REPUBLIC OF AZERBAIJAN

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ABSTRACT

of the dissertation for the degree of Doctor of Sciences

THE IMPACT OF ECONOMY ON LANDSCAPE TRANSFORMATION IN NAKHCHIVAN AUTONOMOUS REPUBLIC

Specialty:	5408.01- Physical geography and biogeography, soil geography, geophysics and geochemistry of landscapes
Field of science:	Geography
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INTRODUCTION

Relevance and degree of development of the topic: Nakhchivan Autonomous Republic is distinguished by its tectonic-geological structure, orography, sharply continental climate, complexity of settlement and use of the territory and many other features. This also maybe rexlected in the uniqueness and diversity of the natural landscape complexes of the territory, as well as in its transformation from natural and anthropogenic influences.

The natural landscape complexes of Nakhchivan have been subjected to varying degrees of overload as a result of economic activity of the population and other anthropogenic impacts directed to socio-economic development of the region. Despite the fact that the government of Azerbaijan has taken a number of legal and administrative measures in the field of nature protection, the effective use of nature in the territory is still not at the desired level. The lack of modern technologies in certain areas in the direction of human activity, the prevailing opinion in society about the "inexhaustibility of natural resources", as well as the lack of an adequate level of ecological culture in human interaction with nature have led to noticeable changes in the natural landscape complexes of the region. So, in many areas, anthropogenic influences have intensified, which, in turn, led to the emergence and development of some natural-destructive processes, biodiversity has decreased, natural-historical boundaries of landscapes have changed, soil cover degradation and so on have intensified. In the end, as a result of the transformation of natural landscape complexes in the area, relatively low-standing natural-anthropogenic complexes were formed.

Due to this, the ecological situation in Nakhchivan demands a thorough investigation of human-caused modifications to natural landscapes and, from there, the creation of practical solutions to partially restore the altered natural landscape complexes. Taking into account all this, the issues of territorial differentiation and anthropogenic transformation of natural landscape complexes in the Nakhchivan Autonomous Republic, which we have chosen as the research territory, as well as the study and assessment of

anthropogenic effects are of both scientific-theoretical and practical importance.

Object and subject of research. Complex natural-anthropogenic landscape complexes, settlements affecting the patterns of their development, economic areas, transport routes, social infrastructures and other areas are unevenly distributed in the territory of the Nakhchivan Autonomous Republic constitute the object of research. The main subject of the study is the comprehensive study of the problems arising as a result of the transformation of the landscapes of the Nakhchivan Autonomous Republic from natural and anthropogenic influences in connection with the expansion of the areas of settlements, the development of economic, social infrastructures and other areas in recent years.

Goals and objectives of the study. To characterize the modern state of natural landscape systems of the Nakhchivan Autonomous Republic and the features of their change under the influence of anthropogenic factors, to study and evaluate landscape complexes that have undergone transformation, to develop measures for their effective use and Prevention of degradation of landscapes in the future.

In accordance with the purpose of the dissertation, the following main tasks are identified:

- to evaluate the interactions of natural and anthropogenic factors that lead to the transformation of natural landscape complexes;
- to study comprehensively factors affecting the formation of modern landscapes;
- to determine the boundaries of modern landscape complexes as a result of anthropogenic transformation of natural landscapes within the object of study;
- to explore and map features of modern landscape types;
- to determine the degree of anthropogenization of natural landscape complexes by studying their change by anthropogenic influences;
- to study and map the distribution of populations and settlements by elevation and landscape belts and their impact on landscape transformation;

- to develop new proposals in the direction of conservation, improvement and effective mastering of natural landscapes.

Methods of research. During the implementation of the presented dissertation work, field studies, fund materials, maps of various contents, statistical data, historical, analogical comparison, mathematical-statistical methods, systematic analysis, observation, distance learning, internet resources, satellite images, space images and ArcGIS software were widely used. State Statistics Committee of Azerbaijan and Nakhchivan Autonomous Republic, Ministry of Ecology and Natural Resources, State Committee on Real Estate and Land Issues of Nakhchivan Autonomous Republic and map and archival data of the State Construction, Geodesy and Mapping Project Institute operating under it, by the author 2015-2018 personal field-research materials collected in the years and scientific-research works carried out in this field, ArcGIS 10.3 (ESRI, Inc., USA) program, use of WGS-84 and GCS_WGS_1984, GCS_Pulkovo_1942 projections during the preparation of maps, space images obtained from Landsat satellite images and orthophotos constitute the information base of the research work.

The main provisions put into defense.

In the research work, the following provisions are put into defense:

- Conducting a historical-geographical analysis of studies with the study of the natural-geographical conditions and the theoretical-methodical bases of landscape studies in the Nakhchivan Autonomous Republic;
- studying and mapping of natural landscapes of the area with analysis of factors affecting the formation of landscapes;
- distribution of farms and settlements by altitude and landscape belts, research and mapping of the impact of natural-ecological conditions and landscape transformation;
- studying the process of grouping and mapping of landscapes transformed by anthropogenic impact;
- optimizing ways of the transformation of landscapes and preserve landscape-ecological diversity.

Scientific novelty of the study

– for the first time, all directions of human economic activity in the research area were studied in detail and the factors affecting the transformation of landscapes were identified and a map of land use of the area was prepared;

- historical stages of anthropogenic dynamics of landscapes, trends in the development of individual types of landscapes and environmental problems caused by them have been identified;

– for the first time, the regularities of the settlement of farms and settlements on the elevation and landscape zones were systematically analyzed and it was determined that the areas with absolute heights of up to 1000 meters in Nakhchivan AR have more favorable potential for the development of farms and settlement;

- morphometric units, which play a fundamental role in the formation of landscapes, were studied in detail, for the first time, hypsometric, incline, viewability and other maps of the research area on a scale of 1:100000 were developed using modern software and digital technologies;

- using the data of previous researchers, using modern technologies, maps of natural landscape, modern landscape and anthropogenic transformation of the territory on a scale of 1:100000 were developed, for the first time the area of areas covered by different types of landscape was calculated;

- landscapes are grouped according to the degree of anthropogenic transformation by performing mathematical and statistical calculations on natural and modern landscape maps;

- relevant measures and recommendations have been prepared in the direction of natural restoration, development and systematic use of landscapes with determination of structural-functional features and durability of natural-anthropogenic landscape complexes.

The theoretical and practical significance of the study.

The results of research work and compiled maps for various purposes can be useful in studying landscape complexes, solving problems of population settlement and their socio-environmental problems, organizing and planning the economy, rational use and protection of natural complexes, studying the anthropogenic impact on the transformation and degradation of landscapes. It is quite

advisable that the action plan and measures proposed in the dissertation work be used by the Ministry, local governments, investors and organizations responsible for the process of socio-economic development of the regions.

Approbation and application.

The researches related to subject were held at the International Silk Road conference named “Historical Silk Road and development of economic and Cultural Relations of Nakhchivan” (Nakhchivan, October 16-17, 2015), at the international scientific conference “Actual Problems Of Modern Natural Sciences” dedicated to the 94th anniversary of the national leader Heydar Aliyev (Ganja, May 04-05, 2017), “Man and Environment” Republican scientific conference dedicated to the 110th anniversary of the prominent geographer, academician H.A.Aliyev (Baku, June 16-17, 2017), at the International Scientific Conference “Actual problems of modern natural and Economic Sciences” (Ganja, May 04-05, 2018), Центр Наукових Публікацій Збірник Наукових Публікацій “велес” VI міжнародна конференція “інноваційні підходи і сучасна наука” (Київ, 31 березня 2020), International Scientific Conference "Nakhchivan: a place where cultures meet" (Nakhchivan, October 22-23, 2020), Proceedings of the Republican conference “Autonomy of Nakhchivan in history and present day” (Nakhchivan, November 22, 2020), Materials of the "International Duzdag Research" Congress (Nakhchivan, May 25, 2021), “Akdeniz 11th international conference on applied sciences” (Turkey, February 23-25, 2024) the author's reports were heard and discussed.

In total, 35 works of the author were published, of which 27 were published in Azerbaijan and 8 abroad. Of the works published abroad, 3 were international conference materials, and 5 were published in scientific journals.

The article, Conference material and abstracts covering the content of the dissertation were published in national and foreign scientific journals recommended by the Higher Attestation Commission.

The name of the organization where the dissertation work was carried out: The dissertation was performed at the Department

of "Geography" of the Faculty of Natural Sciences and Agriculture of Nakhchivan State University.

The volume of the structural units of the dissertation in isolation and the total volume in a sign. The dissertation consists of "Introduction", 4 chapters, "Conclusion" and a list of literature in 101 titles. "Introduction" of the dissertation consists of 6 pages - 10170 signs, chapter I - 15 pages, 27170 signs, Chapter II - 50 pages- 54539 signs, Chapter III - 42 pages, 57917 signs, Chapter IV - 38 pages, 55972 signs, Conclusion, sugestions - 2 pages, 3569 signs, the total volume is 156 pages - 212105 signs, excluding the list of used literature. To increase the viability of the study, 17 tables, 10 diagrams and 18 maps are given in the work.

THE MAIN CONTENT OF THE RESEARCH WORK

The **"Introduction"** part of the dissertation provides information about the relevance of the topic, the object and subject of research, goals and objectives, scientific novelty, method, theoretical and practical significance, provisions submitted for defense, as well as about the approbation of the dissertation.

The first chapter of the dissertation is devoted to the topic **"Natural and geographical conditions of the Nakhchivan Autonomous Republic and general issues of landscape study".**

This chapter tells about the history of the emergence of landscape studies as a science, about various aspects of landscape studies conducted in certain periods, about the emerging directions of this branch of science, which developed and formed over time. Knowledge about the landscape reflects not only knowledge about nature, but also partly knowledge about society and our history. Modern landscape science is considered as a valuable source of information about social development, racial, ethnic, sanitary-epidemiological, environmental processes, and so on[1]. It is important for the development of the science of landscape studies to study the

[1]Dashdiyev, R.H. Landscape ecology / R.H. Dashdiyev. - Baku: MBM, - 2010, - 140 p.

patterns of landscapes, the interrelationships of components and factors that ensure the development of these relationships, and the elucidation of natural phenomena observed on the Earth's surface. In this regard, in our time, as in all countries of the world, the study of landscapes is of great scientific and practical importance**.**

Foreign and domestic researchers conducting research in the field of landscape transformation studies, which are considered one of the main directions of modern landscape studies, and the subjects of their study, have been studied. Although a number of features of the development of landscapes that have undergone transformation are determined by the anthropogenic factor, they do not have a certain pattern of development. The development, self-regulation, and preservation of the structural and functional features of these landscapes are regulated by the natural patterns of the landscape type prevailing in the territory[2]. The effective use of modern methods, techniques and equipment in conducting research in any field of landscape science and obtaining accurate results is of great practical importance.

The history of the emergence and development of landscape research in our republic and the research carried out in this direction has been studied, detailed information has been collected on the conducted landscape research and its results in the Nakhchivan Autonomous Republic. B.A.Budagov noted that the landscapes of Nakhchivan Autonomous Republic were mainly influenced by the arid climate of Iran and were formed in the conditions of isolation of the Central Asian intermountain depression[3]. He showed that the vertical and horizontal alternation of landscapes depends on the high-altitude contrast of the relief and changes in climatic conditions in the Autonomous Republic. Along with B.A.Budagov and S.Y. Babayev, Y.A.Garibov, S.Y.Guliyeva, N.S.Bababeyli have rendered great services in studying the landscapes of Nakhchivan in recent years. The results of the research are studied in detail, information is

[2]Garibov, Y.A. Optimization of natural landscapes of the Republic of Azerbaijan / Y.A. Garibov. - Baku: Aztu printing house, - 2012, - 216 p..

[3]Geographical science in 50 years / compiled by B.A. Budagov - Baku: Elm, - 1996. - 368 p.

provided on vegetation zones and soil types, mentioning the classification of landscapes of the Autonomous Republic, the results obtained by scientists studying vegetation and soil cover, which are considered the main components of landscape complexes.

The second chapter deals with the **"Differentiating features of the natural landscapes of the Nakhchivan Autonomous Republic".**

The role of natural factors that occupy the main place in the formation of landscapes is investigated in a detailed study of such factors that are of particular importance in the formation of landscapes, such as the geographical location of the studied territory, orographic structure, relief hypsometry, slope and grooming of slopes, climatic features, vegetation. With a detailed explanation of the landscape-forming factors of the territory, the natural landscape complexes formed here were studied, the areas that these complexes cover with the definition of boundaries were calculated. Quantitative indicators of vegetation of the studied territory for different years were studied, the importance of vegetation in the formation of landscapes was studied with reference to the dynamics of vegetation development and the definition of categories of vegetation level of the territory. The activities of B.Budagov, S.Babayev (1965)[4], Y.Garibov (1990-1992)[5], S.Guliyeva (2011)[6], who conducted research in different years in the autonomous republic, in the study of landscapes and landscape maps compiled by them are materials of great importance for other researchers. On the basis of the collected materials, a classification of landscapes was carried out, semi-desert, mountain-xerophytic and gray, meadow-shrub, forest and shrubby, mountain meadow, meadow-gray and alpine meadows, rocky-stony

[4]Nakhchivan Autonomous Soviet Socialist Republic / tert. ed. H.B.Abdullayev - Baku: Elm, - 1975. - 360 p.

[5]Garibov, Y.A. Grouping of natural landscapes according to anthropogenic load // - Baku: Works of the Azerbaijan Geographical Society, Problems of Azerbaijan Landscapes and geomorphology, - 1999, - p. 34-41.

[6]Guliyeva, S.Y. Desertification in arid and semiarid mountain geosystems (on the example of Nakhchivan Autonomous Republic) / S.Y. Guliyeva. - Baku: Victory, - 2011, - 182 p.

subnival and nival types of landscapes formed on the territory were studied, taking into account the main criteria, subspecies and types of landscapes are determined, the areas of the territory covered by them are specified. Information on vegetation and soil cover, animal world and climatic features of the areas where these landscape types are distributed is given (Figure 1).

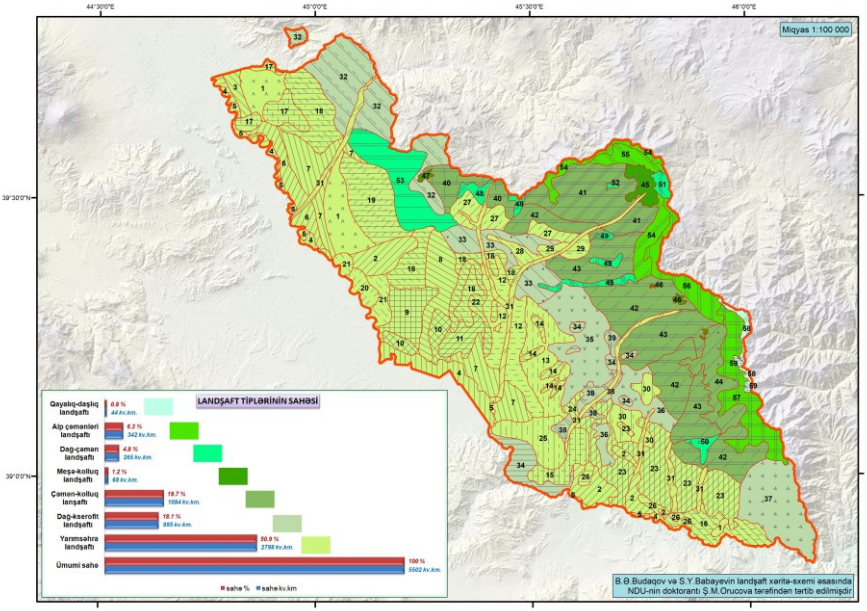

Figure 1. Map of natural landscape of the Nakhchivan AR

The information about the relief, climate, animal world, soil and vegetation cover of the areas covered by Plains and low mountains covering 2766 km^2 or 50.3% of the total territory of the autonomous republic and semi-desert landscape type in dry cold semi-desert and dry steppe climate. 3 species, their scope and areas, grouped within 31 subtypes of this landscape type, have been mentioned.The amount of sunny hours here is 2800, total solar radiation is 145-150 kcal/cm^2, average annual temperature is 14.5^0, average temperature in January is 8-6^0, average temperature in July is 270 C, total temperature above 10^0 is 4400^0 C, average annual atmospheric precipitation is 150-300

mm, possible evaporation is 1200-1400 mm, relative humidity is about 20%[7].

Having an area of 994 km2 covering medium and intensively dissected mountainous areas, covering 18% of the total territory of the Autonomous Republic, the areas of the xerophyte landscape located in the dry cold climate of the middle Highlands, the relief, climate, animal world, soil and vegetation cover are studied in detail and 2 subtypes of this landscape type and 8 species formed within.

Talking about the relief, climate, animal world, soil and vegetation of the mountain-xerophyte grass-shrub landscape formed in the cold climate of the mid-mountainous summer, it was noted that this type of landscape covering 1075 km^2 or 19.5% of the territory of the Autonomous Republic has 5 types spread mainly on the mountain slopes.

Forest and forest-shrub landscapes that cover 53 km^2 or 1% of the total area. Researches on 3 types of forest and forest-shrub landscape types spread on mountain slopes, relief, climate, animal world and soil types of the areas where these types are formed, as well as distribution and species diversity of vegetation cover on different altitude zones were collected.

Sparse forests of various juniper species, riparian forest are also spread here. In the case of spots, birch and pinus kochiana trees are also found. Juniper bushes in Nakhchivan AR are located in Gapijig and Kechaldag at an altitude of 3200 m above sea level. This is due to the fact that the climate there is continental. As is known, as the continentality of the climate increases, in the mountains the forest grows at higher altitudes[8].

Mountain-meadow and meadow-steppe landscapes occupy 258 km^2 or 4.7% of the territory of the Autonomous Republic, and mountain-meadow, Meadow-steppe and Alpine Meadows-330 km^2 or 6% of the total area. 3 types of these landscape types areas, relief,

[7]Guliyeva, S.Y. Desertification in arid and semiarid mountain geosystems (on the example of Nakhchivan Autonomous Republic) / S.Y. Guliyeva. - Baku: Victory, - 2011, - 182 p.

[8]Mammadov, G.S. The forests of Azerbaijan. / G.S. Mammadov, M.Y. Khalilov - Baku: Elm, - 2002. - 472 p.

climate, animal world, soil and vegetation, as well as mountain slopes and leveling surfaces, combined within 10 subtypes were mentioned.

The rocky-stony subnival and nuival landscapes surrounding the high peaks of the Highlands cover 0.5% of the total area of the autonomous republic, or 26 km2. 2 types of this type of landscape, formed on mountain slopes and watersheds, were noted, providing information about the territory, relief, climate.

Chapter III of the dissertation is devoted to the topic **"The influence of the economy on natural environmental conditions and the transformation of landscapes".**

Over time, as a result of the impact of human economic activity, there is an acceleration of transformation and degradation of natural landscape complexes. In order to study the causes and consequences of transformation and degradation of landscapes in the territory, the areas of activity of economic entities that caused the transformation of natural landscapes were identified, their scale, the negative consequences of the impact on natural complexes and ways to solve the problems that arose were studied. Based on our research, we have determined the directions for the transformation of agricultural landscapes on the territory of the Autonomous Republic.

Based on the results, we can say that the natural landscapes in the Sharur, Babak, Kangarli and Julfa regions have undergone greater transformation due to agricultural activities. In place of the semi-desert natural landscape complexes of the predominantly flat territories of these regions, agricultural landscapes were formed, consisting of irrigation and dryland farming agriculture. When assessing the transformation of agricultural landscapes, we consider it appropriate to classify arable lands as strong, perennial plantings and farmland as medium, and hayfields, summer and winter pastures as weakly transformed complexes.

The history of the origin, development and current state of agriculture, which is an integral part of human economic activity, were studied, its results were studied, the influence of irrigation and natural agriculture on the transformation of landscapes was studied, recommendations were given on the regulation of processes affecting the transformation of landscapes.

The cutting down of woody and shrubby vegetation from fields in connection with the development of agriculture in the territory of the Autonomous Republic, the construction of hydraulic structures without landscape planning, the expansion of agriculture and horticulture without taking into account the ecological potential of landscape units led to a reduction in the degradation of the area of forests and shrubs, pastures. It was found that due to the development of agriculture, the composition of a number of plant species has changed, new plant species have been introduced to the territory, which led to the emergence of new biodiversity.

As a result of the research, it was established that in connection with the development of agriculture, the biotic components of natural landscapes and the structure of the top layer of soil undergo significant changes, erosion in soils accelerates, and microclimatic conditions are rearranged. The sown areas peacefully planted on the territory were compared with those currently cultivated, and it was found that within 2-3 years, natural plant cenoses are partially restored in the peacefully planted area.

By providing information about the pasture-meadow landscape complexes of the Autonomous Republic, economic activities affecting the transformation of these landscapes were studied. Pasture-harvesting complexes in the Nakhchivan Autonomous Republic are not so diverse compared to other regions of the republic. Thus, more than half of the total land reserve of the Nakhchivan Autonomous Republic, 50.6% (271.6 thousand hectares) of which are outcrops of rocks and clayey rocks, is located in the mountainous part of the region. 49.4% of land resources (264.7 thousand hectares) are distributed in the flat part.[9].

With an area of 550275 ha, the Land Fund of the Autonomous Republic has an area of 113076 ha under pastures and hayfields. Covering an area of 177222 ha of Nakhchivan AR, 59.8% or 106001 ha of agricultural land is used as pasture and pasture areas. Up to 36 percent of usable land areas are fully used in agriculture. 74.2

[9]Hasanov, A.M. Natural resources of Nakhchivan Autonomous Republic and ways of using them / A.M. Hasanov. - Baku: Araz, - 2001, - 246 p.

thousand ha of the lands suitable for agriculture are pasture areas around the village, 14.2 thousand ha are winter pastures, and 17.7 thousand ha are summer pastures [10].

The technogenic landscapes of the research area, their scope and impact on the transformation of natural landscapes were studied. According to G.Sh.Mammadov and M.Y.Khalilov, these landscapes, driven by human activity, include residential quarters, streets, playgrounds, recreation areas, cominication systems, quarries, mines, mines and a number of other facilities, as well as adjacent areas[11]. By determining the degree of impact of technogenic landscapes on natural landscape complexes, the issues of transformation of natural landscape complexes as a result of this impact were investigated, the degree of industrial-technogenic loading of landscapes was determined. Based on the studies, we can say that 68492 ha va or 32% of the areas subject to industrial-technogenic loading are weak, 81946 ha or 39% are medium, and 61044 ha or 29% are areas where strong loading is observed. Industrial and technogenic load is observed mainly in the semi-desert parts of the plains and low mountains, partly in the mountain xerophytic landscapes of the middle highlands that have undergone transformation. Areas subject to strong industrial-technogenic loads, residential complexes and the mining industry are formed mainly on the site of semi-desert natural landscape complexes of sloping plains and river valleys, while the average industrial technogenic load falls on the areas surrounding these complexes with agricultural landscapes, and weak industrial-technogenic load is associated with the Prirazlomny sections of the Sedarq and Sharur plains, the plain is observed in the central parts of the Boyukduz and Nakhchivan plains. There is no anthropogenic load observed on an area of 338,793 hectares, which is 62% of the total area.

[10]Cabinet of Ministers of the Nakhchivan Autonomous Republic of the Nakhchivan Autonomous Republic "On the approval of the land balance by types, users and owners of land as of January 01, 2018" // Archives of the State Service for Real Estate and Land Issues of the Nakhchivan Autonomous Republic.

[11]Mammadov, G.S. Ecology, environment and man. / G.S. Mammadov, M.Y. Khalilov - Baku: Elm, - 2006. - 516 p..

The anthropogenic transformation of natural landscapes has been studied, and a classification of landscapes has been given based on taxonomic units determined by the study of modern landscapes of the study area, formed as a result of anthropogenic impacts. One of the most important scientific and theoretical problems facing modern landscape science is grouping, that is, the classification of natural and transformed landscapes according to obvious characteristics based on certain taxonomic units[12]. This section also assessed the territory according to the degree of transformation and determined the coefficients of landscape transformation.

From our research and analysis, we conclude that, taking into account the diversity of forms of change in natural landscapes, the territory of the Nakhchivan Autonomous Republic can be grouped according to the degree of landscape transformation into 5 categories (Figure 2).

1. Landscape complexes that have been fundamentally changed and have lost their natural structure with a transformation coefficient of more than 0.7.

2. Landscape complexes with a transformation coefficient of 0.5-0.7, sharply changed and largely lost their natural structure.

3. Landscape complexes with an average change in the transformation coefficient of 0.2-0.5 and partial preservation of the natural structure.

4. Landscape complexes with a transformation coefficient between 0.1-0.2 are weakly changed and retain their natural structure.

5. Unchanged landscape complexes with a transformation coefficient less than 0.1 and fully preserving their natural structure.

[12]Garibov, Y.A. Anthropogenic transformation of modern landscapes of the Republic of Azerbaijan / Y.A. Garibov. - Baku: Mars Print, - 2011, - 299 p.

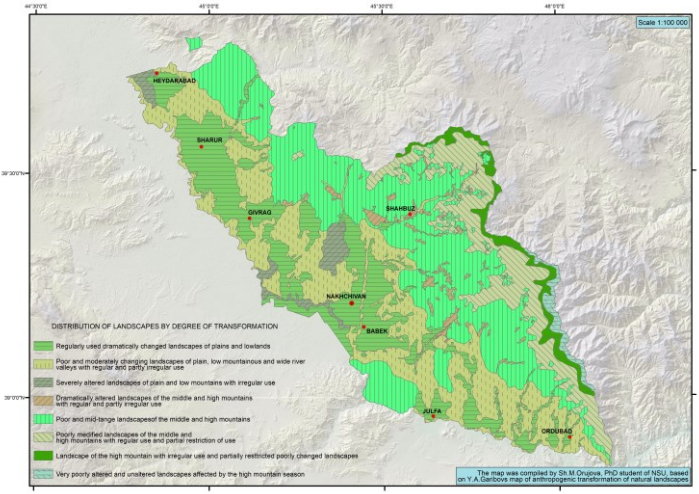

Figure 2. Map of anthropogenic transformation of landscapes

Chapter IV discusses the topic **"Optimizing the transformation of landscapes and preserving landscape-ecological diversity."**

The historical periods of settlement on the territory of the Autonomous Republic were studied, residential complexes and the distribution of settlement along altitudinal and landscape zones were studied. Study of the influence of settlement on the transformation of landscapes, taking into account the normalization of anthropogenic loads when optimizing residential complexes, designing complexes and industrial enterprises in areas with relatively low productivity or not used in agriculture, implementing a number of agrotechnical measures over time in residential complexes formed in areas unsuitable for agriculture with the cultivation of crops and ensuring soil fertility, with the intensive use of natural resources, it is recommended to implement important scientific and practical measures, such as compliance with established standards for the protection of the ecosystem.

Information is provided on the agricultural landscape complexes of the Autonomous Republic and the influence of these

complexes on natural landscapes is studied. It also talked about the implementation of important measures to improve agricultural landscapes.

In recent years, a number of important steps have been taken in the Autonomous Republic to improve agricultural landscapes. As a result of the expansion of reclamation and irrigation networks, the implementation of landscaping measures, etc., a number of achievements were achieved in the field of development of agricultural landscapes (Figure 3).

Over the years, reforestation and reforestation work has been carried out on hundreds of hectares, which in turn play an important role in preventing wind and water erosion. With the commissioning of new pumping stations, subartesian wells, and the laying of irrigation lines and canals, high yields from arable land are ensured. In recent years, in order to develop agriculture, changes have been made to the structure of arable land, irrigation capabilities and supply of arable land have been improved through the development of abandoned useful lands, rational use of available water resources, and improvement of reclamation and irrigation systems.

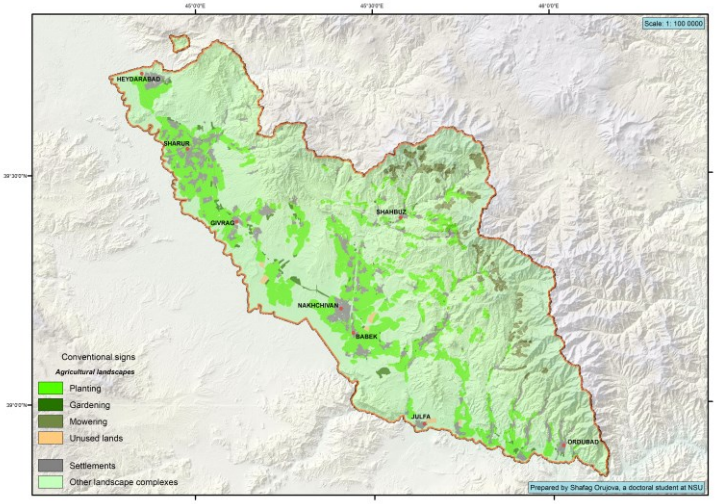

Figure 3. Map of agrolandscape complexes of Nakhchivan Autonomous Republic

New land plots are involved in crop rotation with the construction of closed irrigation networks on an area of 616 hectares in the village of Boyukduz, 135 hectares in the village of Yurdchu of Kangarli region, 300 hectares in Turkesh village of Shahbuz region[13].

Special protected natural areas, their history, territory and protected fauna and flora species, historical archaeological, cultural and natural monuments were studied and detailed information about them was given. Also, the importance of specially protected natural areas in the protection, restoration and development of the ecological balance of natural lanndshaft complexes, landscape-ecological diversity was discussed.

In the results and proposals part of the dissertation, the conclusions of the research are summarized as follows:

RESULTS

1. The long-term evolution and historical development processes of the landscapes of the Nakhchivan Autonomous Republic were studied in detail and the research in this area was summarized in a comprehensive form, the role of natural factors in the formation of landscapes was studied on the basis of hypsometric, predisposition, viewability, etc. maps and diagrams of 1:100000 scale compiled in the GIS environment of the territory has been studied.

2. In order to study the degree of vegetation of the territory, for the first time, maps of the degree of vegetation of the territory relating to different years were compiled on the basis of satellite images. Using GIS capabilities, a map of the natural landscape of the territory was developed on a scale of 1:100,000, field indicators of individual types of landscapes were calculated for the first time, 50.3% of the studied territory was semi-desert, 18%-mountainous xerophytic,

[13]Press service of the State Statistics Committee of the Nakhchivan Autonomous Republic. The process of adding land plots to crop rotation is successfully continued // Eastern Gate. – 2019, July 24. - p. 1.

19.5%-meadow-shrubby, 1%-forest-steppe, 4.7%-mountain meadow, 6%-mountainshrubby.meadow and alpine meadows were identified, and 0.5%-nival glacial landscapes.

3. The role and sphere of influence of Agriculture in the transformation of landscapes were investigated and a map of land use on a scale of 1:100000 was prepared. It has been established that arable land occupies 37606 ha or 13.3% in semi-desert landscape, 5529 ha or 5.6% in highland xerophyte landscapes, 6522 ha or 6.1% in grass-shrub landscapes, 1091 ha or 4.2% in Mountain-Meadow and Alpine Meadows landscapes. 38% of the total area of the study subject to industrial-technogenic transformation was determined to be weak in 32%, medium in 39% and strong loading in 29%.

4. In order to study the ways of optimizing the impact of settlement on landscapes, landscapes transformed as a result of anthropogenic impact were grouped and maps of modern landscape and anthropogenic transformation of the object of study on a scale of 1:100000 were prepared. It has been established that according to the transformation coefficients, 23% of landscape complexes are fundamentally changed and lose their natural structure, 2% are sharply changed and mainly lose their natural structure, 59.5% are moderately changed and partially retain their natural structure, 14.3% are poorly changed and retain their natural structure, and 1.2% are unchanged and completely retain their natural structure.

5. During the study of distribution of agrolandshafts on natural landscape complexes, it was determined that 18.4% of semi-desert landscape, 7.8% of Highland xerophyte landscape, 8.6% of Meadow-shrub landscape, 5.6% of forest and forest-shrub landscape, 10.2% of mountain-meadow landscape and 1.5% of Alpine Meadows landscape were used as agrolandshafts.

6. The importance of implementing measures for the protection of existing specially protected natural objects and natural landscape complexes in the territory of Nakhchivan Autonomous Republic was emphasized.

PROPOSALS

1. To achieve the use of modern irrigation methods by laying irrigation lines from the main rivers of the Nakhchivan Autonomous Republic, drilling new artesian wells, creating an irrigation network that can meet the water needs of the territory due to the restoration of ancient Kahriz and water systems.

2. To achieve satisfaction of demand not due to the expansion of arable land, but due to the use of plant species with high productivity, to ensure the preservation and further expansion of actual forest belts and natural forests.

3. To comply with the established grazing norms and rules for the maintenance of the natural structure of pasture-pasture landscapes, to satisfy the needs of the population in meat and dairy products not at the expense of increasing the number of livestock, but with the use of more productive varieties.

4. Placing Seliteb and industrial complexes on lands unsuitable for agriculture, ensuring the preservation of landscape-ecological diversity with a partial reduction in the transformation of natural landscapes by creating waste processing enterprises.

THE MAİN TOPİC AND PROVİSİONS OF THE DİSSERTATİON ARE REFLECTED İN THE FOLLOWİNG SCİENTİFİC WORKS OF THE AUTHOR:

1. Aliyeva, Sh.M. Desert and semi-desert plants of Nakhchivan// − Baku: News of ASPU, Humanities and Natural Sciences series, − 2005. No.1, − p. 23-25.
2. Aliyeva, Sh.M. Degradation of natural landscapes as a result of anthropogenic activity in the territory of the Nakhchivan Autonomous Republic // Historical Silk Road and issues of development of economic and cultural relations of Nakhchivan, − Nakhchivan: − October 16-17, 2015, p. 83-84.
3. Aliyeva, Sh.M. Population settlement dynamics in Nakhchivan Autonomous Republic // − Nakhchivan: Scientific works of Nakhchivan State University, Natural and medical sciences Series, − 2015. No. 6 (71), − p.143-145.
4. Aliyeva, Sh.M. Population settlement in Nakhchivan until the 16th century // − Nakhchivan: Scientific Works of "Nakhchivan" University, International relations, economy, philology, history, geography, pedagogy and psychology, mathematics, − 2016. No. 2(3), − p.195-199.
5. Aliyeva, Sh.M. Population structure in Nakhchivan Autonomous Republic // − Nakhchivan: Scientific works of Nakhchivan State University, Series of natural and medical sciences, − 2016. №7(80), − p. 165-168.
6. Aliyeva, Sh.M. Dynamics of the population of Nakhchivan MR // I International Scientific Conference of Young Scientists, Ganja: − October 17-18, − 2016, p. 257-260.
7. Aliyeva, Sh.M. Regularities of population location in Nakhchivan Autonomous Republic by altitude zones // - Nakhchivan: Scientific Works of Nakhchivan State University, Series of Natural and Medical Sciences, − 2017. No. 3(84), − p. 203-206.
8. Aliyeva, Sh.M. Safarali Babayev and the geography of Nakhchivan // − Nakhchivan: Scientific Works of Nakhchivan

State University, Series of Natural and Medical Sciences, − 2017. №7(88), − p. 101-105.
9. Aliyeva, Sh.M. Agriculture in the territory of Nakhchivan Autonomous Republic and land as its means of production //Current Problems of Modern Natural Sciences, − Ganja: − May 04-05, − 2017, − p. 318-319.
10. Aliyeva, Sh.M. Population density in Nakhchivan Autonomous Republic and its influencing factors // II International scientific conference of young scientists, Ganja: October 26-27, − 2017, p. 182-184.
11. Aliyeva, Sh.M. Main stages and modern problems of migrations in Nakhchivan AR // Human and Environmental Relations, − Baku: − 2017. − p. 481-485.
12. Alieva, S.M. B.C. Natural and Mechanical Movement of Population in Nakhchivan// - Ordu: City Academy, Journal of Urban Culture and Management, − 2017. Volume: 10 Issue: 3, − p.362-367.
13. Aliyeva, Sh.M. Influence of migration problems on demographic development in Nakhchivan Autonomous Republic // − Kuban: Scientific journal of KubGAU, Polythematic network electronic scientific journal, − 2017. №131(07), − p. 1-8.
14. Aliyeva, Sh.M. Issues of population settlement in Nakhchivan in the 20th century // − Nakhchivan: Nakhchivan University, Scientific works, economics, philology, history, geography, pedagogy and psychology, mathematics, − 2017. No. 2(5), − p. 232-236.
15. Aliyeva, Sh.M. Safarali Babayev's research on the landscape of the Nakhchivan Autonomous Republic // − Nakhchivan: "Nakhchivan" University, Scientific works, economics, philology, history, geography, pedagogy and psychology, mathematics, − 2017. No. 4(7), − p. 240-246.
16. Aliyeva, Sh.M. Semi-deserts of arid and semi-arid landscapes of Nakhchivan Autonomous Republic // Current Problems of Modern Natural and Economic Sciences, Ganja: May 04-05, − 2018, p. 62-64.

17. Aliyeva, Sh.M. Transformation of natural landscapes due to the development of agriculture in Nakhchivan MR // − Nakhchivan: Scientific Works of Nakhchivan State University, Series of Natural and Medical Sciences, − 2018. No. 3(92), − p. 218-220.
18. Aliyeva, Sh.M. Optimizing the impact of population settlement and employment on landscapes // − Nakhchivan: Scientific Works of Nakhchivan State University, Series of Natural and Medical Sciences, − 2018. No. 3(92), − p. 218-220.
19. Orujova, Sh.M. Degradation of natural landscapes of Nakhchivan Autonomous Republic // − Samarkand: Samarkand State University, Scientific Bulletin, Series of Natural Sciences, − 2019. 5(117), − p. 154-158.
20. Orujova, S.M. İnvestıgatıon of the flora wıth modern methods ın learnıng of the lanscapes of nakhchıvan autonomous republıc // Центр Наукових Публікацій Збірник Наукових Публікацій «велес» VI міжнародна конференція «інноваційні підходи і сучасна наука», − Київ:−31 березня, − 2020,− с. 26-29.
21. Aliyeva, Sh.M. Degradation of pasture-meadow complexes in Nakhchivan AR and ways of their elimination // Current Problems of Modern Natural Sciences, – Ganja:– May 01-02, – 2020, – p. 97-100.
22. Aliyeva, Sh.M. The importance of content lines in the realization of learning outcomes in geography // Curriculum reforms in general education: Results and perspectives-2020, − Nakhchivan: − May 21, − 2020, − p. 195-196.
23. Orujova, Sh.M. Assessment of anthropogenic transformation of landscapes of Nakhchivan Autonomous Republic // Place where cultures meet, − Nakhchivan: − October 22-23, − 2020, − p. 476-478.
24. Aliyeva, Sh.M. Industrial-technogenic transformation of Nakhchivan landscapes during the years of autonomy // Nakhchivan's autonomy in history and today, − Nakhchivan: − November 22, − 2020, − p. 290-294.
25. Orujova, Sh.M. The impact of agriculture on territorial organization and landscape degradation in Nakhchivan

Autonomous Republic // - Nakhchivan: Nakhchivan University, Scientific Works, international relations, economy, philology, history, geography, pedagogy and psychology, mathematics, − 2020. No. 4(19), − p. 206-210.
26. Orujova, Sh.M. The role of hypsometric height in the formation of landscapes of the Nakhchivan Autonomous Republic // − Nakhchivan: Nakhchivan University, Scientific Works, economics, philology, history, geography, pedagogy and psychology, mathematics, − 2021. No. 3(22), − p. 214-218.
27. Orujova, Sh.M. Evaluation of the impact of the Duzdag stone salt deposit on the ecological condition of the surrounding areas // International Duzdag researches, − Nakhchivan: − May 25, − 2021, − p. 78-81.
28. Orujova, Sh.M. Ecological problems of forest and forest-shrub landscapes and their solutions // − Nakhchivan: Nakhchivan University, Scientific Works, economics, philology, history, geography, pedagogy and psychology, mathematics, − 2022. No. 1(25), − p. 292-295.
29. Orujova, Sh.M. Seliteb complexes and their development dynamics of Arazboyu plain in Nakhchivan Autonomous Republic // −Ўзбекистон: Ўзбекистон Республикаси фанлар академияси, Хоразм Маъмун Академияси Ахборотнома ОАК Раёсатининг билан биология, қишлоқ хўжалиги, тарих, иқтисодиёт, филология ва архитектура фанлари, − 2022. № 3, − p.22-26.
30. Orujova, S.M. Landscape studies of the Nakhchivan Autonomous Republic: semi-desert and mountain xerophytic landscapes // − Bukhara: Scientific Reports of Bukhara State University,− 2022. №3(91), − p.63-74..
31. Orujova, Sh.M. Anthropogenic transformation of landscapes of Nakhchivan Autonomous Republic and problems of their classification // − Baku: ANAS Acad. Institute of Geography named after H.A. Aliyev, Works of the Azerbaijan Geographical Society, Geography and Natural Resources, − 2022. №3 (18), − p. 22-28.
32. Orujova, Sh.M. Seliteb complexes of Nakhchivan Autonomous

Republic, their development dynamics and impact on landscapes // – Baku: Nature and Science International scientific journal, – 2023. Vol. 5, no. 11, – p. 78-83.
33. Orujova, Sh.M. The role of specially protected areas in the preservation of landscape-ecological diversity in Nakhchivan MR // – Baku: Nature and Science International scientific journal, – 2024. volume 6, number 1, – p. 44-48.
34. Orujova, Sh.M. İmpact and ways of improvement of agrolandshafts on natural landscapes in Nakhchıvan AutonomousRepublic // Akdeniz 11th international conference on applied sciences, – Mersin:– 23-25fevral, – 2024, – p. 118-123.
35. Orujova, S.M. Characteristics of the land fund of Nakhchivan Autonomous Republic // – України: Молодий вчений, – 2024. No. 3 (127), – p. 10-15.

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