

MODERN FEATURES OF THE SETTLEMENT OF THE TERRITORY OF THE CHECHEN REPUBLIC DEPENDING ON NATURAL CONDITIONS

Bekmurzaeva L.R., Bratkov V.V., Kerimov I.A.

*Millionshchikov Grozny State Oil Technical University, Grozny, Chechen Republic
Eip-eco2017@yandex.ru*

Abstract. *The analysis of residential development is a primary task in assessing the anthropogenic load on the territory. The Chechen Republic has been experiencing a construction boom in the last decade. The load on landscapes is increasing. In this regard, it is very important to assess the degree of modern residential development of landscapes. For comparison, data from remote sensing of the Earth were used, namely Landsat and Sentinel-2 images for 1985 and 2024. The material was processed using the ArcGIS and MapInfo programs. A quantitative assessment of the residential load showed that the increase in residential areas in 2024 compared to 1985 was 192%. The maximum increase in residential areas in 2024 is in steppe landscapes (by 233%). Large settlements such as Grozny and Gudermes are located in the steppe landscapes. Infrastructure development and recreational attractiveness have led to an increase in the share of residential areas in the lower montane forest (226%) and in the high-altitude subalpine forest-shrub-meadow landscapes (177%).*

Keywords: *Earth remote sensing data, landscapes, residential areas.*

Introduction

When assessing the anthropogenic load on a territory, first of all, its residential development is studied. Residential load (sometimes synonymous or similar terms are "demographic", "settlement", etc.) is defined as a type of impact on the ecological state of landscapes due to the location of settlements and the number of people living in them [5]. Natural conditions play a key role in the settlement of the territory. In this regard, the landscape approach is the most convenient way to assess the residential development of the territory [3]. There has been a construction boom in the republic in the last decade, and in this regard, the assessment of the modern residential development of the landscapes of the Chechen Republic is of great practical interest.

Materials and Methods

The landscape map of the Chechen Republic, published by a team of authors [1], was used as a landscape basis. For a comparative assessment of the residential development of the landscapes of the Chechen Republic, data from remote sensing of the Earth were used, namely Landsat and Sentinel-2 images for 1985 and 2024. Their processing was carried out by such software tools as ArcGIS and MapInfo. When calculating the territories occupied by settlements, we relied primarily on the concept of residential landscapes, i.e. landscapes of settlements (rural and urban) [4]. The calculations did not take into account the territories occupied by dacha-type settlements, since their area is insignificant.

Results

The results of satellite image processing are presented in Table 1.

Table 1. Changes in the area of settlements within the landscapes on the territory of the Chechen Republic

Landscapes	Landshafts Square, km ²	Area of settlements, km ²		Quantity of settlements, km ²		Area gain, %
		1985г.	2024 г.	1985 г.	2024 г.	
Semi-desert and desert	4348	36,1	47,5	45	44	132
Steppe	3579	262,1	633,8	122	122	242
Delta and floodplain areas	1579	87,6	130,2	79	84	149
Low-mountain forest-shrub-meadow-steppe	863	8,1	9,5	12	16	117
Lower Mountain forests	607	9,8	14,2	32	31	145
Mid-mountain forests	2320	61,4	77,4	119	114	126
Mountain-hollow shrub-meadow-steppe	237	3,4	7,0	20	15	206
Mountain-shrub -steppe	162	4,7	3,9	17	17	83
Upper montane forest and post-forest	1051	1,9	2,0	10	9	105
High-altitude subalpine shrub-meadow	1021	2,2	2,4	9	7	109
High-altitude Alpine shrub-meadow	291	-	-	-	-	-
Highland subnival	71	-	-	-	-	-
Glacial-nival	32	-	-	-	-	-
Total	16160	477,2	927,9	465	459	450,7

As can be seen from the data presented, despite the reduction in the number of settlements in 2024, the area of residential territories has almost doubled. If in 1985 the area of residential territories was 477.2 km², then in 2024 it amounted to 927.9 km². The total increase in the area occupied by settlements amounted to 450.7 km². However, as noted by Bratkov and Taimaskhanov [2], "The growth of the land area of settlements is associated not so much with an increase in the area of the settlements themselves, as with a change in the status of lands within or adjacent to them." The increase in residential areas in different subtypes of landscapes occurred unevenly. Natural conditions have a significant impact on this process.

The steppe landscapes of the Chechen Republic are the most comfortable for living and conducting economic activities, primarily agricultural ones. These landscapes occupy the territory between the Tersk and Sunzha advanced ranges on the one hand and the Forested Ridge of the Greater Caucasus, occupying the territory of the Chechen inclined Plain. Here, the area of settlements has grown 2.4 times: from 262.1 to 633.8 km². A significant increase in the area of settlements is also associated with the addition of new territories to large cities. For example, in 2021, the villages of Gikalo and Prigorodnoye were annexed to Grozny.

Despite the small area occupied, residential territories in mountain-hollow shrub-meadow-steppe landscapes have more than doubled: from 3.4 to 7.0 km². The increase in residential areas in mountainous landscapes is generally associated with recreational attractiveness, the desire to return to historical lands, and improved infrastructure. For example, the mountainous regions of the Chechen Republic have been gasified, roads have been laid, and resorts have been built.

Delta and floodplain and lower montane forest landscapes are being actively developed (an increase in the area of settlements occurred by 49 and 45%, respectively). If in the first case the flat terrain, convenient for development, plays a more significant role, then in the second it can be explained by the fact that they occupy adjacent territory with flat and hilly landscapes, in close proximity to the largest cities – Grozny and Gudermes.

For other landscapes, the increase in the area of settlements is not so significant, and in mountain-shrub-steppe landscapes, on the contrary, there is a decrease in residential areas, which is associated with the inaccessibility of these areas.

As for the population of the Chechen Republic, it has been steadily growing every year since 2001 (Fig. 2). The proportion of the urban population is also increasing. If in 2002 the share of the urban population was 33.8%, then in 2024 it was 401% [6].

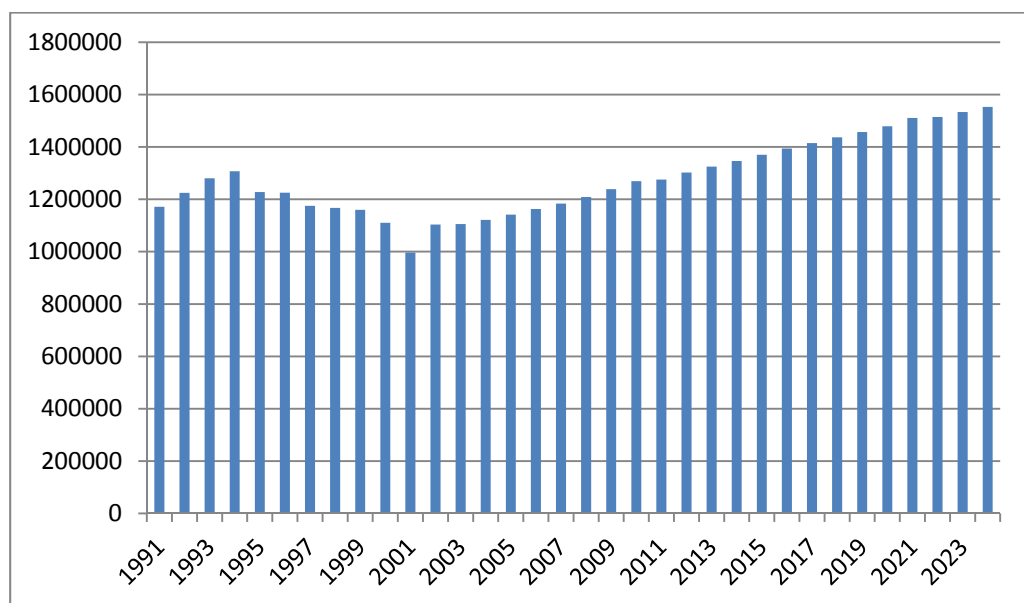


Fig. 2. Population of the Chechen Republic by year

Based on the data from Chechenstat, we calculated the population of the Chechen Republic within each subtype of the landscape (Table 2).

Table 2. The population of the Chechen Republic as of 01.01.2024 by landscape

Landscapes	Landshafts Square, km ²	Population	Quantity of settlements, km ²	Population density, people per km ²
Semi-desert and desert	4348	69364	44	16,0
Steppe	3579	987989	122	276,1
Delta and floodplain areas	1579	218377	84	138,3
Low-mountain forest-shrub-meadow-steppe	863	10044	16	11,6
Lower Mountain forests	607	21175	31	34,9
Mid-mountain forests	2320	86125	114	37,1
Mountain-hollow shrub-meadow-steppe	237	4606	15	19,4
Mountain-shrub -steppe	162	4987	17	30,9
Upper montane forest and post-forest	1051	1373	9	1,3
High-altitude subalpine shrub-meadow	1021	2237	7	2,2
High-altitude Alpine shrub-meadow	291	-	-	-
Highland subnival	71	-	-	-
Glacial-nival	32	-	-	-
Total	16160	1406277	459	87,0

The main population of the Chechen Republic is concentrated in the steppe landscapes. The population density in steppe landscapes is 276.1 people per km². The delta and floodplain landscapes of the Chechen Republic are also quite densely populated, with a density of 138.3 people per km². In the mountainous landscapes of the Chechen Republic, population density decreases with increasing altitude. The density of semi-desert and desert landscapes is relatively low (16.0 people per km²), which is due to the small population and large area of the landscape.

Conclusions

The natural conditions play a primary role in the settlement and development of the territory of the Chechen Republic. The steppe landscapes are the most populated, as they are the most comfortable for living and conducting economic activities. In 2024, there is a 2.4-fold increase in the area of residential territories in steppe landscapes compared to 1985, and the population density here is also the highest at 276.1 people per km². In the mountainous landscapes of the Chechen Republic, population density decreases with increasing altitude. However, a comparative analysis of residential areas has shown that in comparison with 1985, there is an increase in the area of settlements in the mountains. This is primarily due to the recreational appeal, the improvement of infrastructure and the desire to return to historical lands.

Acknowledgments. The work was carried out within the framework of the state assignment of Million-shchikov Grozny State Oil Technical University FZNU-2024-0001 «Assessment of the impact of modern climate change on natural and natural-anthropogenic complexes (using the example of the Chechen Republic).

References

1. Bratkov V.V., Idrisova R.A., Alsabekova A.A., Landscape diversity of the Chechen Republic. // Bulletin of the North Caucasus State Technical University. No. 1, 2009, pp. 34-39. (in Russian)
2. Bratkov V.V., Taimaskhanov Kh.E., Changing the areas of settlements in the Chechen Republic and the possible consequences of this process. Monitoring. // Science and technology. No. 1(55), 2023, pp.67-73. (in Russian)
3. Zaurbekov Sh.Sh., Bratkov V.V., Bekmurzayeva L.R., Geoecological assessment of anthropogenic modification of landscapes of the Chechen Republic // Izvestiya Dagestan State Pedagogical University. Natural and exact sciences. No. 1 (10), 2010, pp. 86-91. (in Russian)
4. Milkov F.N., Man and landscapes. – M.: Mysl, 1973. P. 224. (in Russian)
5. Sennaya E.I., Molodan Ya.E., Assessment of residential load on landscapes in the process of regional landscape and ecological research // Scientific notes of the Russian State State Medical University. Issue 28, 2013, pp. 88-92. (in Russian)
6. The Chechen Republic in numbers. 2024: A short statistical collection / Chechenstat – Grozny 2024. p. 148. (in Russian)