

LANDSCAPE AND SETTLEMENT DIVERSITY IN THE HIGH HIMALAYAN REGION A CASE STUDY OF HAR KI DUN

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DOI: 10.5958/2249-7315.2022.00002.8

ABSTRACT

The high mountain settlements are often described by the diversity of their geographical spaces. This diversity is defined by differences in land use. In fact, the landscape shapes the land use and it gets shaped by the land use. The rural communities adopt a diversity of livelihood strategies and adapt the land use according to the diversity of the landscape. Therefore, every village has a diversity of landscapes with a diverse mosaic of land use. The multi functionality of the landscape adds to the sustainability of mountain settlements. These landscapes are shaped to enhance economic possibilities or opportunities. The economic possibilities or opportunities of the mountain settlements are further enhanced by the spatial organization of settlements at different landscapes. Landscape diversity influences livelihood diversification and diversity of crop production and animal husbandry. It enhances the economic viability and sustainability of the mountain communities and also the settlements. This research presents the spatial and functional diversity of the high mountain settlements. This research also presents the relationship between landscape diversity, adaptability, in the form of land use diversity and consequent sustainability of mountain settlements. To present the relationship between spatial and functional diversity of mountain settlements it makes an intensive study of the mountain settlements of Har ki Dun (Uttarakhand Himalayas).

KEYWORDS: *Landscape Diversity, Spatial Diversity, Settlements, Sustainability, Har Ki Dun,*

1. INTRODUCTION

Landscape is the shape of the land and its landforms (it is the sum of attributes of land). Landscapes can be viewed as spatially heterogeneous areas [1]. Geographers and landscape ecologists have different views on landscape and its diversity. It is often described as the diversity of geographical spaces and their environment. This diversity is also defined by differences in land use [2]. Landscape shapes the land use and land use reshapes the landscape. Thus, land use creates diverse landscapes of outstanding aesthetic, economic and ecological value [3]. Settlement and its diversity represent these all. Mountains have more heterogeneous spaces or places than others. Mountain settlements have both spatial and functional diversity. It brings in diversity in the social, cultural and economic characteristics of mountain communities. The spatial and functional integration of places or spaces is the foundation of mountain existence. These spatially diverse settlements are functionally integrated. The spatial integration of settlements and their functional diversity brings sustainability to the mountain settlements.

This research identifies landscape and settlement diversity in the high Himalayan region. It presents the relationship between spatial and functional diversity of mountain settlements based on the intensive study of the mountain settlements of Har ki Dun. With a descriptive-analytical approach, this study evaluates the role of settlement diversity in the sustainability of mountain

communities.

Characteristics Of Mountain Settlements

Natural Adaptability; the location and distribution of mountain settlements have obvious geographical adaptability. Adaptation to nature (the terrain and natural environment) and adjustment to the natural conditions are basic characteristics of high mountain settlements. These settlements are closely and directly related to the constraints and possibilities or opportunities of the mountainous environment.

Scattered or Dispersed Distribution; landscape diversity has an effect on the spatial distribution of settlements. Mountain settlements (rural settlements) have a more scattered distribution. Besides, the high mountain settlements have a fragmented development due to landscape diversity. A few settlements even have scattered and isolated (independent) existence.

Diversity; the fragmented topography, high elevation and steep slope have a significant influence on the spatial distribution of the high mountain settlements. The landscape diversity creates spatial and also functional diversity in the settlements. In fact, the location and distribution of settlements conform to the landscape features of the area. On the other hand, the function of the settlement depends on its location and distribution. It all leads to the diversity of settlements.

Sustainability; the existence and survival of mountain communities were made possible through the use of the diversity of settlement and production spaces. Increased production through the photosynthetic route helps these settlements to overcome resource scarcity and enhance sustainability.

2. LITERATURE SURVEY

Landscape diversity includes both biodiversity and geodiversity. It also includes cultural diversity and economic diversity. The landscape diversity creates diverse conditions of human existence and settlement diversity. Although, an encyclopedic range of knowledge is available about landscape diversity but research dealing with landscape and settlement diversity is rare. The mountain landscape has biodiversity, biocultural diversity as well as the diversity of landscape resources. These landscape diversities create land use diversity. Many scholars have discussed the different aspects of landscape diversity and economic diversity [4]. Monica Ribeiro Palacios and others have worked extensively on landscape diversity of tropical mountains. They have presented a detailed description of the emerging land use mosaics in rural landscapes with livelihood diversification [5].

Mountains have had a central role in subsistence agriculture. The sustainability of mountain agriculture is the product of the landscape diversity of mountains. Christophe K. Koffi and others have described the landscape diversity and associated coping strategies such as landscape organization. It helps (the mountain dwellers) to address the risk of food shortages and food insecurity [6].

But there is an evident dearth of research on the landscape and settlement diversity of the high Himalayan region. This is an endeavour to fill the existing gap of information about the landscape and settlement diversity in the high mountainous region of the Indian Himalayas. This research also evaluates the significance of this diversity for the sustainability of these settlements.

3. OBJECTIVE OF THE STUDY

Mountains have landscape as well as biocultural diversity. It translates into the spatial and functional diversity of mountain settlements. It brings in diversity in the social, cultural and economic characteristics of mountain communities. The objective of this research is to present the spatial and functional diversity of the high mountain settlements. Mountain settlements have a long history of existence. The existence and survival of mountain settlements, since centuries, prove the sustainability of these settlements. The sustainability of the mountain settlements is created and maintained by the traditional methods of adaptation of mountain communities.

Another objective of this research is to evaluate the relationship between landscape diversity, adaptability, in the form of land use diversity and consequent sustainability of mountain settlements.

4. METHODOLOGY

The study of settlements has always been a major subject of geographical research. The distribution of settlements provides information on the factors and forces which shape them. It has been a recurrent theme in settlement geography [7]. This research identifies landscape and settlement diversity in the high Himalayan region. These settlements are not only spatially diverse but also functionally distinct. This research presents an account of the spatial and functional diversity of mountain settlements in the Har ki Dun region.

It is descriptive-analytical research. It maps and outlines all spatial and functional interrelations between places and spaces. The evidence-based mapping of spatial and functional diversity of settlements helps to understand the traditional methods of space organization. This research further makes a study of the relationship between landscape diversity and the spatial and functional diversity of mountain settlements. In this fashion, it evaluates the impact of this diversity on the sustainability of mountain settlements. It helps to understand the aspects of sustainability of mountain communities.

Source of Information

This research has used different sources of information. It includes data from topographical maps, field investigation reports and satellite imageries. It has also used information from ethnographical and historical sources.

The Study Area

The study area for this research constitutes the valley of Har ki Dun. It is located in the western part of the Garhwal Himalayas. Geographically this area is situated in the valley of the Rupin and Supin rivers (the upper catchment of the Tons River). To be precise it lies between 31°02' - 31°20' N latitude and 77°55' - 78°40' E longitude [8].

Salient Characteristics of the Study Area

The Land and the Landscape; the valley of Har ki Dun has a unique landscape. The land and the landscape represent geographical (topographical and climatic) extremes. The altitude ranges from 1300 to 6300 mts over a distance of just 100 kms. The climate of the region ranges from subtropical to alpine. The landscape has glaciers, alpine forests and meadows, Mountain Rivers and narrow valleys.

Har ki Dun is an intermountain valley. The land is entirely composed of a succession of hills and mountains. The topography of the region is rugged and highly dissected. A large part of the area remains covered under snow, throughout the year. Usual to the nature of high mountains, it gets long and cold winter and a short growing season. The cold mountain climate alternates with summer dryness and torrential monsoon rain.

The landscape of Har ki Dun has both geodiversity and biodiversity. It also has cultural diversity. Nature and culture are specifically linked, mutually effective and interdependent. Thus, the natural diversity creates cultural diversity of the land and it is equally reflected in different patterns of the coexistence of man and nature.

Social and Cultural Milieu; it is a sparsely populated region with few dispersed human settlements. These scattered settlements are located in the mountain valleys or on uplands with lesser slopes. The inhabited territory of the valleys extends up to the orographic limits of settled life. These areas are often occupied by isolated communities. Rurality is the way of life in mountains. The valley has a challenging environment for human existence and survival. The life and livelihood of the people (who live in this region) depend on agricultural, agro pastoral or pastoral activities [9]. Subsistence farming is both culture and economy of these marginal communities. Pahari or the

mountain communities get just enough (or with a minimum surplus) for their survival from traditional mountain agriculture. Being located in an encapsulated mountainous region, the mountain communities, almost totally, rely on their own resources. The difficult terrain and extreme climate often mean poor communication and poor infrastructure. Marginality and remoteness are inherent to these mountain settlements.

Determinants of the Location and Distribution of Mountain Settlements

The development and spatial distribution of mountain settlements are influenced by many combined factors. The natural factors create the foundation of the evolution (formation) of these settlements, while the human or social factors drive the development and growth of these settlements.

Natural Determinants; in mountainous areas, the location and the nature of its geography, mainly, topography, is a major determinant of the location and spatial distribution of settlements. It also plays a major role in the shape (forms) of settlements. Settlements are built according to the topography of the region. In these areas, only limited areas provide suitable conditions for the establishment of settlements. The effect of the rugged terrain and steepness of slope also has a significant effect on the location and spatial distribution of settlements. The water resources and availability of fertile agricultural land define the nature of centres of population. The settlement does not usually occur in locations where these conditions are not favourable for human existence and survival.

Social and Cultural Determinants; the location and distribution of settlements are also the outcome of social, cultural and economic factors. The determinants of the location and distribution of settlement are numerous and it includes remoteness of settlement (conditions of accessibility and inaccessibility) and the economy (economic functionality) of the settlement. The history of the region is another determinant of the location and distribution of settlements. The valley of Har ki Dun has a long history of human existence.

Dispersed Mountain Settlements

Har ki dun has a concentration of a small and widely dispersed population. It is because of its landscape (natural conditions including its geographical location). This landscape is dominated and sustained by scattered, isolated dwellings and farmsteads. Often such settlements are called scattered or dispersed settlements (the two terms 'scattered settlement' and 'dispersed settlement' are often used interchangeably and both the terms are used as synonyms).

The dispersed settlement represents a specific type of settlement [9] that is found in certain sub-mountain or mountain areas. It is also a characteristic of the areas drained with innumerable streams. Many geographers believe that the landscape with a dispersed settlement is internally diversified in terms of the nature of the land cover and landscape diversity [10]. In fact, the dispersed settlement is an expression of rugged and undulating topography whereupon the land use is segregated in varieties that lead to the dispersed settlement [11]. Therefore, dispersed settlements are one of the common features of mountainous landscapes. Naturally, these scattered or dispersed settlements are not peculiar to only Har ki Dun.

Dispersed settlements are shaped by the arrangement of the land, depending on distinct land cover characteristics [12]. The conditions of the natural environment; natural topography, the steepness of mountain slopes, harsh climate condition, limited or restricted availability of soil and water resources, scarcity or deficiency of agricultural lands and spread of forests contribute to this situation in a mountainous land.

The landscape of a dispersed settlement is a reflection of the human adaptation with nature as well as the cultural and social changes of our society. In mountainous areas, the productive activities of mankind (agricultural and animal husbandry) are closely related to the unique natural conditions of the landscape. The diversity of agropastoral activities creates the scattered nature of settlements. It also affects the social and economic development of these mountain settlements. It even defines

the future of these settlements.

The scattered or dispersed location of settlements is also a product of landscape scarcity. As there is nothing close to a natural abundance; basically, the distribution of sufficient land resources with a reasonable potential of production. The scattered nature of the land resource (soil with adequate fertility) favours the establishment of small and scattered settlements. The oversimplification of this spatial reality of mountainous landscapes is that the settlements are dispersed widely through the landscape. This dispersal of settlements facilitates the use (exploitation) of scarce natural resources.

The basic function of the dispersed settlements is to allow the cultivation of land and general agricultural production in remote mountainous regions. Due to the diversity of landscape, Har ki dun has agricultural settlements, agropastoral settlements and pastoral settlements and a combination of all these. The diversity of settlements is enhanced by a variety of permanent and temporary (seasonal) settlements.

The landscape ecology defines the spatial characteristics of production (life and livelihood). The suitability of landscape (for agro pastoral activities) leads to the development of settlements. The resource availability (not only soil but also pasture) defines the suitability of an area for settlement. Settlements get limited and are widely dispersed over a large area due to the diversity of landscape and scarcity of natural resources. This spatial diversity of the suitability of land has an impact on the spatial distribution of settlements. Settlements are concentrated in areas with (most) suitability for existence and survival. Otherwise, settlements get dispersed. Many settlements even get isolated and fragmented due to the fragmentation of the landscape.

Dispersed settlements are characterized by the population concentration in small communities. It is due to the low carrying capacity of mountain settlements. The settlements in the high Himalayan region have both small populations and scattered locations. Har in Har ki Dun also, the settlements are dispersed, remote and isolated. Massari and Sewa are the last (most isolated) villages of Har ki Dun. These are also the last villages of Uttarakhand. In this part of Uttarakhand, there are few scattered settlements with large uninhabited areas due to the inhospitality of the land and harsh climatic conditions.

Dispersed settlements are also described as areas of dispersed land use. The dispersed land use is also a characteristic of the mountainous region. A typical mountain settlement consists of several dwellings lying on different terraces. The dispersed settlement in its surroundings contains dispersed houses and terraced agricultural fields with a mosaic of pastures (grassland) and orchards. In a typical high-altitude settlement, houses are surrounded by arable land. These houses are isolated from each other. It is a 'normal' feature of mountain settlements. The dispersed settlement also came into existence as a result of the vertical expansion of settlements (dwellings). The expansion of land use in a mosaic of orchards, pastures (meadows) and forests lead to dispersed settlements. The verticality of settlement is both cause and consequence of dispersal of settlements. The word dispersal from the verb 'disperse' means action or process of distributing or spreading things or people over a wide area.

Spatial and Functional Analysis of Settlements of Har ki Dun

Mountains present diversity of landscape, diversity of ecology and diversity of physical environment. On the other hand, mountain settlements present a diversity of man-nature interaction and diversity of land use. Mountain settlements also present diversity of size, shape and configuration. Mountain settlements even present diversity in the density of settlement. These settlements are the sites of agriculture (farming and pastoralism). These primary activities; agriculture horticulture and pastoralism are the means of livelihood of rural people (inhabitants). But these activities are also diverse. Consequently, mountains have both spatial and functional diversity of settlements. Consequently, the mountainous landscape of Har ki Dun has a diversity of settlements, ecologically and economically.

Har ki Dun has a sparse population with scattered settlements. There are 47 permanent village settlements. These settlements are widely distributed over the vast territory of the high Himalayas. The population is settled in the river valleys or on the slopes of mountains with suitable soils. The basic function of these scattered settlements is agriculture (soil cultivation) at the marginal areas. These settlements are agro pastoral in nature. In the mountainous areas in general and the high Himalayan region, in particular, most of the settlements are villages. But not every settlement is a village. One such type of settlement is a fragmented or isolated village. It includes land outside the village with dispersed houses. It may include 2 - 10 or more houses. These settlements are locally called Tok. Tok belongs to some village. Some of these settlements (Toks) are located even outside the village and have unique names (but not included as census villages). These places have unfavorable land quality, lack of irrigation but still, have a permanent settlement. The distinctive settlement pattern of Tok is characterized mainly by its isolated existence. The land use of these settlements is controlled by the physical conditions of the landscape, its spatial location and its accessibility.

The present location of Rala is, in fact, a fragmented settlement of the old village (it was earlier called Mall Rala). The original village got relocated after the natural disaster devastated it. There are few villages in the region with suffix or prefix of Talla or Malla. These were, in fact, one village in the earlier time, fragmented from each other. In the course of development they have acquired independent existence. PaunTalla and PaunMalla are one such example of fragmented settlements. Earlier Rekcha and Haripur were fragmented parts of one village. The original village was Rekcha. Now, these two villages have an independent existence. Satta village is fragmented at three locations. These are Kandulwala, SattaTalla and SattaMalla. Nanana Tok is another such fragment. It belongs to Duni. Tiny settlements of Bhatikasil and Burashti are located between Rala and Kasla. Devkudia and Samladi are Toks of Kasla. Maisariand Ratkudi are Toks of Lewari. One small settlement is located between Rekcha and Fitadi. It is neither an independent village nor Tok of any of these two villages.

These settlements (Toks) are not villages but are places of sedentary living. All these settlements are only geographically distant from each other but socially, culturally and economically connected (or integrated) with the village. Therefore, these fragmented settlements present an integrated form of settlement pattern.

Har ki dun has a unique combination of these scattered or dispersed (and even fragmented) settlements. The landscape of these settlements is composed of dispersed buildings and agricultural land, that is, arable land, grasslands, orchards and so on. Lutyal Gaon, Deval Gaon and Jhadi Gaon in the Fatah Parvat region of Supin valley are large enough to be called a village but these settlements have not acquired the status of revenue village or census village.

The settlement pattern in the high Himalayan region indicates a correlation between the ecology of the landscape. The size and nature of settlements depend on resource needs and resource availability. Due to the diversity of natural conditions, few settlements have a dual location; used as summer and winter settlements. Khansyani is the winter settlement and Sarka and Bugarbagh are its summer settlements. Similarly, Istargadh and Dhaula are summer settlements of Hatwadi and Thadi is the summer settlement of Bhitari.

The landscape of Har ki Dun offers several other alternatives for settlements. Different settlements have distinct ecological characteristics. A few of these settlements are just seasonal and used for temporary living and animal husbandry. These are pasture settlements and 'shades' or seasonal settlements (chhanis and dudharies). These settlements are distinct in landscape characteristics and also cultural and agricultural characteristics. The villagers still apply traditional agricultural practices in these landscapes. These settlements are very good examples of how man has been able to adapt to difficult and often extreme, environmental conditions.

'Shades' (chhanis) or temporary shelters for personal and animal use are commonly built in the

fields, usually a few km away from the village. The natural conditions of these chhanis and dudharies are usually favourable for building small dwellings (houses). Thus, the geographical space of the village extends to chhanis and dudharies. These seasonal settlements (chhanis and dudharies) are common to every Himalayan area. These places play a significant role in the economy of the settlement. These distant (or separate) settlements also add to the sustainability of the settlements (it offers an area for further research).

In the areas where natural constraints are enormous and resources are not bountiful, both the environmental and economic factors are responsible for settlement location and changes in settlements. Multiple dwelling is, in fact, an adaptive device for the people of the high mountain region. It allows fuller exploitation of the resource potential of the environment (mountain landscape).

Chhanis and dudharies are widely scattered, particularly in Har ki Dun. Some villages have even developed from 'shades' (chhanis) when people started residing permanently in them and when their population increased to a substantial level. The settlements of Taluka and Vasant Nagar had their origin in the 'shades' (chhanis) of Dhatmeer and Gangar villages respectively. Soliyana is dudhari of Duni. Akhadkhani is dudhari of Rala. Some of these chhanis and dudharies are even located in far-off places. Sometimes these chhanis and dudharies exist beyond the existing settlement maps of the village. The dudhari of Duni and Bhitari are located near Sar Tal. Thus, the geographical space of the village is not confined to the village boundary only.

The diversity of the landscape has a strong influence on the agricultural and pastoral landscape of Har ki Dun. It has created a significant diversity of rural settlements. Besides sedentary settlements, there are few non-sedentary settlements (settlements based on shifting cultivation). There are other pastoral settlements. Kalap is a unique settlement with a transitional subsistence economy.

The settlements situated at or near high-altitude meadows (bugyal) are temporary but these meadows have sheltered areas (in high altitude areas of Har ki Dun these pastures (bugyals) are called Thach). The alpine meadows of Har ki Dun also had few Gujjar huts till a few years back (before the restriction was imposed on the movement of Gujjars in Har ki Dun). Although Gujjars used this area for brief camping, these huts had permanent structures with storage facilities. Consequently, these settlements are interpreted as seasonal or temporary settlements due to seasonal site occupation and seasonal patterns of resource procurement.

Villages make regular (seasonal) relocation of population and cattle to these bugyals. These relocations of population and cattle to a specific area is well defined and systematic. Samucha is bugyal of Lewari. Other bugyals of this village are Patagarhi and Nigalbo. These bugyals are close to Bhara Sar Tal (an alpine lake of this region). Narma bugyal is located near Narma Kantha. There is another bugyal Gai Kantha. These bugyals are located close to Kada Sar Tal. Sunchikada bugyal belongs to Rekcha. Chaura is the pasture or grassland of Kasla.

These seasonal settlements are the places of transhumant farming. These settlements command good grazing land and many small fields. These seasonal settlements with transhumance farming areas expand the possibilities and opportunities of production in the high mountain areas. Thus, these settlements increase the effectiveness of resource-harvesting.

TABLE 1 - ALPINE MEADOWS (BUGYALS) OF HAR KI DUN

Sr. No.	Village	Meadow Areas
1.	Osla	Simhodra, Basuthas, Sagunna
2.	Gangar	RuinSara, Batgara, Thanga
3.	Datmir	Mahanir
4.	Jakhol, Dhara	Devkir
5.	Taluka	Mahanir, Pusthar

6.	Liwari, Fitari	Samucha, Patagarhi and Nigalbo
7.	Rekcha	Sunchikada
8.	Kasla	Chaura
9.	Khansyani	DandaSirgul

The ecology of the landscape (in and around bugyals) offers multiple dwellings to the people living in these high Himalayan regions. Although these places or spaces are not permanently occupied, these are sheltered areas thus, these places also constitute settlements.

Diversity, Functionality and Sustainability of Mountain Settlements

The landscape and its diversity are often described as the diversity of geographical spaces or places and their environment. [13] This diversity leads to diversity of land use, and settlement diversity. The landscape diversity of the high Himalayan region causes settlement diversity; verticality of settlements and fragmentation of settlement space. Landscape diversity also influences a variety of phenomena such as location and distribution of agricultural and pastoral activities etc. This diversity is produced by both compulsion and adaptation to the landscape diversity. But this adaptation brings in sustainability to the mountain communities. The settlements evolved and survived due to the sedentary activities related to the use of the land. Even today there are areas of agriculture which are distinctive and specific because of the landscape features. It has resulted from traditional methods of cultivation [14].

Living on the margin implies the necessity to deal with several challenges. Rural settlements must guarantee enough agriculture for local supply, little surplus and well-being of the inhabitants [15]. The practice of traditional agriculture is the result of centuries of (experiments) of indigenous peoples and the experience of adaptation to the environmental conditions. In fact, chhanis and dudharies are places of livestock rearing. This livestock fulfils different functions in the livelihood of rural communities [16]. This diversity of land use and livelihood is a source of sustainability of mountainous life. Besides the ecological values, more diverse landscapes appear to be more productive and stable, than are less diverse landscapes. The landscape diversity, especially where agriculture is situated within a mosaic of trees and forest, serves as a foundation for food (dietary) diversity and enhances food security [17]. Thus, this land use diversity has an important role in ensuring resilient agriculture [18].

The regional biodiversity and traditional ecological knowledge acquired through the centuries old sedentary (and nonsedentary) life is the source of resilience and sustainability of mountain communities. These small landscapes (chhanis and dudharies) are potentially more sustainable and resilient to support diversity and environmental and economic functions. The land around chhanis and dudharies are also used for cultivation of pseudo cereals such as chaulai (amaranth). These are also places of many wild plants used by mountain communities. The adaptive strategies to cope with food shortages are also shaped (by) according to the landscape.

There are different modes of coping with food shortages. (Mountain) communities shape their adaptive strategies differently, depending on the resources available and the structure of the landscape. Transhumance, the recurring and seasonal movement of grazing livestock [19] and other such traditional practices also contribute to sustainability. The landscape organization helps to address the risk of food shortages and food insecurity. Landscape organization simultaneously enhances food security and increases the adaptive capacity of the community. Transhumance is one such mode of landscape organization.

Sustainability is the capacity to create and maintain adaptive capability. Development is the process of creating and maintaining possibilities or opportunities. The phrase that combines the two, 'sustainable development' thus, refers to the goal of cultivating and enhancing adaptive capabilities and creating possibilities or opportunities. It is therefore not an oxymoron but a term that describes a logical relationship [20].

It is generally observed that landscape diversity enhances the resilience of populations and the local economy in rural areas [21]. It also brings sustainability to the communities. It is important for sustainable development to maintain the traditional texture of landscapes and especially rural settlements, which are characterized by traditional land uses. And to ensure the continuity of rural life. [22]

5. CONCLUSION

The diversity in landscape influences a variety of cultural features. Settlements are similar cultural features. Mountains present more diversity of landscape than others. Consequently, Mountain settlements also present diversity of size, shape and configuration. Mountain settlements even present diversity in the density of settlement. Mountain settlements even present a diversity of land use. The diverse landscapes of the high Himalayan settlements are the best representation of the diversity of land use. The land use of the mountain settlement is ecologically (or economically) related to the land and the place. Mountain settlements have a long history of existence. The existence and survival of mountain settlements, since centuries, prove the sustainability of these settlements. The sustainability of the mountain settlements is created and maintained by the traditional methods of adaptation of mountain communities. It yields sustainability to the mountain settlements.

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