yielded results in many areas, there are still problems in line with their development. There are sharp differences between Absheron and other regions of the country in the settlement of the population, the level of development of cities and villages, the number of people concentrated, the volume of socio-cultural services provided to them, the sectoral structure of employment. These increase the internal migration of the population, and the process of their concentration in the Absheron region continues.

Therefore, the study of the country's population, the conduct of research and development of regulatory measures to reduce the inconsistency of its settlement in cities and villages, the capital and other regions is of great scientific and practical importance.

The study analyzes the important features of the GIS method, its application, and its importance in the study of the population. This method allows you to create databases of the population, track their dynamics over different periods. The issues of protection from man-made and natural-geographical disasters during the settlement process, the influence of climatic indicators on the settlement, methods of protection from hydrometeorological phenomena are analyzed.

Research based on GIS technologies covers all sectors of the economy. The use of this information in the application of GIS technologies in the operation of objects in various sectors of the economy, including agriculture, tourism and other infrastructure, as well as the regulation of the settlement system, the organization of social and cultural services provided to them, the effective territorial organization of the economy and regions are of great importance. The dissertation examines the measures taken in this direction, their scientific and practical significance.



Measures in this direction are already being taken in Azerbaijan, applied in geodesy and topography, digital maps and registration.

The theoretical and methodological foundations of population studies are analyzed in the first chapter of the dissertation. The study of the population is carried out simultaneously with the effective territorial organization of the economy. Studying the location and operation of farms and the interactions of the population is essential for the transition to sustainable development.

For the first time Guba-Khachmaz economic region was studied as a special research object by Sh.G. Demirgayayev<sup>1</sup>.The dissertation presents the results of his research. It is noted that the region occupies a special place in the settlement of the population in the country, while mountainous and plain areas lead to the formation of diversity in settlement.

During the years of independence, Guba-Khachmaz economic region was studied as a separate object of research.d to the formation of diversity in settlement. Among them are the researches of Z.T. Imrani and V.N.Javadov. Z.T.Imrani analyzed the changes in the economic structure of the region, the settlement of the population in the first years of independence, showed the role of state programs in the field of economic, socio-cultural development. The dissertation shows the important aspects of research. It is noted that the measures taken have played an important role in the development of the region<sup>2</sup>.

The work done in the development of the economic region in the following periods was analyzed in the works of E.G.Mehraliyev, Z.N.Eminov, V.A.Afandiyev, N.H.Eyyubov, R.N.Karimov and other scientists. In addition, the development of directions for the regulation of urban and rural settlements in the Guba-Khachmaz economic region, ensuring the socio-economic and demographic development of cities and settlements, the need to maintain demographic indicators to ensure population growth are important

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<sup>1</sup> Дамиргаяев Ш.Г. Проблемы географии населения в Губа-Хачмазском экономическом районе Азербайджанской ССР.

Автореферат диссертации кандидата географических наук. Баку, 1971. 27 с.

<sup>2</sup> Imrani Z.T. Guba-Khachmaz economic region. Baku, "Elm" publishing house 2007. Page 172.

issues for research. The dissertation is devoted to the search for solutions to these problems.

It is important to use GIS technology, which is a new method of studying the regulation of urban and rural development. Therefore, the use of cartographic methods in research in this area is important. The role of measures taken in the field of socio-economic development of the regions in the settlement of the population and the provision of new jobs should be analyzed.

The second chapter is devoted to the analysis of **natural-geographical conditions and socio-economic base of settlement in Guba-Khachmaz economic region**. The object of research is the Guba-Khachmaz economic region located in the north-west of Azerbaijan. The economic region includes Khachmaz, Guba, Gusar, Siyazan and Shabran administrative districts. The area of the economic region is 6.96 thousand km<sup>2</sup>, the population is 558.7 thousand people. The economic region accounts for 8.04% of the country's total area and 5.52% of the population. Guba-Khachmaz is one of the economic regions with a relatively small population and low level of urbanization. At the beginning of 2021, in the economic region settled, 184.3 thousand people or 33.0% of the population in cities, 374.3 thousand people in villages. They make up 3.44% of urban population and 7.86% of the rural population of the country (01.01.2021)<sup>3</sup>. Here, an assessment of the physical and geographical factors of the study area in terms of settlement and socio-economic development was carried out, methods of effective territorial organization of the economy and population were studied. The economic region occupies the area between the Caspian Sea and the watershed of the Greater Caucasus Mountains. The main settlement areas here are the Samur-Davachi lowland along the shores of the Caspian Sea, the Shollar plain and the Gusar sloping plain, which are separated in the direction of increasing the absolute height towards the mountains, are considered to be a continuation of this area.

The most densely populated Samur-Davachi lowland is characterized by favorable climatic conditions, agricultural crops, geographical proximity to the sea, and the passage of railways and

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3 Demographic indicators of Azerbaijan-2020. Baku. DSK. 2021

highways of international importance. This has led to the dense settlement of the area and its relatively rapid development. One of the main settlements of the country has been formed in the region.

The hydrographic network has a significant impact on the formation of the settlement system in the economic region. Most of the villages and towns are located in the valleys and adjacent areas of freshwater sources. The cities of Khachmaz and Guba are located in the basin of the Gudyalchay River, and Gusar city is located in the basin of the river of the same name. The Samur-Absheron canal, Khanarkh canal and Takhtakorpu reservoir, which flow from the region and supply Absheron with fresh water, play an important role in providing fresh water to farms and the population, and in irrigating agricultural lands<sup>4</sup>.

The dissertation analyzes the use of water resources in the farms of the economic region. The analysis shows that in 2019, 352.7 million m<sup>3</sup> of water was taken from natural sources in the region. 345.0 million m<sup>3</sup> (97.8%) of them are used for irrigation in agriculture<sup>5</sup>. Efficient use of water resources in the economic region, protection of their ecological balance are important tasks. This requires the installation of water treatment plants. Prevention of waste and sewage discharges into the Caspian Sea is also an important problem to be solved.

The economic and social base is of great importance in the development of settlement. Therefore, the second chapter examines the activities of economic facilities in the economic region, their regional organization, their role in employment, development of urban and rural areas, opportunities for the use of natural conditions and natural resources, the importance of these measures in settlement.

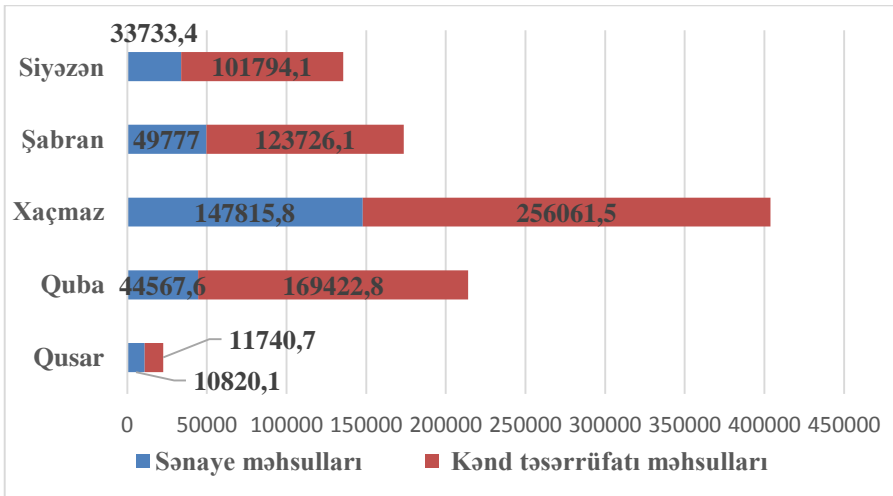
The dissertation studies the formation of the cities of Guba, Khachmaz, Gusar, Khudat, Shabran and Siyazan, the settlement centers of the economic region, the features and stages of historical and geographical development, the factors influencing the formation of the modern economic base. In addition to being administrative

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4. Ahmadzada A.J., Hashimov A.J. Amelioration and water management. Encyclopedia. Baku, 2016. 647 p.

5 Environment in Azerbaijan - 2019. Statistical Yearbook. Baku, 2020. P. 97, 109

centers, cities also serve as economic bases. However, due to the difficulties of the transition period, most of the economic facilities operating in cities and settlements have stopped due to significant problems. Recent measures in the field of regional development have allowed the resumption of production and service facilities here (Figure 1).



Source: Regions of Azerbaijan, 2019. ARSSC, Baku, 2020

Figure 1. Volume of industrial and agricultural products in the economic region, thousand manats, 2019

The main areas of agriculture in Guba-Khachmaz economic region are fruit growing, vegetable growing, grain growing, animal husbandry and potato growing. Favorable soil and climatic conditions of the region, proximity to potential consumers of Baku have a positive impact on the development of these areas of agriculture. At the same time, there are canneries in Khachmaz, canneries in Guba and Gusar on the basis of processing products related to these areas. In addition to being one of the main occupations of the urban population, they play an important role in the development of the region and the formation of the economic base of settlement.

The presence of main railways and highways in the Guba-Khachmaz economic region, as well as direct access to the sea,

creates very favorable conditions for intensifying the economy in the region and developing economic ties within the region. Despite the mountainous terrain, transport is one of the key factors in the formation of urban and rural settlements and the establishment of links in the settlement system. Social infrastructure facilities play an important role in the formation of the settlement system, meeting the needs of the population for various socio-cultural services

The large population of the village in Guba-Khachmaz and the superior development of rural settlements cause the activities of social facilities to lag far behind modern requirements. A lot of work has been done to solve the problem within the "State Programs for Socio-Economic Development of the Regions."

Guba-Khachmaz economic region is one of the areas where the tourism industry is developed in Azerbaijan. The Yalama-Nabran zone is the most suitable area for the construction of recreation facilities and resorts in the region. The forest cover of the area is relatively well preserved, where the slopes are rich in mineral and thermal waters. Currently, there is an influx of tourists from different regions of the country and foreign countries, mainly in the summer months.

Promising areas to be used for tourism are Guba-Khaltan, Gusar-Shahdagh, Shabran-Galaalti and others. With the exception of the Shahdagh Winter-Summer Tourism Complex, tourism in other areas is seasonal (summer months). Also, the poor quality of services in the tourism infrastructure and high prices are factors that negatively affect the expansion of the tourism sector.

The third chapter of the dissertation **analyzes the dynamics of demographic indicators of the population and their study with the GIS technology**. It analyzes the dynamics of population, births, deaths, natural growth, factors affecting them, changes, migration processes, its negative and positive features, causes, problems of migration regulation, and puts forward practical proposals, reflecting the demographic development of the region. Sex-age composition, the main features of the national composition, which are important demographic indicators, are the main issues studied in this chapter.

In addition to being the main demographic indicator, the **population** is determined by the economic potential of the region, historical and geographical features of development, ICM, a set of socio-economic and cultural measures implemented during the years of independence, its proximity to the capital and other factors. However, these factors do not always ensure its high rate of sustainable development.

In 2021, the population of the economic region was 558.7 thousand people (Table 1). The administrative districts included in the Guba-Khachmaz economic region differ sharply in terms of population, their growth rate and the share of the urban population. Natural and geographical conditions suitable for population growth, number of settlements, their economic and social potential, density of the network of socio-cultural facilities serving the population, living housing, etc. factors affect. Taking these into account, the main part of the population is concentrated in Khachmaz (181.2 thousand people or 32.4%) and Guba administrative regions (174.7 thousand people or 31.3%). The population of Siyazan region is small (42.9 thousand people or 7.7%).<sup>6</sup>

Table 1  
Change in the population of administrative districts, thousand people

Administrative regions	Years					
	1970	1979	1989	1999	2009	2021
Khachmaz	94,8	105,3	115,9	144,4	159,2	181,2
Kuba	99,2	108,0	114,9	136,9	152,5	174,7
Kusar	62,9	67,5	67,0	80,8	87,9	99,7
Siyazan	-	-	28,7	33,5	37,7	42,9
Shabran	54,2	58,8	38,9	46,0	51,5	60,2
Economic region	311,1	339,6	364,9	441,6	488,8	558,7
Azerbaijan	5117,1	6026,5	7021,2	7953,4	8922,4	10119,1

Source: "Demographic indicators of Azerbaijan 2015". Baku, SSC, 2016. Issued on the basis of statistical collection. P. 66. Population of Azerbaijan 2020. Statistical collection. Baku, 2021. P. 67-68.

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<sup>6</sup> Population of Azerbaijan 2020. Statistical collection. Baku, 2021. page. 68.

Among the administrative districts, the population growth after 1970 was relatively high in Khachmaz region. During this period, the population of the region increased by 86.4 thousand people or 91.1%. When taken together with Siyazan in Shabran region, the population growth is characterized by high quantities and this indicator was 90.2%. During this period, the population of Gusar region increased at a relatively slow pace (58.5% or 36.8 thousand people).

The low rate of population growth is due to the fact that *natural growth* has fallen several times during the years of independence, foreign migration has increased, and the population has been concentrated in Absheron at a high rate. In 1990, the natural increase per 1,000 people in the economic region was 23.8, but in 2000 it decreased to 9.9, and in 2020 it was 7.1. This is partially higher than the national average (5.1 per 1,000 people). At the same time, the death rate in the economic region (7.4 per 1,000 people) is lower than the national average (7.6 per 1,000 people). Its highest number (8.3 per 1,000 people) is registered in Siyazan region.

Although the absolute amount of natural increase increased from 6,430 people after 2010 to 6,789 people in 2015, it is much lower than in 1990 (9024 people). In recent years, this figure has declined sharply, falling to 3,930 in 2020. The main part of the natural increase in the administrative regions falls on Khachmaz (1385 people) and Guba (1294 people) regions.

The dissertation analyzes the distribution of births, deaths and natural increase in the economic region among the urban and rural population, the dynamics of their development, their distinctive features. According to statistics, in 2020, the natural increase among the urban population of the economic region was 5.0 per 1,000 people, and 8.1 among the rural population. Although there were no differences in these indicators between the urban and rural population of the region in 2010 (12.9 and 13.0, respectively), natural growth has recently declined significantly in urban and rural areas. The predominance of the rural population in the region, the low level of education of women, and the weak participation in economic activities lead to an increase in the level of natural growth.

The mortality rate among the urban population remains higher than that among the rural population (8.5 and 6.8 per 1,000 people, respectively). Due to the large population of rural areas, the absolute amount of natural increase here is more than 3,0 thousand people, and the low level of urbanization is 918 people in cities<sup>7</sup>.

Recently, the *sex composition of children born in the country* has been violated, the number of boys born has increased sharply, and as a result, the sex composition of the population in the country has changed in favor of men. This also manifested in the Guba-Khachmaz economic region. In 2020, the birth rate for every 1,000 people in Azerbaijan was 13.5 for boys and 11.9 for girls. In the economic region, these indicators remained at 14.7 for boys and 14.2 for girls, respectively. The number of boys born in Azerbaijan in 2020 was 8,200, and 220 in the economic region. Mortality among men has been on the rise recently, reaching 576 in 2020<sup>8</sup>.

*Infant mortality under one year of age.* In 2020, there were more than 1242 infant deaths in the country. This is significantly lower than in previous years. 83 of them fall to the share of Guba-Khachmaz economic region (6.7%). The infant mortality rate in Guba and Shabran region is higher than the national and economic region averages. This ratio is several times higher than in rural areas, both in the country and in the cities of the economic region. The mortality rate among children under 1 year of age in cities was 14.3 in the country, 12.1 in the economic region, and 5.6 and 9.5 in the villages, respectively. In Khachmaz and Guba region, infant mortality is high in both urban and rural areas<sup>9</sup>. In order to reduce infant mortality among children, it is necessary to establish medical service centers for mothers and children, provide them with staff, and provide them with material and technical base.

*Migrations* are one of the most important demographic indicators of the population and occurs for socio-political, economic, socio-cultural and demographic reasons, affecting demographic indicators.

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7 Population of Azerbaijan 2020. Statistical collection. Baku, 2021. P. 88-89.

8 Population of Azerbaijan 2020. Statistical collection. Baku, 2021. P. 85-96.

9 Population of Azerbaijan 2020. Statistical collection. Baku, 2021. P. 103-108.



The location of the Guba-Khachmaz economic region on transport and communication lines to Russia and European countries, in a favorable Economic and Geographical Position (EGP), the problems of providing the population with socio-cultural services, jobs, housing and communal services increase the intensity of migration, the region belongs to areas with high migration intensity. The cities and surrounding settlements, which are the center of the region, cannot accept the population migrating from the villages. For this reason, along with villages, the migration balance in urban areas also has negative quantities. In 1991-1995, the migration balance in the economic region, ie the difference between arrivals and departures, was -8.7 thousand people (Figure 2). During these years, the migration balance had negative values for all administrative districts. The main part of the negative migration balance falls on Gusar, Guba and Khachmaz regions.

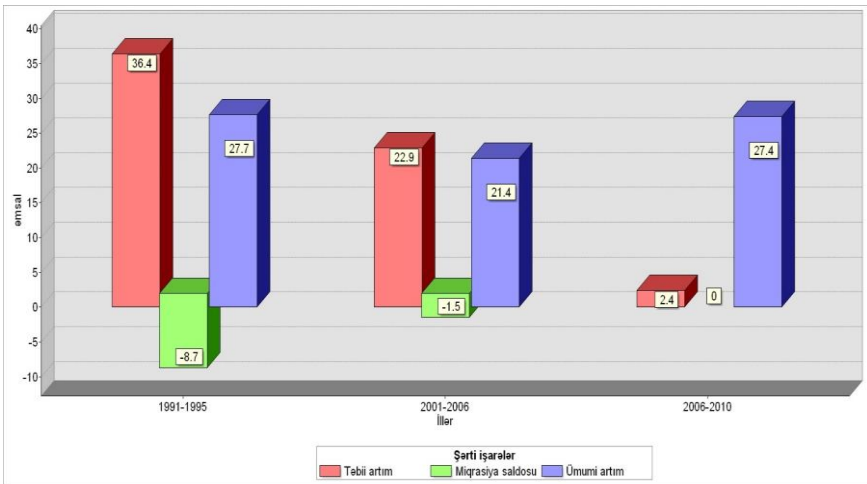


Figure 2. Natural and migratory population growth in the economic region, thousand people.

Population decline in the second half of the 1990s was 800 people. In 2001-2005, the migration balance in the economic region was 1.5 thousand people. During this period, the population influx from Shabran and Gusar regions was rapid. In 2006-2010, the

number of arrivals and departures in the economic region was equal. That is, the coefficient of the migration balance was 0 people. Natural and gross growth rates increased compared to the previous 5 years (0.8 times) (Figure 2). At the same time, the influx of population from some administrative districts still continues. Most of them fall on the Khachmaz region<sup>10</sup>.

In order to regulate migration in the economic region, it is necessary to continue economic and social reforms, build new production and service facilities, and create new jobs on their basis. The continuation of measures to increase the socio-cultural services provided to the population, to improve housing conditions will have a positive effect on the decline in migration.

The administrative districts of the Guba-Khachmaz economic region can be divided into 2 groups according to the sex composition of the population:

- In the first group of districts, the share of women is high among the population. Siyazan region belongs to this group. 21.4 thousand people are men (49.8%) and 21.5 thousand people (50.2%) are women. In 2009, the number of women for every 1,000 men was 1,034. At the same time, the share of men in the population continues to grow.

- In the second group of administrative districts, the share of men in the population is already higher than that of women. They include Khachmaz, Guba, Gusar and Shabran administrative districts.

The *age composition* of the population allows it to determine its total number in the coming years, and the number of each age group, including the number of labor reserves. In connection with the low decline in natural growth in the economic region, children under 15 children are less. A decrease in age groups over the age of 35 is also observed. If the share of the population in each group by this age is 7-9%, this figure is 5-6% and more in groups of more groups.

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<sup>10</sup> On the way to independence - 25. Azerbaijan National Academy of Sciences. East-West. Baku: 2016, 628 p.

Mortality rate has recently risen among the elderly population. Therefore, the share of groups over the age of 70 goes to decrease.

According to census information in 2009, the Nations and ethnic groups living in our republic, 100% of the Khinalugs, 99.8% of the Giriz people, 98,2% of the Tat people, 62.9% of the Lezghins, 30.8% of the Jews live in Guba-Khachmaz economic region<sup>11</sup>. In addition, Ukrainians, Georgians, Kurds, Tatars, Talysh, Avars, Armenians, other nations and ethnic groups live in the economic region.

Chapter four is dedicated to the *regulation of the settlement and the study of the priorities of demographic development*. First of all, the main directions and legal basis of demographic policy in the country are analyzed. Since the change of demographic indicators under the influence of socio-economic factors, the demographic situation in the area is determined by the social structure of the population, the level of economic development, the level of development of settlements, its production structure, the demand for labor reserves and the relationship between them.

For the implementation of demographic policy in Azerbaijan, "Demographic Development Concept of the Republic of Azerbaijan" (1999), "State Program in the field of Demography and Population Development in the Republic of Azerbaijan" (2004), "State Migration Program of the Republic of Azerbaijan" (2006), "Azerbaijan 2020: Vision to the future" Development concept (2011), "State Programs of Socio-Economic Development of the Regions" (2004-2008, 2009-2013, 2014-2018, 2019-2023) were adopted. The situation in the country is assessed in the state programs, the problems are shown, the priorities of their elimination are determined.

Dissertation is studied in the economic region, prospects for development in the economic region, the potential opportunities, affordable natural-geographical conditions, natural resources are determined for its development. Since the vast majority of villages in the region are located in the mountainous areas, the relief makes it

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<sup>11</sup> Census of the population of the Republic of Azerbaijan. 2009, vol. Baku: 2011, 568 p.

difficult to expand its territory, the creation of the transport and communication network requires additional financial and technical equipment.

Because small villages dominate in the mountainous areas, they are becoming more difficult to create socio-cultural service facilities in most of them. During the study, the classification of villages in the region is classified in terms of the number of people, is being grouped (Table 2). Calculations show that 18% of the population of the village, 42.4% of the number of villages are concentrated at stations with a population of 100-200 and 200-500. Most of them are located in the lips and the Khachmaz regions. Most of them are located in Guba and Khachmaz regions.

Table 2

Distribution of rural population in groups in administrative regions

Number of population	Guba	Gusar	Khachmaz	Siyazan	Shabran	Total
Up to 50 people	183	15	40	284	409	931
51-100	303	405	602	317	367	1994
101-200	3133	871	2112	763	1851	8730
201-500	16115	9841	16993	839	5948	49736
501-1000	27155	15287	23394	4333	4582	74751
1001-2000	32680	24135	27832	3348	10708	98703
2000-3000	15133	13760	13674	-	5360	47927
2001-5000	3256	-	6957	3067	-	13280
More than 50 people	16542	5023	5019	-	-	26584

Source: The results of the 2009 census of the population of the Republic of Azerbaijan. Part I. The population, location, sex, age composition and marriage. BAKU: DSK, 2010, 629.

The number of villages with 500-1000 and 1000-2000 people in the population is quite high. 74.8 thousand village population are concentrated in 109 villages in the first group, 98.7 thousand village population are concentrated in 74 villages in the second group, this group ranks first (30.6%) according to the special weight of the rural population (map-scheme).

There are 4 villages in each of the groups with a population of 3000-5000 people and more than 5000 people in Guba-Khachmaz economic region. Villages play the role of the mainstay of settlement.

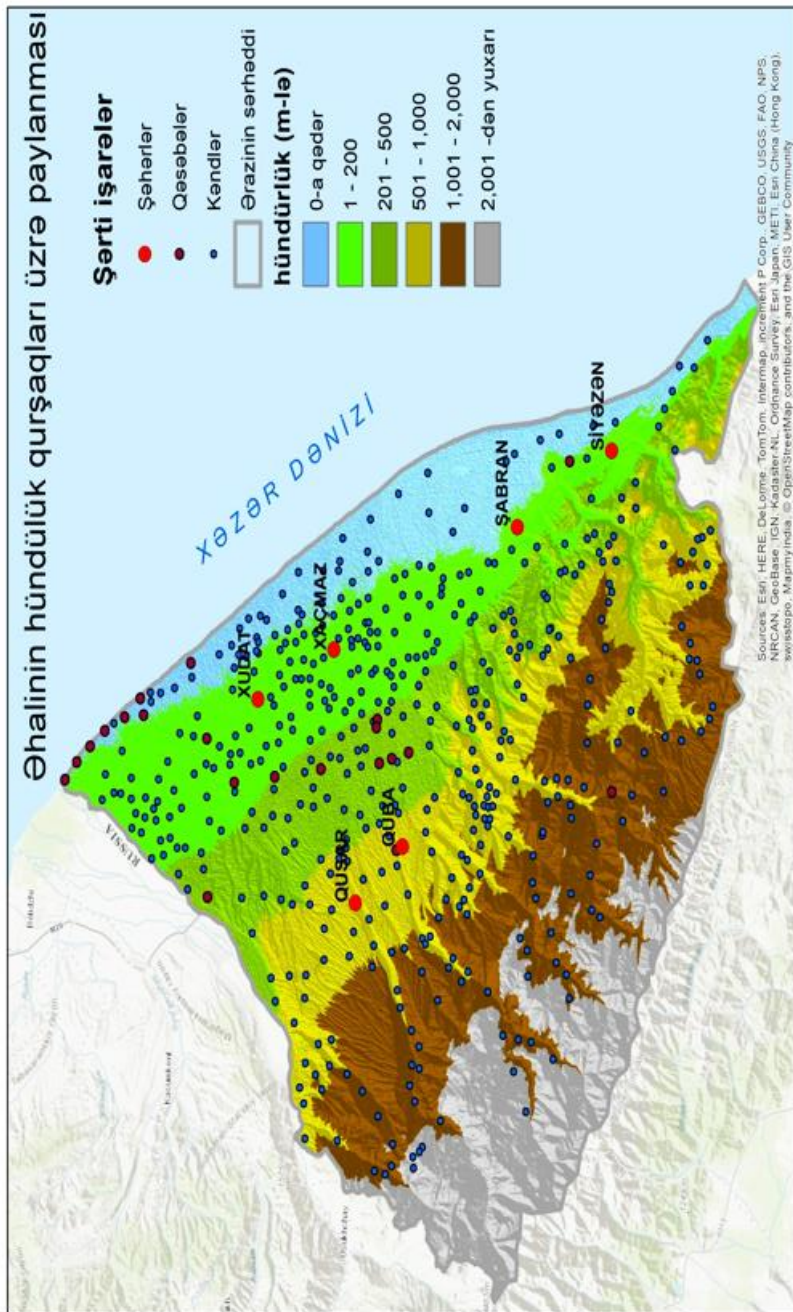
This group plays a central role in the development of villages, organization of the economic base of the villages, to meet the needs of the population for socio-cultural services.

The villages with more than 5,000 people in the population include I Nugadi (7768 people) and II Nugadi villages (8774 people) in Guba region, Hil village (5023 people) Gusar region and Gusarchay village (5019 people) in Khachmaz region.

Here a complex of measures necessary for the development of each administrative district center is determined, the measures necessary to improve the economic structure are taken. The development of these centers is necessary to create new jobs and a network of operating facilities, which is constantly continuing to maintain demographic potentials. It is necessary to create a transport network to carry out the role of a carcass in the settlement of the cities, expanding relations between urban and rural areas, the leading role of cities.

The measures should be taken in the following areas for the development of the socio-cultural base of settlement:

- take measures that are persistent for the provision of the population with jobs;
- Provision of cultural and domestic service, establishing them at the level of modern requirements of facilities;
- Creation of conditions for guarantees with apartments, giving discounted loans;
- Improving the level of housing, their water, natural gas, heat supply.



Map-scheme. Distribution of population by altitude zones in the economic region.

As a result of the research, ways of improving the use of the GIS method in the study of the population are identified. GIS is the most effective tool when studying areas with different spatial characteristics. This is because the data (statistical and field data) is easily transferred to a computer, a database is created, a calculation operation is performed on the visual image obtained by mapping, and future development paths of the settlement areas are analyzed. The analysis takes into account not only the settlements, but also the ecological condition of the surrounding areas, planning and natural conditions, taking into account the components of sustainable development. In the course of the research, a hypsometric map of the area was compiled with its help, and the distribution and areas of settlements along the altitude zones were determined. Then, the number of population of each settlement was analyzed during historical periods based on the statistical materials we obtained.

The analysis carried out with the application of the new method allows for a more in-depth analysis of the areas. Given the abundance of information, it is possible to analyze them in different ways, improve the direction of their use, create a database, update them over time. When using the GIS method, more information can be analyzed and compared at the same time.

## **CONCLUSIONS AND RECOMMENDATIONS**

The study of the population of the Guba-Khachmaz economic region and the analysis of this process with the application of GIS technology allow us to state the following results:

1. Analysis of demographic indicators in the Guba-Khachmaz economic region during the years of independence (1991-2021) shows that natural growth per 1,000 people decreased from 23.8 to 7.1, the migration balance fell significantly. Analysis of the data shows that the urban population increased by 32.4% and the rural population by 21.0% in 2000-2020. High population growth has been recorded since 2000 in Guba (25.8%) and Khachmaz (23.5%) regions.

2. In the process of studying the population with the application of GIS technology, the data of different years were compared, the dynamics of demographic processes were studied and the basis for the social development of Guba-Khachmaz economic region was created. It was determined that during 1999-2009, demographic development was observed mainly in the district centers, in the villages of II Nugadi, I Nugadi, Amsar, Alekseyevka, Vladimirovka of Guba region and the villages of Old Khudat, Narajan, Gusarchay of Khachmaz region. These are reflected in the maps.

3. Based on the analysis of maps prepared on the basis of GIS technology, changes in population density in specific selected areas were studied. Thus, a decrease in the areas with a population of up to 200 people per km<sup>2</sup> and 600-800 people has been observed for 10 years. The area of settlements with a population from 200 to 600 people per km<sup>2</sup> has increased. At the same time, an increase in the area of territories with a population of 800 people per km<sup>2</sup> was observed. This is due to the predominance of the rural population, high natural growth and, consequently, the rapid growth of population.

4. As a result of the analysis of state programs implemented in Guba-Khachmaz economic region and maps compiled by GIS, it was determined that the level of urbanization in the economic region is low and 33.2%, as the cities and settlements where the socio-economic base of settlement cannot be supported.

5. Summarizing the analysis, we can say that although the area of the altitude zones between 0-200 and 500-1000 m is approximately equal, 44.4% of the population is concentrated in the first zone. Elevations between 0-200 m are selected according to the number of settlements (155 settlements) and the number of people concentrated in them (216,504 people). The maximum population was recorded in Khachmaz city (38974 people), and the minimum population in Ibrahimhaput village of Guba region. The lowest number of settlements (10 settlements) and their population (3667 people) falls on the area above 2000 m.



## **Recommendations**

1. The application of GIS technology, which is widely used in developed countries in the study of the population should be constantly improved, as it is the most accurate technology in the settlement, its management and forecasting for the future.

2. Demographic setbacks caused by the difficulties of the transition period have been eliminated, and the dynamics of natural growth and migration have been stabilized. In order to ensure demographic development in the future, it is necessary to constantly implement economic, socio-cultural measures.

3. Although the demographic policy pursued in the country during the years of independence has allowed to regulate the rate of population growth and migration processes, there are still inconsistencies in its distribution by regions. In order to solve problems in this area, along with regional centers, strengthening the economic base of cities and settlements, the creation of light and food processing facilities, the organization of a network of socio-cultural facilities at the level of modern requirements must be addressed as important tasks.

### **The main content of the dissertation is reflected in the following articles and theses of the author:**

1. Amanov R.R. Construction of 3D model of the Caspian Sea using Geographical Information Systems / Ministry of Education of the Republic of Azerbaijan Baku State University, State Land and Cartography Committee of the Republic of Azerbaijan, BSU branch of Azerbaijan Geographical Society, Baku, 2012, p. 203-207 (with Y.A.Nasibov).

2. Amanov R.R. Assessment of modern natural conditions of Samur-Yalama National Park / Works of Azerbaijan Geographical Society, Baku-2013, Volume XVIII, p. 47-62 (with R.M.Mammadov, M.S.Hasanov, M.Y.Khalilov, M.C.Ismayilov, I.A.Guliyev).

3. Amanov R.R. Assessment of socio-economic conditions of Samur-Yalama National Park and creation of information base / Works of Azerbaijan Geographical Society, Baku-2013, Volume XVIII, p. 297-305 ( with R.M. Mammadov, Z.N.Eminov, N.A.Pashayev).

4. Amanov R.R. Detection of invisible objects of the area on the basis of GIS technologies / Geography and natural resources, Works of the Azerbaijan Geographical Society, Baku-2016, №1, p. 124-127 (with A.A.Bayramov, E.G.Hashimov).
5. Amanov R.R. Application of Geographic Information Systems technologies in the study of the population / Works of Young Scientists, Baku-2015, №11 / 2015, p. 134-140.
6. Amanov R.R. Possibilities of research of observation conditions of the area with GIS technologies / National security and military sciences, Baku-2015, №1 (1), p. 90-95 (with Y.A. Nasibov).
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10. Amanov R.R. Problems of demographic development and resettlement of the population of the northern border regions of the Republic of Azerbaijan / Ternopil Vladimir Gnatiuk, National Pedagogical University, Economic and social geography, Izvestia. Ternopil -2018, No. 1. P. 102-107.
11. Amanov R.R. Applicable features of geographical information systems in the study of population in Guba-Khachmaz economic region/ Science, education, innovations: current issues and modern aspects, "Science and Education", Penza: ICNS - 2022, p 181-183.

The defense of the dissertation will be held on 21 April 2022 14<sup>00</sup> at the meeting of the ED1.23 Dissertation Council operating under the Institute of Geography named after acad. H.A.Aliyev of ANAS.

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