

# Landscapes—Structure, Functions, and Development Trends (On the Example of Landscapes of Georgia)

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## Abstract

The article discusses the peculiarities of landscape geography development, types of landscape structure and their types, the essence of cultural landscape and its types, landscape functions and peculiarities of their definition, the main tasks and challenges of using and managing Georgian landscapes.

## Keywords

Geography, Landscape Structure, Landscape Function, Landscape Planning, Climate Change

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## 1. Introduction

The case with term Landscape is slightly different. At one glance, the term denotes the peculiarities of a geographical space only. However, there is scarcely any branch of politics, social field, economy, military field, or arts not using term Landscape in many different ways [1].

Moreover, even geography has several tens of names and explanations of Landscape. It is them, used to explain the modern state of geographical environment. It should also be noted that the number of scientific publications with novel interpretations of term Landscape increases steadfastly. The fact is that the great number of such explanations evidence of geographical landscape is a particular study object. We think that at present, together with the ecologization, economization, humanization, socialization and politicization, we can boldly talk about the “landscaping” of geography, *i.e.* landscape geography.

One of the most important objectives of geographical sciences is still the up-

dating of the theoretical foundation of a complex geographical study by way of synthesis of geographical disciplines. A single geographical study is desirable to accomplish by identifying and analyzing the geographical, regional, and typological units. The examples of regional units are eco-geo-systems (large natural-economic formations) or river basins, and those of typological units are landscapes.

At present, there is one more important factor evidencing the importance of landscape geography. This factor is associated with the realization of the major requirements of the European Landscape Convention underlying the role of landscape in the societal development. The Convention is joined by many European countries, what puts the consideration of urgent objectives related to the analysis, synthesis and planning of a single methodology, or landscape on the agenda.

The basis of landscape analysis is associated with the evaluation of its modern state. It is seen in the light of variety of the terms and peculiarities of the landscape structure and function.

## 2. Methods

Based on the landscape analysis and synthesis concrete results are received: it is created and approved the theoretical concept of space and time approach in landscape research, it is carried out certification of landscapes of Georgia, geographic information systems and databases are created, landscape and ecological characteristics of the forest of Georgia are studied, is created methodological fundamentals of landscape planning.

The concept of the space and time analysis and synthesis of natural territorial complexes, developed by Prof. Niko Beruchashvili (1947-2006), formed and forms an important basis for landscape research and development of the different scientific directions. Include: landscape ethology, geophysics of landscape, dynamics of landscape, studying of conditions of Agri landscapes, structures and functioning of landscapes, military geography, landscape planning, modeling, and forecasting of geographical processes, etc.

The goal of geo ecological investigation of the landscape is to appear these various mutual connections, its spatial-temporal variety which exists between nature and society. By that, the research of territorial organization, landscape components and ecological condition of its morphologic units, their interrelation is the main essence of geo ecological investigations.

Geo ecological investigation of landscape is realized is implemented by some stages from which most important are landscape-ecological analysis (inventory) of the territory (general geographical, landscape, social-economical, ecological) and estimation. At the general geographical analysis there is considered the geographic location of observable territory, area, borders neighboring regions, common physical-geographic and social-economic features. At the landscape analysis, scale of which is followed from investigation purposes, natural potential

of the territory, interrelation of physical-geographic components, basic features of structure and functioning, dynamics and ethology are searched. There must be noted that from characteristics of natural potential of the territory there are important for geo-ecological investigation: relief features and geologic formation, climate and climatic resources, waters and water resources, plants and herbal resources, bio variety, animal world and zoo resources, soils, and soil resources.

The analysis of ecologic situation of the territory can be realized by determination of ecological condition of natural and cultural environment in which is supposed the situation analysis, connected with ecologic condition of geographic components and their application. The goal of the analysis of general geographic, landscape, social-economic and ecologic situation of the territory is a geo ecologic synthesis which from its side consists of some stages. On the first stage of geo-ecologic synthesis is stated the character of today condition of landscapes (by structural, dynamical, functional, and ethologic characteristics, forms and scales of the influence, stability, and potential. On the second stage is a determined function of landscapes.

### 3. Result

#### 3.1. Structure of Landscapes

According to the European Landscape Convention [2], “Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.” The analysis of the results of such interaction gives us certain imagination of the modern state of the landscape. Its thorough evaluation has a decisive importance for further synthesis and planning of the landscape. There is hardly any literary work in the field of geographical science without any concern with the modern state, structure, development in space and time, peculiarities of functioning, etc. of the landscapes. Such situation is the result of the great significance of the issue; however, a great number of views make it difficult to arrive at the systematization and classification of the modern states of landscapes. Another reason for such complexity is that many researchers tend to explain the landscape altered in some way or other with one’s own, or author’s term. There are tens of terms known in the field describing not only the modern state of landscapes with a certain degree of accuracy, but also the attitude of an author or group of authors to the physiognomic appearance, structure or functioning of the landscapes. The terms can be grouped by the following features:

- Physiognomy (e.g., natural, altered, conditionally unchanged, cultural, rural, urban landscapes, etc. [3] [4] [5] [6];
- Territory of a uniform origin and structure, Agri landscape [7] [8] [9];
- Complexity [10] [11];
- Type of impact [3] [5] [12] [13];
- Techno genic [14] [15];

- Anthropogenic landscape [9] [13] [16] [17];
- Natural-anthropogenic landscape [18] [19];
- Para genetic landscape [20];
- Type of systemic links [15];
- Ecological state [19] [21] [22];
- Usage in time (e.g., historical, or modern, secondary, or primary [12] [23] [24];
- Economic designation (e.g., agricultural, forest, industrial, recreational, reserve, environmental, resource-productive, environmental restorative, water economic [9] [12] [25];
- On components [2] [26].

### 3.2. Structure of Cultural Landscapes

The term “cultural landscape” appeared in the scientific literature (German school) in the early 20<sup>th</sup> century. Thus, the term—cultural landscape—dates back a century, although its active discussion began in 1992, after the Rio Historical Conference.

Originally considered a cultural landscape as a landscape with high aesthetic and functional characteristics, it was a living environment of people or ethnos, in the formation of which spiritual and material values played an active role. In a separate definition, the cultural landscape: the product of the history, material and spiritual culture of the people living here; Is the result of processes initiated by nature and society. The German scientific school virtually, does not consider natural landscapes. In the opinion of Prof. E. Neef [27], since the 1950s, the natural landscapes in the geographical environment have been replaced by the kind of formations containing the trace of the societal historical development in some or other way. As per the German school, the geographical landscape, in addition to the inter-component relations, is clear evidence of the natural and social-economic (public) processes and their resultant states. Prof. H. Richter [28] uses the term *Cultural state of the area (landscape)* to describe the modern state of the landscape implying the material state of the area established by the society, though functioning through the natural processes. Such situation is the response to the societal requirements, periodic planning of the landscapes and purposeful economic activity. In his opinion, every area must be considered as a landscape with multiple uses, a geo-system with multiple functions, whose alteration is directly associated with the development and demand of the economy and society.

Many landscapes in the modern geographical environment have really lost their original appearance, mostly evidenced by the destroyed vegetation. It is also known that mixed, broad-leaved, forest-and-steppe and steppe natural ecosystems of the moderate belt, forests in subtropical and tropical belts and low-and average-mountain landscapes are totally transformed. However, this is hardly true with taiga eco-system of arctic, sub-arctic and moderate belts or moist and



arid eco-systems of tropical, subtropical, and equatorial belts or landscapes of nival, sub-nival, alpine or subalpine mountain zones.

Consequently, the modern state of landscapes can be characterized based on the scales of transformation, impact intensity and types of landscape application. The modern state of landscape can be identified depending on the type of impact (natural, anthropogenic, or mixed) on the basic landscape.

In case of dominant natural impact, the peculiarities of the landscape structure and functioning are totally the result of the natural processes. A certain impact of the economic activity can also be seen, but it cannot change either external (indicative) appearance of the landscape, or its ecological (structure, functioning, stability, etc.) and ethological (dynamics, development, functions, etc.) properties.

In case of dominant anthropogenic impact, the state of landscape is mostly resulted from the societal demands and social-economic processes with their nature and intensity associated with some of other level of the historical development of the society. The longer and more intense the anthropogenic impact is, the less the dependence of such a landscape on the natural processes.

In case of the third type, or mixed impact (nature, people), the state of landscape is determined by both, the societal demands and natural phenomena and processes. The anthropogenic impact on such landscapes is episodic, while the natural impact is permanent.

The cultural landscape is the result of a long (historical) interdependence of man and nature and part of the national heritage. It reflects the local culture and identity. It can be related to an important historical event as well as traditional economic and social activities.

The vast majority of researchers agree that:

- 1) The cultural landscape is developed on its natural foundation,
- 2) Preserves the main geographical elements (relief, geological structure, climate, waters, soil),
- 3) Formed within the natural landscape and mainly “obeys” the processes taking place in the natural environment.

Thus, the cultural landscape is a good example of the development of a society, its culture, ecological or social consciousness—it is the result of the demands that society places on the natural environment in a particular time and space. The cultural landscape is created in order to preserve the economic, social, ecological, religious, ethnographic, history and traditions and well reflects the attitude of a particular society towards the geographical space [9].

The structure of the cultural landscape is related to the preservation of the following values, namely:

- Religious values and religious architecture;
- Traditional agriculture;
- Place of historical significance (settlement, historical building, historical crossroads);

- Cultural;
- Harmony of urban and natural landscape;
- Unique landscape architecture and landscape design;
- Urban and economic evolution;
- The interdependence of nature and man;
- Traditional form of extraction and use of natural resources;
- Ethnoculture;
- Nature evolution and botanical park.

#### 4. Functions of Landscapes

The realization of a project of the most important economic or ecological significance of modernity requires the rational use of natural resources, their systematic control and purposeful management.

Determining the functions of landscapes is a key issue in applied landscape studies, their planning. Such activities are possible with the participation of a number of specialists, who take into account the landscape-ecological situation of the area—the current state of its structure and functions, the forms and scale of anthropogenic impacts, potential, and sustainability.

A landscape can perform one or more functions at the same time, depending on the needs of the community and the geo-ecological situation. Landscape functions are dynamic indicators. They change in space and time, which is related to the ever-increasing demands of society, as well as ongoing processes in nature and environmental problems. A striking example of the variability in functions over time is the high mountain subalpine and alpine landscapes, which perform resource functions in summer and recreational functions in winter.

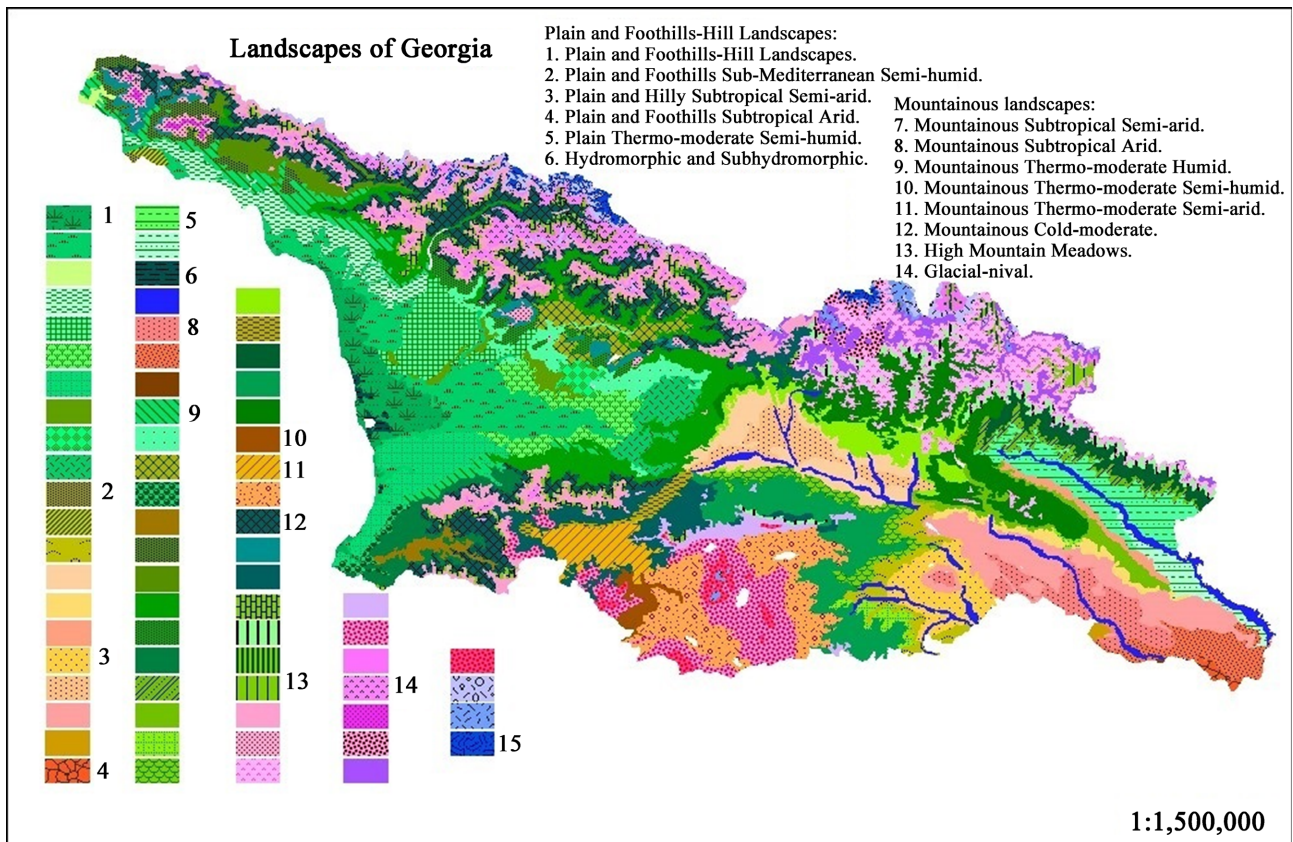
#### Functions of Georgian Landscapes and Their Characteristics

To determine the functions of landscapes, it is necessary to consider such characteristics as: the current state of nature use (along with the geo-ecological characteristics of the landscape), economic development trends and nature conservation strategies. According to the modern forms of nature use, the following units are distinguished: agricultural, forestry, energy, water supply, mining, transport, sports-health, medical-resort, and other landscapes.

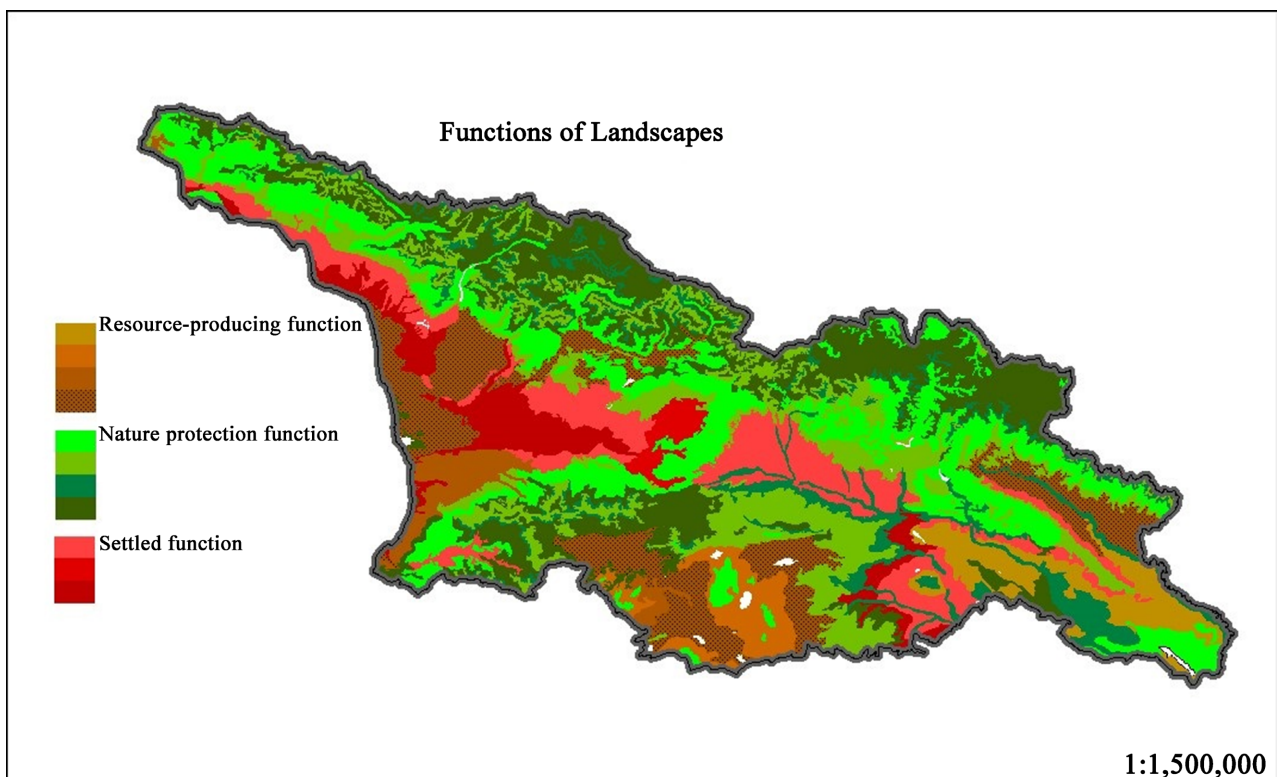
During the XX century, the natural orientation of the landscapes of Georgia [Figure 1] has changed several times. This is especially true of plains and low mountain landscapes. The modern type of landscape functions [Figure 2] is conditioned both by natural conditions and landscape potential, as well as by the historical-geographical features of the farm and ethnocultural traditions.

Georgian landscapes currently perform or can perform the following key functions:

- The resource production function derives from the natural-resource potential of the landscape and mainly serves the purposes of developing separate sectors of agriculture (mining, energy, agriculture, forestry and water). In



**Figure 1.** Landscapes diversity of Georgia (N. Beruchashvili, 1979).



**Figure 2.** Functions of landscapes of Georgia (N. Elizbarashvili, 2012).

landscapes with a productive function of resource, the processes are carried out, through which biological (agricultural) products are created, water is accumulated, phytomers, etc. are formed. Landscapes with resource-producing function are mainly located in the foothills of Georgia, on the surrounding hills and foothills, in the middle mountains, as well as in the form of fragments in river valleys, subalpine and alpine zones.

- Landscapes with environmental restoration function must have the ability to maintain structural-functional characteristics in such a way as to restore the constituent components and the structure of the landscape, to regulate their interdependence. Landscapes with restorative function should be present in areas with high anthropogenic impact or risk of impact. Such areas primarily include large urban agglomerations, industrial centers, transport hubs and highways, intensive agricultural regions, and so on.
- The function of environmental protection (nature protection) is related to the preservation of the sanitary, soil protection, water protection importance of the area by landscapes, as well as the structural diversity (which determines its sustainability). It should promote: 1) Sustainable development of the farm; 2) Social and economic stability of the population; 3) Conservation of biological and landscape diversity; 4) Performing an environmental restoration function by the landscape.
- Landscapes with a recreational function should have a high aesthetic purpose, contain elements and components necessary for human health, have cultural-historical and aesthetic values, etc. A recreational function can be incorporated into a landscape with any structure if:
  - They have the above resources,
  - As a result of agricultural activities, the aesthetic values of the landscape are not violated here,
  - The abundance of recreational objects serves the aesthetic perception of the landscape.
- Landscape function of settlements (settlements, industrial facilities, transport communications).

## 5. Developmental Trends of the Landscape Geography in Georgia

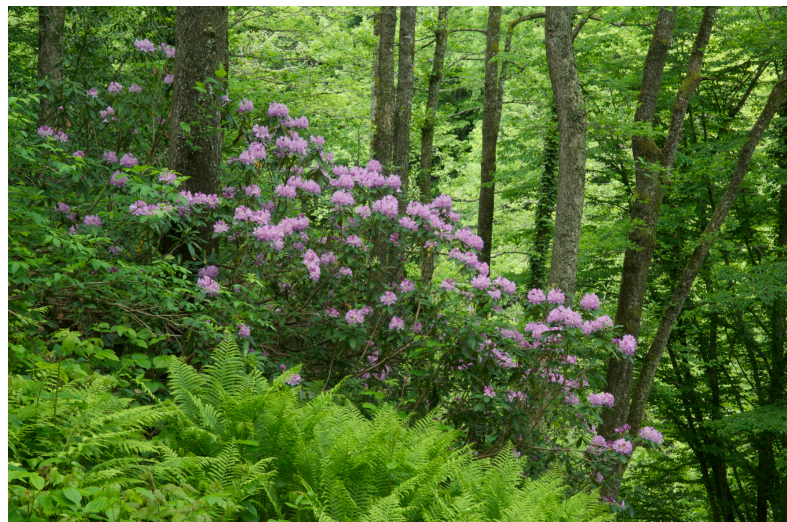
In the world, Georgia is distinguished for the high proportion of the “primary” or natural landscape amounting to 17% of the total area of the country. Intact natural environment is found both, in the preserved and moist zones and high-mountainous reliefs.

With its area (up to 70 thousand sq. km) and population (4.6 million people), Georgia ranks 25<sup>th</sup>, somewhere middle in Europe. Georgia has all the relief forms known in the world. 2/5 of the area covered with forest is a great ecological resource of the country. There are over 15 thousand plant species in Georgia, including 2600 algae species. 6.0% of the vegetation (*i.e.* up to 900 species) is en-



demic or relict. Fauna in Georgia is similarly diversified, with over 100 mammal and over 300 bird species. With the size, endemism and biodiversity of wildlife, Georgia is among the top five countries of Europe what is clear evidence of the diversity and uniqueness of the natural environment of Georgia.

There are hundreds of natural monuments on the territory of Georgia, which are particularly impressive for visitors, including dinosaur trace, particularly large and deep caves, canyons covered with endemic species, rivers with abundant water and high-power potential, lakes of different originations, wonderful glaciers, impassable and light forests, semi-deserts and marshes, red soils, etc. Another important thing is that the diversified nature is presented over a relatively small area increasing the recreational designation of Georgia [Figure 3, Figure 4].



**Figure 3.** Humid natural Colchian Forest Landscapes—West Georgia (Z. Manvelidze, 2002).



**Figure 4.** Semi-Arid natural Landscapes—East Georgia (N. Elizbarashvili, 2016).

Georgia is also distinguished for its ecologically pure environment in Europe. Only an insignificant part of the territory (2.2%) is under strong anthropogenic impact, what is 5 to 7 times less than the same indicator in many European countries (The United Kingdom, Denmark, Italy, and others) as compared to Georgia. The indicators like use of pesticides, specific weight of the polluted goods and raw materials in total import, number of vehicles per square kilometer of a settled area, average level of industrial pollution, number of toxic residues, etc. are also low in Georgia.

At the beginning of the XXI century, the European experience in landscape planning starts to establish in Georgia, and pilot projects [29] as well as landscape planning of new trans-border protected areas [1] [12] [30] were realized on its basis.

Recently (in 2014), the project of the Ministry of Culture and Monument Protection of Georgia aiming at preparing the historical landscape of the city of Mtskheta [Figure 5], the historical capital and religious center of Georgia, for The United Nations Educational, Scientific and Cultural Organization (UNESCO) nomination ended. Within the scope of the project, zoning of the historical, cultural, esthetic, environmental-restorative and environmental-protective landscapes of the city was done for the first time.

At present, landscape planning of urban areas is on the agenda. This will be accomplished for the first time in Georgia and will cover the agro-melioration limits of Tbilisi, the capital of Georgia. The goal of such planning is to solve some urgent issues and it is related to the planning of significantly reduced “green” zones and recreational areas, esthetic environment, environmental-restorative and environmental-protective landscapes.



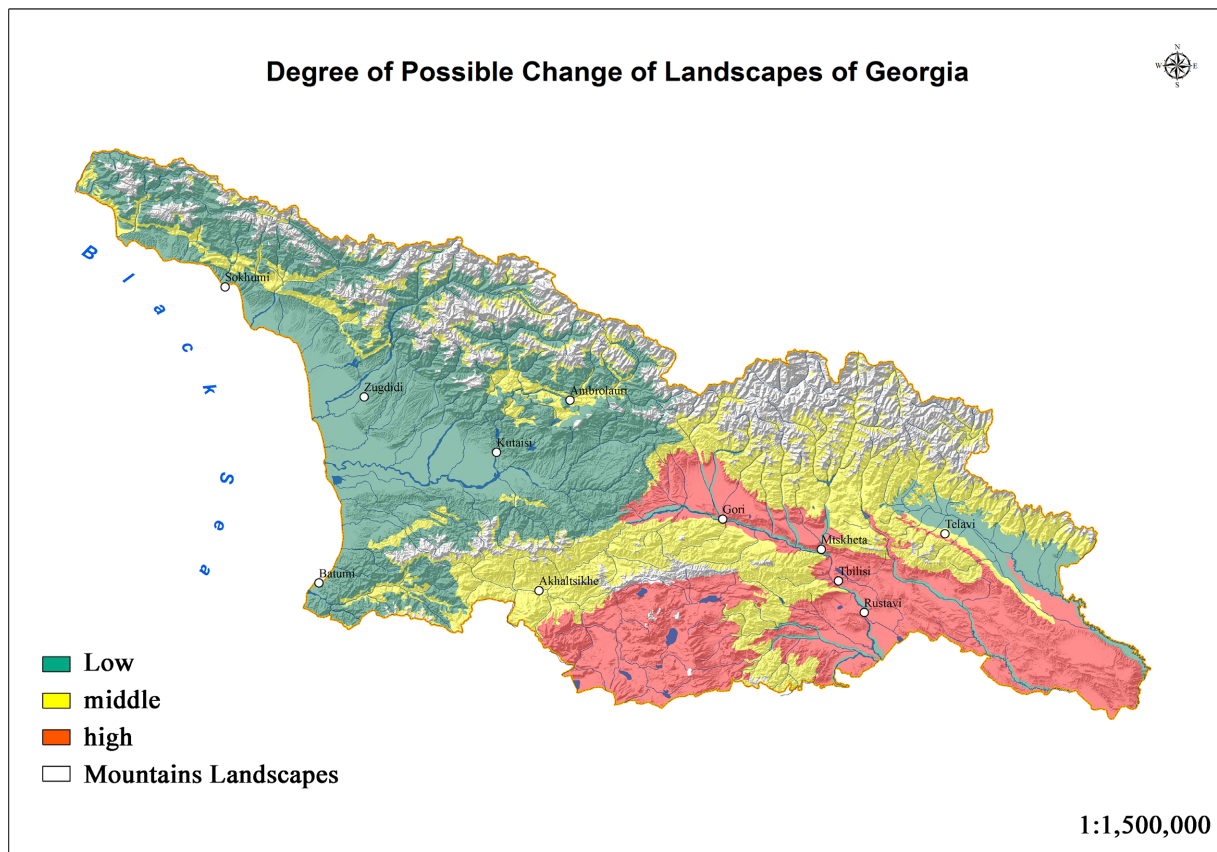
**Figure 5.** Mtskheta (Old Capital of Georgia)—Historical landscapes (N. Elizbarashvili, 2016).

## 6. Conclusions

Landscape management is a rapidly evolving scientific and practical field of study for geographers, spatial planning and management specialists, sociologists, urban planners, landscape architects, economists, and more. Its essence is primarily concerned with maintaining and ensuring the ecological sustainability of the environment. This refers to the development of spatial policies and the management of problems that arise locally, regionally, nationally or globally.

The ultimate goal of landscape management is the harmonious coexistence of the natural and social environment. Achieving such a goal is impossible without knowledge of the natural mechanisms that determine the geographical features of the structure and functions of the landscape. On the other hand, social processes and consciousness essentially determine the ecological state of the natural environment, which is why the study of socio-economic conditions and community behavior characteristic of a particular place is a necessary prerequisite for defining and effectively managing landscape functions.

Determining the structure and especially the functions of landscapes is important in the context of climate change [Figure 6]. Those landscapes of Georgia, which are distinguished by high resource production and elite function, are threatened with aridization in the next 30 years. Such a forecast is based not only on climate change trends, but also on changes in the structure of landscapes.



**Figure 6.** Possible transformation of landscapes of Georgia (N. Elizbarashvili, 2016).



Landscape adaptation and management against the background of climate change are an important scientific and practical challenge for both the state and the Georgian Geographical School.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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