

MOUNTAIN REGION DEVELOPMENT STRATEGY, PRINCIPLES OF ARCHITECTURAL-SPATIAL ORGANIZATION URBAN AREAS AND HOUSING

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ABSTRACT

In this working paper, the current situation in the mountainous villages of the eastern part of Georgia, as well as urban-social and economic development potential and others, is studied.

Mountainous villages need some fundamental functional planning and structural changes. It is noted that when deciding urban-social and architectural-planning questions, natural-climatic factors' complexes should be considered: Difficult relief, its shape, its inclination and articulation, its climate and landscape variability by the vertical zoning, etc.

In this work paper, we discuss the development problems of mountainous regions. Nowadays, there are severe problems in the mountainous villages: Lack of land, less competition, and technological backwardness of agricultural products. In winter, this area is almost empty of its difficult environmental conditions.

Foreign experiences have been studied to plan the mountain settlements and formation-development principles, which could be used for the destination of architectural planning development in the mountainous part of east Georgia. It has been determined that it's essential to form the mountainous regions as the general urban area to develop agriculture recreation and industry as well as agriculture recreation and tourism. According to the united urban planning development tendencies, development principles have been formed step by step in the mountainous inhabited regions in the eastern part of Georgia.

Keywords: Mountainous region of Georgia; Accommodation system; Planning and development; Types of planning structure; Transport infrastructure; Placement of residential development.

Introduction

In the advanced countries of Europe, great attention is paid to the territorial planning of mountainous regions. From the second half of the 20th century, in several countries, the main directions of state government activities in mountainous urban areas are defined by national plans for territorial development. A unique feature of the historical-geographical highlands of Georgia is the unity of their natural and anthropogenic landscapes, characteristic architecture, and specific culture. This time, we will review the highlands of Eastern Georgia. It has significant potential for urban and socio-economic development. This region should produce ecologically clean products, agrarian-recreational, tourism, and resort-recreational regions. The formation/development of settlement in the mountainous regions of Eastern Georgia will be strongly influenced by factors such as the prospective development of the transport network, the realization of which is expected to significantly increase domestic and foreign tourism, free repartition of passenger and cargo flows from the mountainous regions of Eastern Georgia to any part of the country, which will lead to its primary functional and structural changes and ultimately increase the living standards of the population, poverty alleviation, slowing down migration, social-economic and development of rural region.

The mountainous regions of Eastern Georgia, despite their significant natural and historical-cultural potential, need to be more involved in the country's socio-economic development. In terms of urban planning, this is manifested in the disruption of the unified structure of development, disorganization of transport and functional relations between individual mountainous areas, increase in demographic situation and the number of deserted villages, damage to critical historical-architectural complexes and monuments, with degradation of ecologically and aesthetically valuable landscape, etc. Nowadays, due to the need for a unified plan to regulate the current housing system in the mountainous areas, the areas look chaotic, with illegal land acquisition and construction of unapproved projects. All these lead to the destruction of the historically established architectural and natural complexes that have survived. The analysis of the architectural planning and spatial solutions of the mountain villages of Eastern Georgia shows that the planning solution of the first towers and castles of the historical settlements included defense and agricultural-household functions. The choice of a stand-alone tower fortress or settlement site largely corresponded to the rational use of defensive and surrounding natural conditions. The settlements of separate dwelling groups were mainly used in closed valleys with difficult access. In selecting the site, great importance was attached to the ability to drag the primary building material -

stone - to the location. Such settlements are mainly located on the slopes of the southern orientation. According to the architectural-planning organization and the network of streets, it is possible to distinguish the following types of settlements in the historical mountain villages: unsystematic - with unregulated development, scattered without any order; Linear - with development on one or both sides of the street; Quarter - perpendicular to each other with intersecting streets and perimeter settlements; Circular - in the radial direction of the streets towards the center of the settlement; Mixed - a combined combination of street network and residential groups.

According to modern requirements, the main shortcomings of the architectural planning organization of mountain villages are

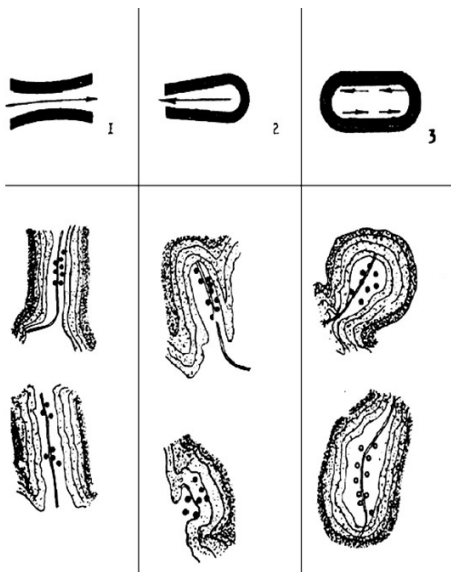
- neglect of the functional zoning of the area in accordance with the volume-spatial requirements;
- Low density of development, irrational use of homestead plots and adjacent, difficult areas to assimilate;
- The street network and roads need to be more consistent with the nature of movement on parts of complex relief.

It is necessary to develop a unified concept of urban planning-spatial development for mountainous areas, which will be based on modern achievements and centuries of experience. The concept should include a single set of factors and conditions that affect the formation of the entire settlement. As well as the aesthetic and scientific values of the preserved historic development and the ecological significance of the natural landscape. Herewith, it is scientifically proven that the planning of residential development on rugged terrain is greatly influenced by the nature of the terrain, which determines its location, the nature of the development, density and storeys, typology of buildings, paving of roads, streets, engineering networks, landscaping or terraces, etc. Accordingly, when planning the development of mountain rural settlements, special attention should be paid to the complexity of the terrain, which is determined by the size and segregation of the slope. Depending on the slope parameters, there are different classifications of the area, the most effective of which is to calculate the complexity of the terrain according to its angle of inclination.

The area's relief is classified as follows: 0.5 - 40% inclination - acceptable for development; 40-60% slope - limited use of area for development; And more than 60% inclination - not used for development. Therefore, according to the hypsometric classification, it is possible to distinguish three main types of microrelief in the

highlands of east microrelief. Despite the scarcity of residential and agricultural areas in the mountainous regions of eastern Georgia, considerable attention should be paid to the diversity of natural conditions. The natural terraces of the valleys have been used for the villages in the mountainous zone of Eastern Georgia since ancient times. In some places, the valleys are so broad that mountain meadows are formed. Medium-sized mountain villages were cultivated in such places in Pshav-Khevsureti and Tusheti (with 200-800 inhabitants in each village). Many small settlements are located on mountain slopes, in small side valleys, or on ridges frequently “crossed” by mountain plateaus, which, in principle, are the central area of rural settlements. Appendix figures (1; 2) show the types of rural development for challenging terrain.

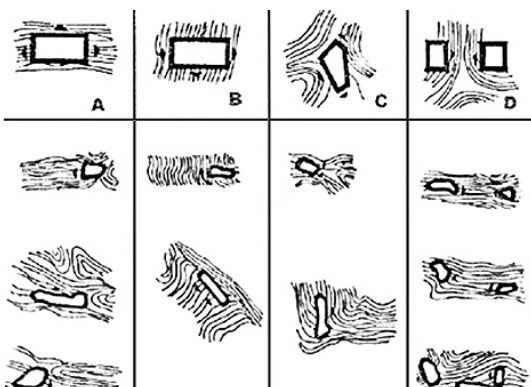
Figure 1



Rural Development in difficult terrain
Types of settlement in mountain villages:

- Unsystematic - with unregulated development
- Linear - with development on one or both sides of the street
- Quarter - with streets intersecting perpendicular to each other and with perimeter development
- Circular - the radial direction of the streets towards the center of the settlement
- Mixed - a combined combination of street networks and residential groups

Figure 2



- B - Transverse
- C - is locked by internal mountains
- D - segregated

In addition, the central reserve of the area here is the Tsinamta and Shuamta zones, which is why, in the future, the natural (locked) settlement of these places should make way for a scientifically based, renewed settlement system, as today, these villages are on the verge of devastation and emptiness and the area needs a new resettlement system and new life.

The main features of the settlement of villages in the mountainous regions of Eastern Georgia are unequal distribution of rural settlements, Population fluctuations in settlements over a wide range and peculiarities of the demographic process, The diversity of the functional structure of rural settlements, Large territorial distances from the labor areas of the population; Weak connection between settlements. The unequal distribution of rural settlements is caused by the spatial diversity of mountainous areas. The complex system of mountains, microclimatic conditions, road network conditions, etc., determine the settlement's nature. As a result of the influence of these and other factors, a significant difference is created between mountainous and lowland rural settlements, both in terms of structural, architectural planning, and spatial solutions, as well as in terms of population, which is more noticeable in the mountains today.

On the example of the Dusheti municipality of the Mtskheta-Mtianeti region, let us consider the stages of formation and perspective development of the mountain settlement system of Eastern Georgia, their structure, functional zoning, internal and external connections, etc. In the first stage, during the weak and low development of the transport-road network in the local settlement system of Mtskheta-Mtianeti, there is a complex hierarchical structure with chaotically scattered semi-empty rural settlements, wherein the first stage small subsystems of the local subsystems together with the center of the local system creates so-called "Bush" centers (In this case Pasanauri), whose economic and cultural impact extends to specific groups of the settlement. Based on these groups, an internal settlement system will emerge in which the center's role rests with the central settlement, in this case - the village of Mleta. (See Figure 3.)

On Figure 3. It is shown that *the first stage* is characterized by the transformation of mainly existing settlements and the formation of a supporting network of rural settlements. At this stage, agricultural production functions will be expanded, and residential settlements, tourism, and leisure facilities will be used temporarily and seasonally. The construction process of the main roads will start, and the distance between the agricultural areas and the general road network will be reduced. At the end of the given period, the restoration and improvement of the villages that form the leading network of settlements in the municipality will be completed.

Figure 3

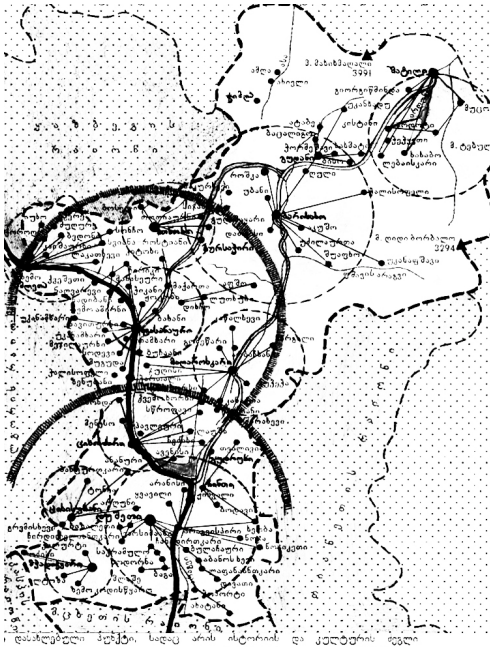


Figure 4.



In the second stage (see Figure 4.), improving the road-transport network and therestoration expansion of rural settlements will make the local settlement system relatively more straightforward. More rural settlements will be restored and enlarged and will become a structural-functional element of the unified settlement system; construction and improvement of critical rural settlements will be carried out functionally and structurally, including the network of auxiliary settlements adjacent to the bases.

The third stage envisages shifting the development focus to creating and completing a resettlement system, focusing on the architectural-spatial and functional restoration of the villages included in this area. Creating a transport-engineering network will help establish a unified accommodation system and improve external and internal connections. (See Figure 5; 5'). The above-mentioned spatial-urban solutions will help to create a clear and concise local settlement system, the elements of which are the center of the local system (Dusheti Municipality Center, borough Dusheti), Local subsystem center (village Pasaauri), So-called element of a well-equipped accommodation system with a high level of cultural and household services (village Mleta);

In the third stage of the transformation of the internal system of the village Mleta settlement - it is possible to create an agrarian-industrial union within the unified

Figure 5

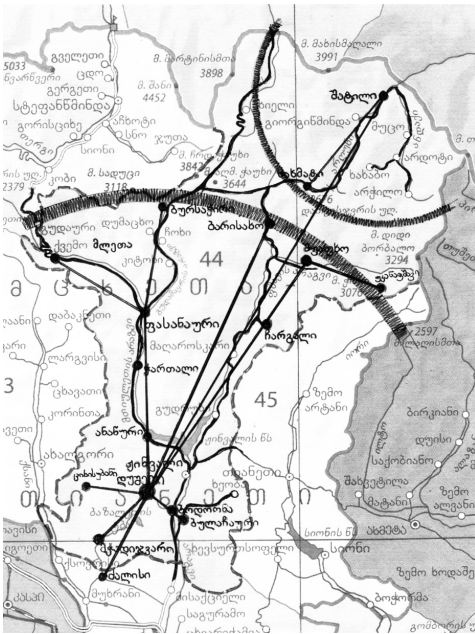
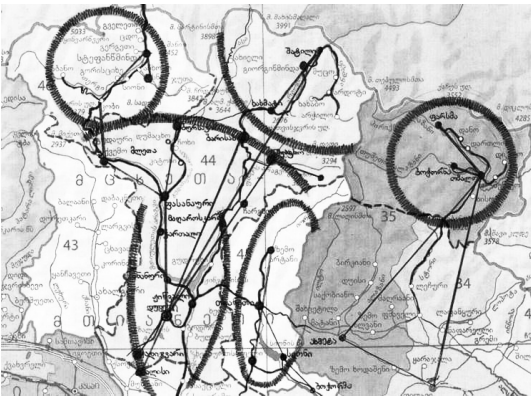


Figure 5'



group system of settlement, to form a new architectural-planning structure of the village, to form architectural ensembles for development and landscape. It is improving the level of service, overhauling and arranging housing stock, and creating developed inter-rural connections.

It is necessary to mark the area for the rehabilitation-development of the rural settlement area simultaneously and the regional planning Figure for both the residential and the agricultural zones.

When relocating separate functional zones in mountainous conditions, specific urban planning requirements should be considered: rational use of land, optimization of external and internal functional connections, Preservation of the existing landscape, solution of architectural-artistic issues of the development, etc.

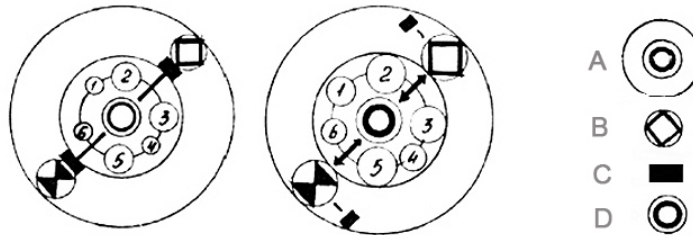
For the functional organization of villages on rugged terrain, the following should be considered:

- complex placement of separate functional zones
- Compliance with the norms of sanitary and other special requirements
- Rational organization of pedestrian and transport links between rural populated areas and workplaces

Convenient connection mainly with transport roads; Possible expansion of existing territorial zones, maintaining their compact structure as a whole.

Structural-functional principle schemes for different types of villages in the mountainous region are given in Figures 6 and 7, where the principle schemes of structural-functional elements of agrarian-industrial and industrial-agrarian mountain villages of Georgia are given. The Figure divides the rural area into residential and agricultural enterprises, tourism development, community centers, and agricultural land zones.

Figure 6

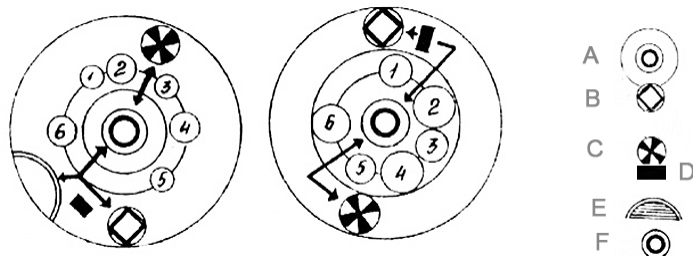


1. Preschool education;
2. - Cultural-Household services;
3. - Rest area;
4. - Healthcare;
5. - Trade objects;
6. - Educational

- A - Residential zone
- B - Agricultural zone
- C - Warehouseing zone
- D - Community center

Principal figures of structural-functional elements of agrarian-industrial and industrial-agrarian mountain villages of Georgia

Figure 7



1. Preschool education;
2. - Cultural household services
3. - Educational;
4. - Rest;
5. - Trade objects;
6. - Healthcare

- A - Residential area
- B - Agricultural area
- C - Resort area
- D - Warehousing zone
- E - Agricultural lands
- F - Community center

Principal figures of structural-functional elements of agrarian-industrial and industrial-agrarian mountain villages of Georgia

The constituent functions of the rural public household zone are education, health, trade, cultural household, administration, etc. The distribution of individual functional zones in populated areas is influenced by the following main factors: site landscape and microclimate, as well as rural profile and size. However, the impact of landscape on functional zoning is, in turn, due to the complexity of the terrain. A differentiated approach is necessary when placing a separate functional zone in the village.

The following principles and solutions should be observed when planning rural development and its separate zones: For the residential zone, it is advisable to allocate plots on a southern or south-eastern slope with a comfortable microclimate. In this case, preference is given to the middle and upper part of the mountain slope with a one-sided slope. Placement on top of open elevations in a residential area increases airflow velocities and is recommended for areas with low wind speeds. In addition, the construction should not create resistance to air movement in inverted mountainous areas. For the highland villages of Tianeti, Kazbegi, and Dusheti municipalities, which are characterized by high wind speeds, it is necessary to place the dwelling on the middle and lower points of the mountain slopes parallel to the wind direction, where the wind speed will be lower. The location of the rural community center zone is mainly due to the pedestrian and transport access and the architectural-spatial connection with the development and the landscape. It is advisable to place the community center and trade-household facilities along the middle and low points of the mountain slope along the transport communications.

The area to be selected for the expansion or construction of a new settlement or existing site should include:

- The area required for all types of construction, taking into account its prospective development;
- Sloping terrain does not require significant earthworks during the construction of buildings and roads.
- Ground, which allows the construction of the building not to use expensive materials for the foundation;
- Soil for green cover diversity.

The presence and frequency of forest areas are of great importance for selecting the area for the separate functional zones. Therefore, to maintain them in the mountainous region, it is necessary to differentiate the forest according to its composition and quality. Moreover, according to the level of deforestation, it is possible to distinguish dense and dense forest massifs, forests with mountain

meadows, and partly forested areas. It is necessary to consider the protection and inviolability of natural landscapes containing state reserves, protected areas, and national parks in the mountainous regions of Eastern Georgia. Critical functional zones for mountain rural settlements (housing, center, green plants, tourist zone, transport, and industrial, agricultural zone) should be located in the areas defined by the established norms, each with different opportunities for future expansion. In urban planning practice, out of all existing schemes of mountain villages, three main village planning structures are used to develop Tsinamta and mountainous districts: compact - 50%; Linear - 35%; Segregated - 15%.

It should be noted that the types of planning structure mentioned above and their separate functional zones are unique and once and for all established. They can change faces by merging. Examining rural settlements on rugged terrain and foreign examples of developed villages revealed that in the mountainous villages of Europe, the task of perfecting settlement for agricultural purposes was accomplished by strengthening the new rural functions defined by the economic and social development plans. In the mountainous villages, a unified agricultural and other process-related population (sheep, beekeeping, poultry, tourism, and related infrastructure) seeks to consolidate labor-intensive areas, thus facing essential social and economic preconditions for individual rural settlements to unite into a single complex. In addition to socio-economic factors, the rural population's socio-living conditions greatly influence the development of mountainous settlements in Eastern Georgia. The selection of planning and development types for rural settlements and the composition and size of the volume-planning structure or storerooms are determined by the workload of the private subsidiary farming population. Therefore, the rehabilitation of individual farms should be carried out consistently based on public development and the capabilities of the state.

In addition, the basis for improving the socio-economic situation in mountainous rural settlements is the creation of new farms, developing new energy raw materials and resort resources, and expanding its own food base. All these necessitate filling small autonomous settlements with multi functional settlements and sub-regional centers in accordance with the establishment of local systems in which new farming centers are added to the renovated villages. As we have already mentioned, an example of the rational use of difficult terrain in the mountains of Eastern Georgia is the projects implemented during the Soviet period in the villages of Barisakho, Basiso, Gudani, and others. The architectural planning solution for these villages, the types of houses, and their layout on the terrain was the first attempt to restore and renovate the villages in the mountains. However, in this case, the issues of

complex solutions of even specific mountain areas should have been considered, including road infrastructure, agricultural development, etc. Thus, when evaluating various examples of functional zoning of rural areas of the mountainous regions of Eastern Georgia, the main criterion should be the combination of optimal and convenient external and internal functional connections. The rational solution of the organization of external functional connections is determined by the continuous connection between the rural settlements and their connection with the municipal center. Organization of local roads and their connection with the regional destination road and domestic and regional transport with external vehicles. Vehicles are essential for the intra-regional transportation services of tourists and vacationers in the tourist and resort areas of the mountainous region.

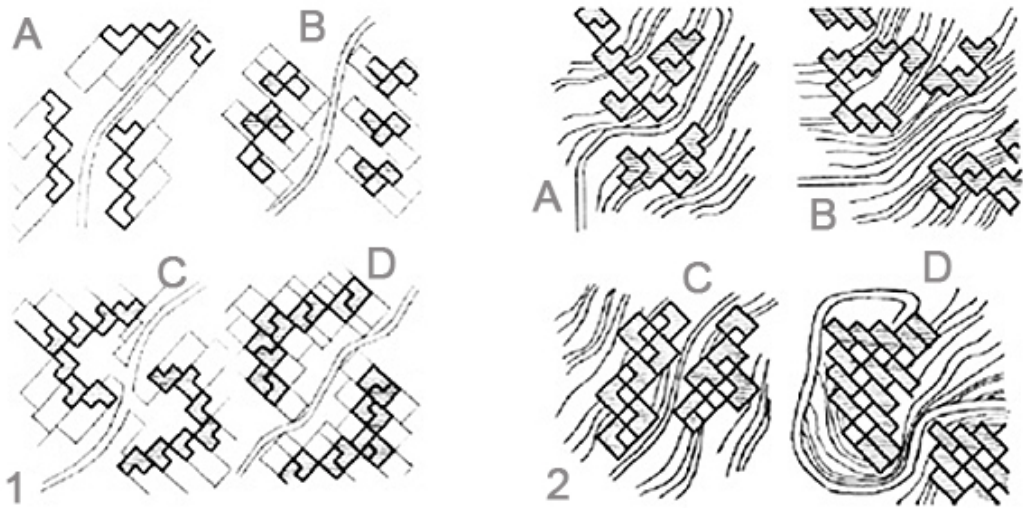
Foreign practice and author studies have substantiated the advantages of a compact planning structure that organizes the shortest functional connections in a rural settlement, the rational use of land, forest vegetation, etc. Provides maximum protection.

Based on the analysis, we can conclude that the following urban planning requirements are defined for the rational organization of the architectural-planning structure of mountain village settlements in Eastern Georgia: - Expansion of internal rural transport networks and its inclusion in the regional transport network; - Restoration of settlements (villages) in a small area, gradual development, determination of their functional load and connection with municipal centers; - Increasing the density of new settlements, in-depth exploration of mountain slopes, organizing transverse and longitudinal functional connections with respect to mountain slopes; - Maximum compactness of the residential development and the adjacent public zone; - Protection of the plant during heavy snowfall, avalanches and landslides by architectural-planning and engineering-construction means; - Maximum conservation of landscape and forest massifs; - Strengthening and developing functional zones, including agricultural and tourist-recreational zones.

Thus, by identifying and analyzing the factors influencing the structure of settlements and the formation of the settlement system in the villages of the mountainous region of Eastern Georgia, it is possible to develop proposals for the territorial zoning of the mountainous regions of Eastern Georgia according to the value of the landscape.

As a result of the conducted studies, the basic principles of rural development for the mountainous regions of Eastern Georgia and the options of the corresponding planning schemes for different natural-climatic conditions have been developed (See Figure 8).

Figure 8



1. AB - Hot and humid areas
 CD - Moderately humid areas

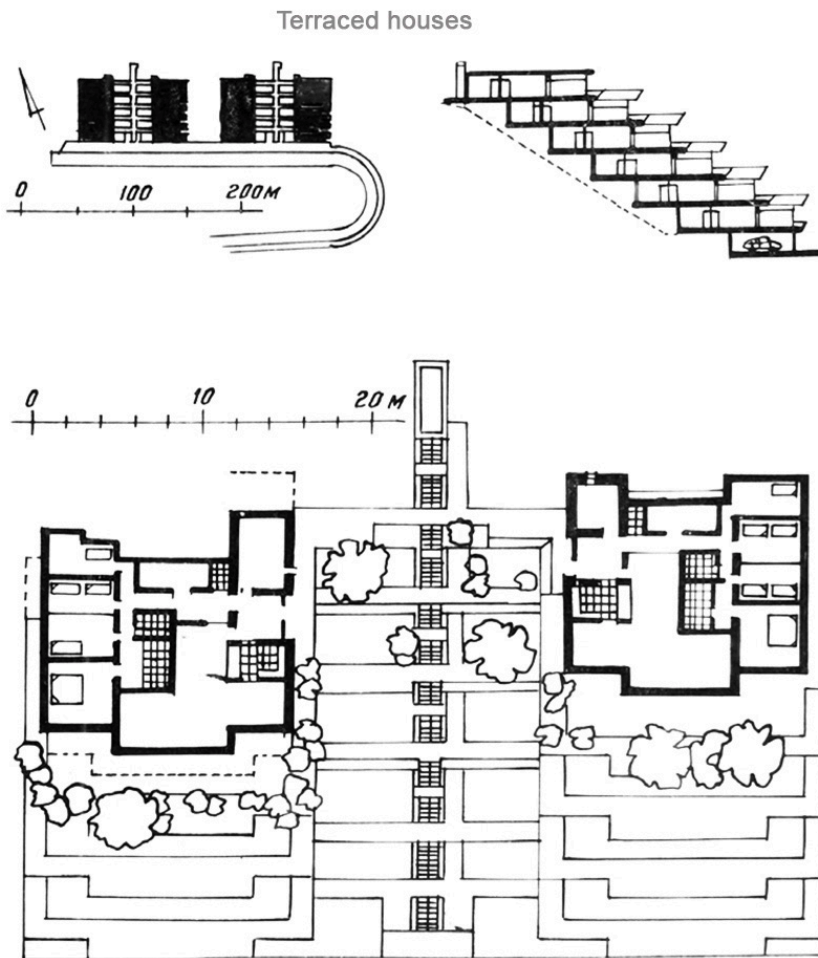
2. AB - Warm, rainy areas
 CD - Moderately rainy areas

In accordance with these principles, in the first stage of design, it is necessary to study in detail the natural characteristics of the project area and to identify the characteristic sections and elements of the micro-landscape, which should be focused on in the architectural planning and spatial solution of the residential structure. A housing group may include one or more types of dwellings. Depending on the natural-climatic conditions, it can be formed as a closed, semi-closed, or open space or a system of interconnected spaces (if appropriate natural conditions exist). Locked groups are recommended for cold mountain climatic regions. In mountain villages, it is necessary to provide maximum insolation of housing and placement of housing on the slopes of the southern or south-eastern orientation.

Modern practices and traditional experience in the design and planning of mountainous areas show that constructing a separate slope or valley with an expressive shape is advisable to gradually load the volumes of the upper part of the development. One or more volumes can be distinguished as a leading spatial element. In this case, the total background volume determines its scale and composition. In this case, the total background volume determines its scale and composition. The following residential houses can be used to create compact residential development in mountain villages: two-four-section, one/two-storey blocked and one-storey individual houses. Terrace houses have traditionally been

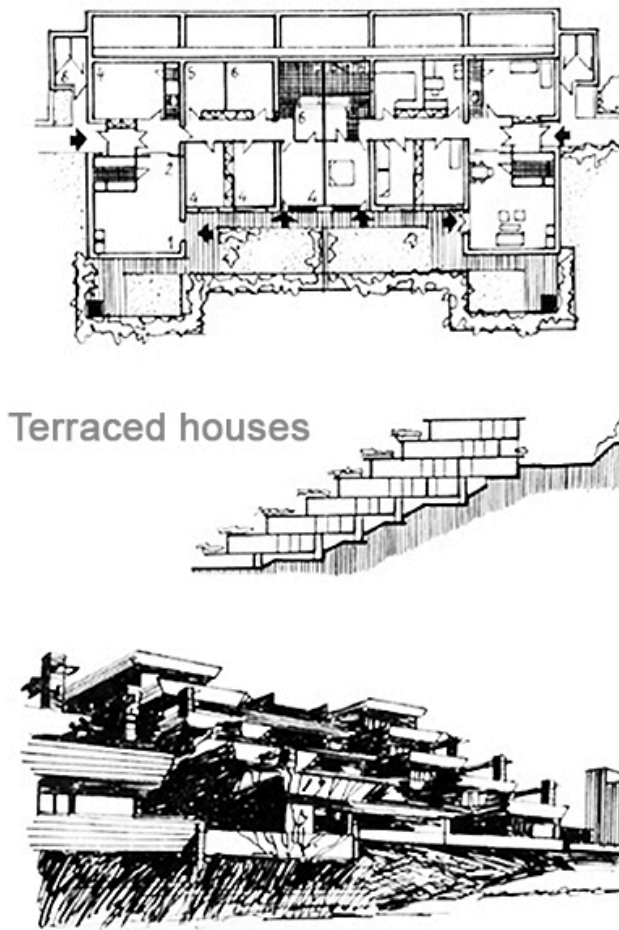
formed in the high mountain villages of Eastern Georgia due to natural-climatic and socio-economic factors. This type of housing has become more or less common in Pshav-Khevsureti. Terrace development in difficult mountain climates allows terraces to be used for agricultural purposes, thereby improving the architectural-artistic appearance of mountain slope development and insolation and ventilation of the interior storerooms of the dwelling. (See Appendix, Figures 9, 10,) where an example of terraced development on difficult terrain is given. The design and planning of this type of house in modern conditions acquire a new function and form of architectural-planning solution. The modern type of terrace dwelling house is one of the varieties of stepped houses. It can be considered, on the one hand, as a series of one-storey houses, on the other hand - as a multi-storey house, the floors of which, due to the slope, are separated from each other in the horizontal.

Figure 9



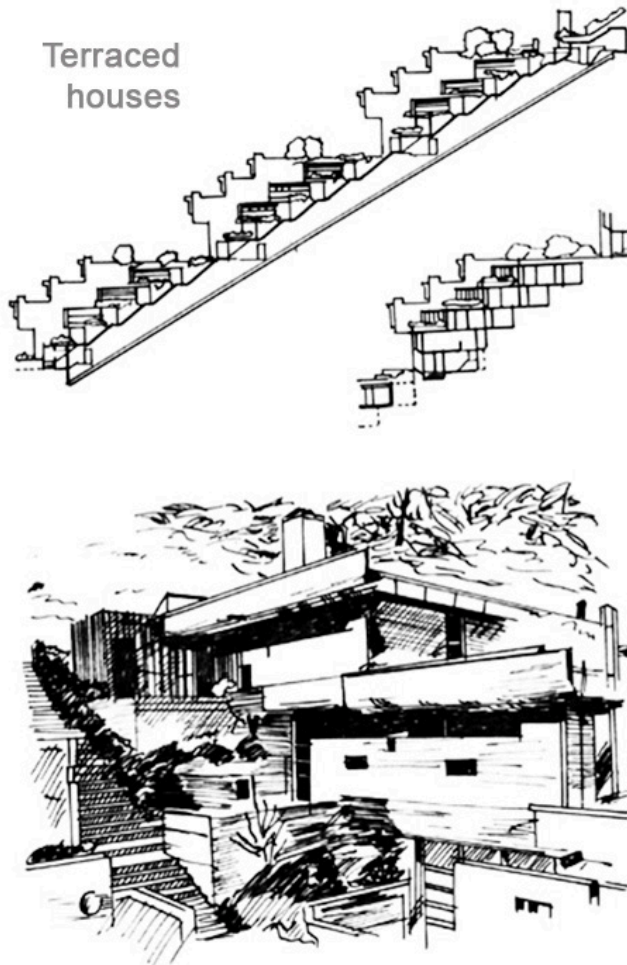
Terraced houses can be built on areas with a 20% to 60% slope. In addition, sloping flats of almost all regional orientations can be built with single-section sections. The construction of terraced houses in mountain villages will include fundamentally new planning methods. Although in the 70s and 80s, we were working on the widespread introduction of this type of development in mountain villages, it was carried out only in the village of Gudani. It is advisable to build stepped and cascading houses on slopes with 40% to 50% slope in mountain villages. This type of house is characterized by high mainstays, which will protect the building from ground moisture and sudden floods.

Figure 10



Its introduction is also advisable to avoid the additional costs required for the construction of the plinth floor, as well as, in this case, the volume of earthworks to be minimized— Figure 11. (See Appendix).

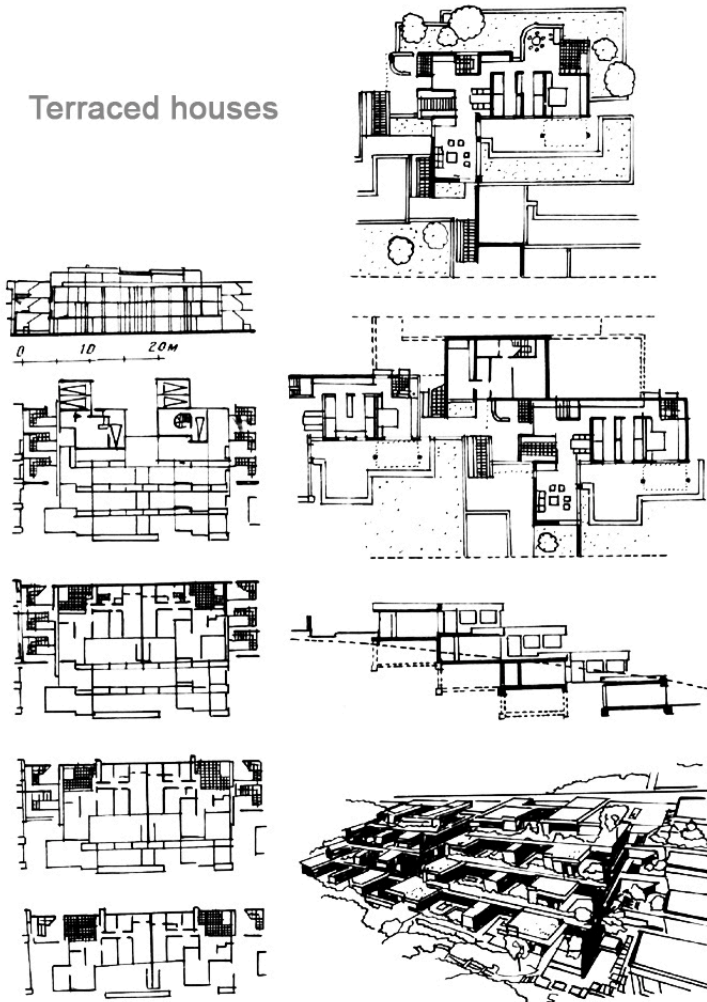
Figure 11



The solution option for the facades of blocked houses for difficult terrain is given. Suppose the primary type of rural housing in the Tsinamta hypsometric zone of Eastern Georgia is a single-family house with a homestead in the middle and high mountain zones. In that case, it is advisable to block two four-apartment dwellings, which can be blocked to the horizon at an angle and along it or transversely. This allows the creation of housing groups of different configurations and settings to facilitate the housing placement (see Appendix, Figure 12; 13). When developing mountain villages, local traditions and centuries-old living arrangements should be considered when choosing the type of house.

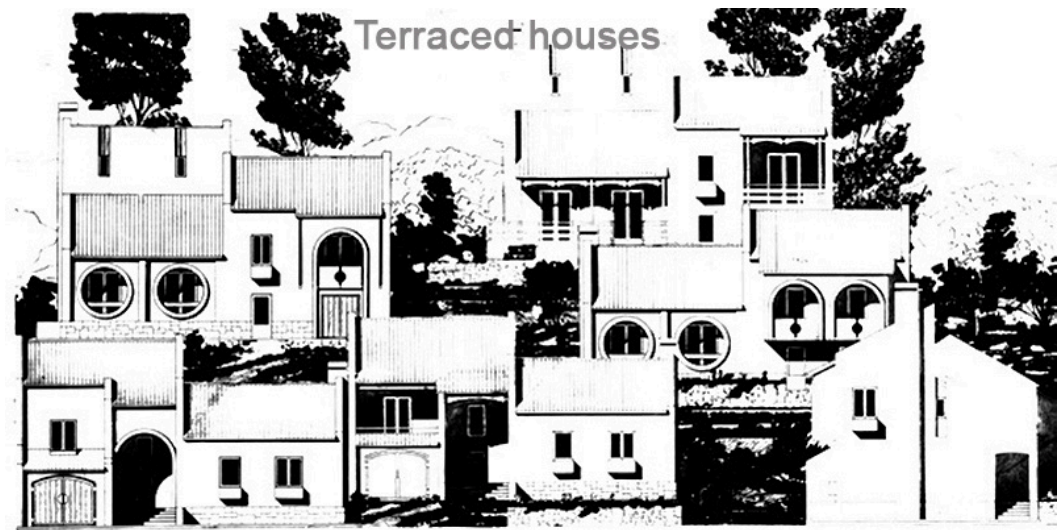
Figure 12

Terraced houses



Rural housing is a complex of houses and farms conveniently connected to the homestead plot, ensuring every family has a subsidiary farm. Such housing is convenient if one family uses the plot and the house does not exceed two floors. The family homestead should be considered as the main primary element of rural development, to which are added the agricultural buildings located on the common-use plots according to the local conditions. Regardless of its type, a mountain village house should be distinguished by a developed structure - it should have developed residential and agricultural zones, communication, and summer storage. Unfortunately, the Mountainous Housing Fund of Eastern Georgia does not fully meet this requirement. As mentioned above, for the planned development and sustainable functioning of Pshav-Khevsureti and Tusheti, it is necessary to rationally use both traditional fields - livestock agriculture as well as tourism

Figure 13



recreational potential, which is because today the number of people wishing to visit the villages of Pshav-Khevsureti and Tusheti is large enough. Rural housing is a complex of houses and farms conveniently connected to the homestead plot, ensuring every family has a subsidiary farm. Such housing is convenient if one family uses the plot and the house does not exceed two floors. The family homestead should be considered as the main primary element of rural development, to which are added the agricultural buildings located on the common-use plots according to the local conditions. Regardless of its type, a mountain village house should be distinguished by a developed structure - it should have developed residential and agricultural zones, communication, and summer storage. Unfortunately, the Mountainous Housing Fund of Eastern Georgia does not fully meet this requirement. As mentioned above, for the planned development and sustainable functioning of Pshav-Khevsureti and Tusheti, it is necessary to rationally use both traditional fields - livestock agriculture as well as tourism-recreational potential, which is because today the number of people wishing to visit the villages of Pshav-Khevsureti and Tusheti is large enough. In the future, in terms of recreation, to improve the socio-economic situation in Pshav-Khevsureti and Tusheti and to integrate it into the tourism infrastructure of the country, in addition to creating adequate living conditions and economic activities for the region's permanent residents, tourists, and other visitors are needed. This can be done by considering these requirements and, on the other hand, adapting part of the existing housing stock to family hotels. In the current physical condition of the housing stock in Pshav-Khevsureti and Tusheti, selecting objects of interest for adaptation after the

restoration and renovation makes it possible to produce perfect agricultural and tourist services.

Conclusion

Thus, the urban-social and architectural spatial development of the mountains of Eastern Georgia should be based on a complex spatial-territorial master plan, the most essential of which is the network of modern transport communications, which will connect functionally established local areas. The result will be interconnected accommodation systems with their centers and sub-centers. A unified principle figure for the implementation of urban-social and architectural-plan-based resettlement of population-transport, communication, agricultural, and service systems in stages has been presented, which envisages

- mainly transformation of existing settlements and formation of rural settlements;
- Improving the road transport network and enlarging rural settlements;
- Expansion of less functional settlements, the establishment of priority accommodation centers, the development of villages, and further development of the formation of internal and external transport and engineering infrastructure.

In order to create compact residential development in the mountain villages of Eastern Georgia, various types of residential houses were presented, and recommendations for the construction of residential houses - the use of fundamentally new planning methods in the development.

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