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IDENTIFYING DIFFERENCES IN THE STUDY OF MULTY-SCALED STRUCTURE OF LANG SON LANDSCAPE TYPOLOGY

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Abstract. The direction of landscape research in the world has developed and there have been many changes suitable to the actual context. The European Landscape Convention (ELC) encourages countries to identify and describe landscapes that cover their entire territory. Therefore, many new methods of landscape research are formed, diversified and flexible, depending on the research purpose and specific characteristics of each territory. Lang Son is a mountainous province in the Northeast region of the country with many differences in the tropical monsoon nature, typical mountainous areas. Therefore, studying the nature and differentiation of landscapes, assessing the landscape of the province according to a multi-dimensional, comprehensive approach, adhering to the maximum local reality, the author uses the dominant method approaching the new trend of Western European scientists. The main result is to identify new unique points to offer a multi-level classification picture of typical landscape types of the mountainous region of Lang Son: a comprehensive study of the whole territory without any real works before; use modern methods of Western Europe; establishing a classification scale on two levels different from previous Russian studies; the results do not apply to a specific purpose.

Keywords: Landscape typology, multi-scale, holistic method, mountainous areas, information technology.

1. Introduction

Nowadays, with the strong development of manufacturing industries along with social progress, it is enriching and diversifying the multi-dimensional relationship of the "natural - social" system. Therefore, landscape research also requires a new multi-dimensional approach.

In recent years, this research direction has been used in many European countries. The European Landscape Convention (ELC) encourages countries to identify and describe landscapes that cover their entire territory. European landscape strategy of the European Union with the most comprehensive model initiative on a European scale [1]. Former types of landscapes have been based on geographic region classifications and

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often have a general nature of nature. These different types of landscapes are incompatible with non-comparative national and regional administrative boundaries due to different approaches, data sources, and methods. This makes data comparison difficult, managing and protecting landscapes are developed in different ways and contexts, and as a result landscape classification is also different. Recent landscape types are based on GIS thematic maps and the use of spatial analysis and statistics to identify landscape types. This research approach will help us to approach and master reality, sketch the overall picture and the changing trends of territorial nature. Therefore landscape maps are used for many different purposes.

Lang Son is a mountainous province in the Northeast region of our country. The place is dominated by mountainous terrain, typical tropical monsoon humid climate. Therefore, the research and assessment of the landscape with a highlight of the unique mountainous landscape, focusing on studying the nature and differentiation of the landscape of the province in a multi-dimensional, comprehensive approach aim to provide an overall picture of the landscape in the area. The typical landscape type of the mountainous region of Lang Son has great significance both theoretically and practically, with the hope of making a small contribution to the development of landscape research in the general and sustainable development of the province.

2. Content

2.1. Research methods

To carry out this study, the author uses data collection, aggregation, and processing methods and GIS methods. The processed data will be the basis for the process of researching and evaluating the landscape, thereby proposing directions for rational use planning of the study area. The method of mapping and GIS geographic information systems is traced from the study of maps to grasp the general and quick overview of the area of Lang Son province, thereby mapping out the typical survey routes and points of the region. The GIS method effectively implements updating, analyzing and aggregating local information to find new features to create a new layer of information, resulting in presenting data in the form of maps, based on this, to identify typical and distinctive features of the landscape of Lang Son province.

Inheriting and applying the new method of Western Europe to research in line with the territory of Lang Son province because most of the previous studies were mainly based on the traditional Russian method, considering the natural ingredients to play a decisive role. In order to determine the landscape, landscape differentiation is greatly influenced by the subjectivity of the researcher. However, according to the current European Landscape Convention, the division of natural landscapes or cultural landscapes is redundant, because there is no place without human influence, no pure natural landscape, landscape analysis should be based on objectivity in its very nature. Lang Son territory is no exception.

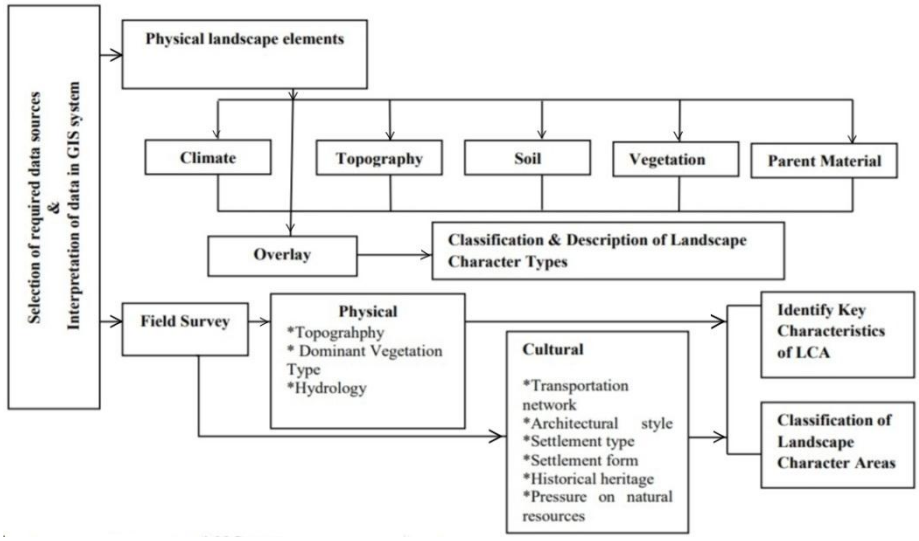

Figure 1. Research process flowchart identifying different highlights of landscape types in Lang Son province

2.2. Results and discussion

2.2.1. Application of classification methods according to the hierarchical structure of landscape types

Many different methods exist to classify landscapes in the world in general and Vietnam in particular, some modern classification methods suitable to the author's research direction are inherited as Figure 2.

According to Marc Antrop (Belgium), two methodological approaches to landscape classification are holistic and parametric methods. The holistic approach begins with building a spatial framework that is gradually filled up when natural details are available. The parametric method starts from superimposing a set of thematic maps, forming a composite map in which the overlay polygons identify the combined units to describe the landscape types. This technique became popular as GIS and digital maps evolved. The choice between the two methods is mainly based on the nature of the data sets used. The holistic approach is indicated by landscapes with a clear spatial linkage between the components and land use, soil conditions, geomorphology and composite samples (fields), which are more evident when concretize on images and maps. This method allows the construction of an open framework on the job to be completed successively and a parametric approach is an effective high-quality digital map. This is a semi-automatic and automated technique in GIS, where the results depend heavily on map attributes such as scale, quality, etc. Another special problem is the processing of the resulting polygons virtual. Typically, full-scaled digital maps are usually only available for elevation (DTM elevation model) and land cover. Thus other important properties can be excluded from graphs and classifications. Using a large number of topics is needed to gather and analyze statistical data [2].

In order to define a modern landscape at the national level, a new approach has been established based on current geographic approaches to landscape classification,

giving an overview of this approach to the evaluation of both levels. At both levels, units are defined and types of landscapes are assigned to space units. The first level uses grid cells to assign landscape types. The second level defines landscape units with sets of grid cells. The two levels are not hierarchical according to the holistic approach but they represent two different types of landscapes at different levels. The process consists of 5 steps: (1) selecting data sources, identifying variables, geocoding the grid cells and building databases; (2) identify the landscape types by grid cells at level 1; (3) sketching landscape units at level 2; (4) identify landscape types at level 2; (5) visualize areas of landscape characteristics.

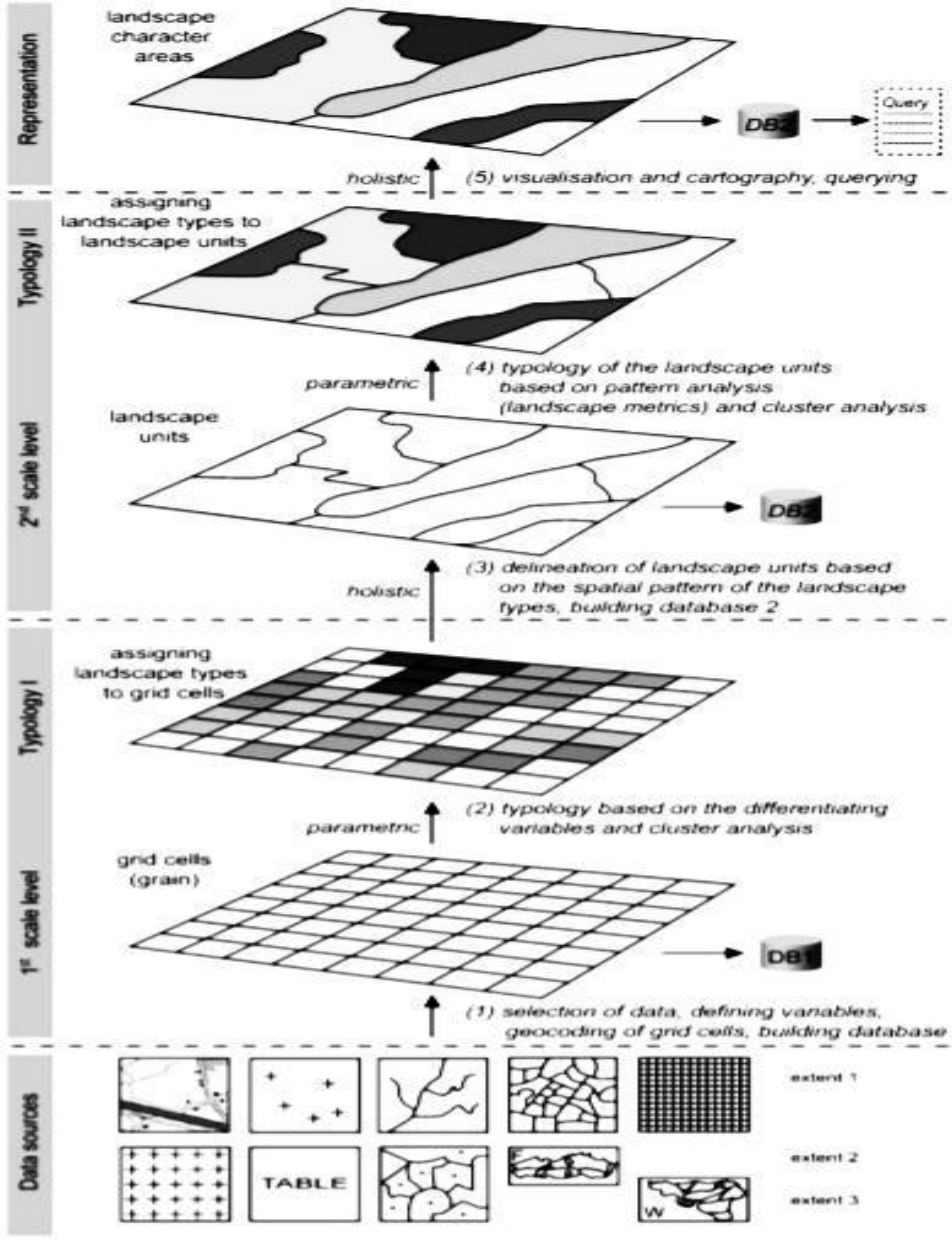

Figure 2. Five steps in the methodology model used for characterization and characterization of landscapes [2]

From the viewpoint of José Gómez Zotano (Spain): a comprehensive proposal for the classification of landscapes is the pyramid classification that determines the characteristics of landscape types and regions according to spatial scale and other levels each other, classify the landscape as a multi-scaled structure, displaying its five reference rates. This method provides a well-structured visual representation of the complexity of the landscape and shows that certain properties can only be detected at certain scale levels. A nested classification as proposed allows the concept of territory as a duplicate picture in a mosaic. It must be emphasized that only in optimal circumstances can the whole range of multi-scaled descriptions be achieved. In most landscape studies, it is not necessary to ponder at all levels because the simplified versions of the pyramid may be more realistic, as required by the policy context. However, browsing the entire level to describe the landscape is a rich exercise, from which it is possible to gain flexible insight into the true nature of the landscape. Although in field observations, boundaries between landscapes are often not considered sharp boundaries and have transitional zones between different landscape units, considering them to be clearly defined boundaries for creating. Map-based on GIS data. The connection between the spatial scale and political levels is very variable depending on the political context. While the simultaneous evaluation of landscape elements and processes, as well as policy processes and practices at different scales and levels, is necessary, the study focuses on regional levels, sub-region, and supercenters to adapt to the Spanish landscape regulation system. The pyramid approach provides a well-structured visual representation of the complexity of the landscape and shows that certain properties can only be detected at certain scale levels.

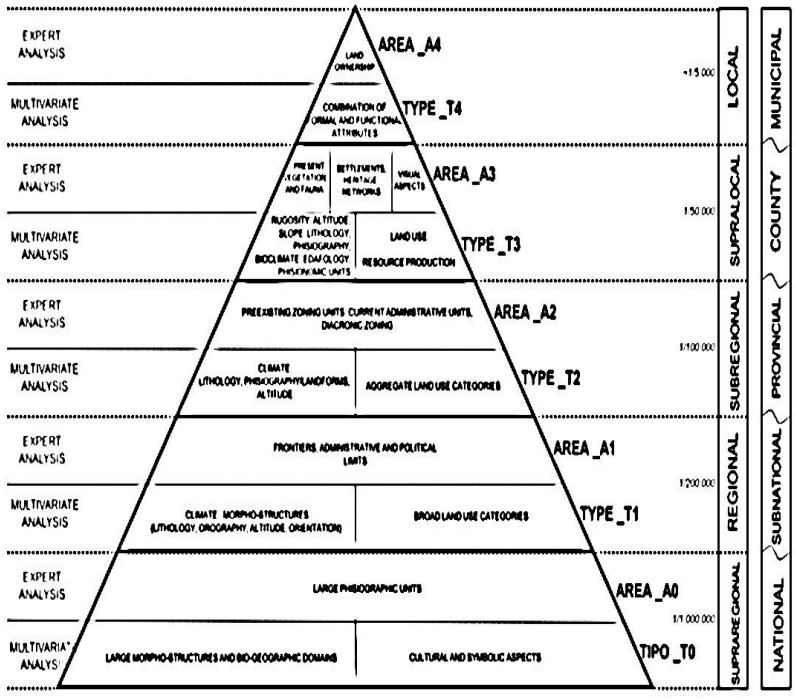

Figure 3. Pyramid landscape classification, defining characteristics of landscape types and areas according to spatial scales and different levels

The graph shows the degree of dependency between different landscape variables. Some are more stable and self-deciding, while others depend a lot. The abiotic components (climate, lithology, geomorphology, hydrology, and climate) are relatively independent and identify biological components (vegetation, wildlife and soil). Dependencies increase as we go higher on the pyramid, so variables at the top depending on those who act as platforms. Landscape identification procedures must pay special attention to this model when considering human activity. This can happen at all levels because the importance of human intervention in the landscape has increased continuously throughout history.

The process allows the integration of key variables into the identification of types and regions at different scales, thus allowing for clear identification of the various components of a landscape: abiotic, biological, culture and perception. The identification of types and areas is followed by a characteristic providing an overall description of the combination of specific characteristics of a given landscape that sets it apart from another landscape. This overall description is defined in the typical characteristic analysis system. It focuses on arranging the landscape in a hierarchical structure, so that larger areas include smaller areas, resulting in a nested classification. The multi-scaled classification shows the special size of the landscape hierarchically, thus representing existing spatial relationships. Multi-scaled classifications can be labeled with qualitative denominations (global, regional, local, other) or through numerical indices (e.g., among other possibilities, large-scale, medium or small scale) [3].

2.2.2. Analyze characteristics of Lang Son province to identify appropriate points and research directions

As a part of Vietnam territory, Lang Son also has the characteristics of our country, which is a humid tropical monsoon with an average temperature of 17 - 22^{0}C, a rich source of radiation. However, due to its proximity to the Tropic of Cancer, it is located at the gateway to receive the winter monsoon, where the tropical monsoon comes first and finishes in the northern region of the country, the longest and coldest winters in the country. On the other hand, because it is not adjacent to the sea, this is a place with little rainfall in the Northern climate region; the annual average rainfall is 1200 - 1600mm, some places with only a rainfall of over 2000mm such as Mau Son high mountain area (2589mm); In Lang Son, there are Na Sam (1118 mm) and Dong Dang (1100 mm) which are arid centers of the North. The annual average humidity of the air in Lang Son is from 80 - 85%, lower than many other regions in our country. The biological composition is mainly subtropical, lyophilized, typical tropical species only thrive in low elevation areas [4, 5].

Lang Son nature also features many very typical hills and mountains of Vietnamese nature. The province is located in the Northeast region of the South China-North Vietnam region has a close geological - terrain relationship with a part of southern China territory "mountains by mountains and rivers by rivers" and lowering gradually the terrain from southern China to northern Vietnam. Popular terrain is low mountains and hills, few medium mountains and no high mountains, the average height is 252m above sea level, located between the bow - the quite special terrain of the Northeast

mountains, karst terrain types are quite developed. The small delta area is insignificant, mainly fields, basins interspersed between mountains.

The general inclination of our territory is northwest-southeast, which is shown most clearly in the terrain. Hydrological characteristics are also influenced by this feature, with most large and small rivers flowing into the sea. But in particular, Lang Son is the only place in our country that has Ky Cung River (belonging to the Ky Cung - Bang Giang river system is one of nine major river systems of Vietnam) which is not in the east and southeast direction into the sea but backward and northward into China.

Figure 4. Research territory

Despite its small territory, due to the complexity of natural factors such as diversified terrain with 4 main terrain types and divided into 3 different terrain regions, the climate has a cold winter but there is marked difference in different terrain areas and divided into 3 climatic and soil regions divided into 7 regions with 16 soil geographic sub-regions including 43 different soil types, rich and diverse biological species not only tropical species but also quite well developed subtropical and temperate species. Therefore, Lang Son not only has a natural differentiation in the north-south direction but also in the east-west direction, according to the height that makes up diversity in nature as well as in the landscape. Besides, the fluctuations of natural components, especially the climate, coupled with the increasing impact of human activities have made local nature complicated.

Regarding the current land use status, there are big differences in 3 groups of agricultural land, non-agricultural land, and unused land, reflecting the impact of humanity on the natural landscape environment: existing agricultural land 680.921,53 ha accounting for 81.83% of the total natural land area, non-agricultural land 45.355,30 ha accounting for 5.45% of the total natural area, unused land 105.798,99 ha accounting for about 12.72% of the total area natural soil.

Lang Son is a mountainous province inhabited by ethnic minorities (Tay, Nung, Dao, Hoa) accounting for more than 80% of the population, the total population as of April 2019 was 782,666. With the characteristics of the far-front boundary of the north of the country, the economy is quite developed. The average annual economic growth rate in the period of 2011 - 2017 reached 8-9%, of which agriculture and forestry increased by 3-4%; industry - construction increased 9-11%; service increased by 10 - 12%. The economic structure has been shifted towards reducing the proportion of agriculture and forestry and increasing the proportion of industry – construction, and services. Agriculture and forestry account for 20.30%, industry - construction 19.68%, services

49.78%, product taxes minus product subsidies 10.24%. Per capita income in 2018 reached 38.4 million dongs [6, 7].

2.2.3. The process of identifying differences and multi-scaled structures of Lang Son landscape types

To identify modern landscapes at the provincial level, we inherit based on modern geographic approaches to landscape classification that combine a comprehensive approach and a parametric approach. The levels represent different types of landscapes at different levels. The whole process consists of 5 main steps:

- *Step 1: Select data sources, define variables, geocode the grid cells and build a database.*

In the first step, all relevant data sources including the entire study area were collected, to classify, and represent a balanced representation of the landscape's components including nature and society, literature and culture. If necessary, the data is converted, referenced and geocoded so that it is useful in GIS. Based on the transformation of the data set, there are 3 types of variables defined: distinct variables, description variables, and diagnostic variables. To classify at the first level, grid cells are used as spatial, deterministic units. particle classification. Each grid cell is represented as a polygon in GIS, making it easier to integrate with other data sources. After selecting the data sources and defining variables, the variables are integrated into grid cells by GIS overlay of data sets (parameter method). All variables are forwarded in the continuation attribute. For example, the three types of land cover in a grid would be expressed as a percentage of the three types in the grid. Consequently, all the variables have the same resolution as the grid cells and no fragments will appear when combining the topics. Grid cells of GIS vector topics are the framework to build a database containing 3 types of variables.

- *Step 2: Identify the types of landscapes using grid level 1.*

Each grid cell is characterized by a series of distinct variables, used to identify the groups in the grid cell that have the most characteristic homogeneous landscape types. This is done by cluster analysis. Multivariate analysis is used to analyze landscapes such as spatial activities to group similar objects and to obtain landscape types. The number of landscape types can be based on the possible combination of nominal discriminant variables (land cover and soil combination) and the correlation between these variables. Group membership and distance from the center are saved as new variables, along with the last cluster center. When landscape types are defined, they are assigned to grid cells and added as an attribute in the database. In the representation map, categories are represented by individual colors and codes. The choice of colors is based on the most prominent features, features and basic color schemes commonly used in the map.

- *Step 3: Sketch the landscape units at level 2.*

The landscape units at level 2 are formed by a unique combination of adjacent grid cells with different landscape types at the first level. The types of grid landscapes that form separate spatial models. Landscape units are described manually by comprehensively explaining these models. This description can be adjusted manually by using satellite imagery support, which may have landscape contours associated with image features.

- *Step 4: Identify landscape types at level 2.*

In each landscape unit, the spatial format of the grid cells for the soil type is quantified using landscape measures. The indicators describe the configuration and geographic location of the grid models at the first level in each landscape unit at the 2nd level. Adjacent grid cells of similar landscape types are forming. Identify units and identify the pieces. The first choice of landscape data is based on the meaning of the data to assess a type of landscape. Six groups of data were calculated, indicating the shape of the land units, the spatial model of the pieces in the landscape units, and the edge indices of the pieces in the landscape units. The final landscape dataset is selected after correlation and analysis of the components is mainly a large statistic, made in SPSS. Figures and proportions of grid landscapes in each landscape unit are stored in an attribute table. The selected landscape indices, combined with the view data of the landscape types of lattice used to identify groups in landscape units. They are defined as variables within a hierarchical group of spatial units to define landscape types at the second level.

- *Step 5: Visualize areas of landscape characteristics.*

Landscape units adjacent to the same type can be incorporated into landscape areas. The map representation is intended to reflect the specific characteristics of the soils involved. For Lang Son territory, all mapping is achieved using ArcGIS and statistical analysis is done in SPSS. The landscape database consists of GIS layers at two levels, created by thematic and distinct variables. Not only are the landscape units represented polygons, so so do grid cells. This allows easy linking of spatial units and grid cells to an open description database for more details and connection to existing classifications, especially for different area classifications. In reality.

2.2.4. Differences in landscape research in Lang Son province

The research and assessment of the landscape with the highlight is the unique karst mountain landscape with the longest cold winter in the country and complex spatial division. Along with the impact of population growth and socio-economic development with the characteristics of indigenous culture, beliefs and customs in the border areas have profoundly affected the landscape of the province. The research focuses on the nature and multi-scaled differentiation of landscape types in Lang Son province but not in the direction of studying traditional Russian and Eastern European landscapes that have been applied before but in the new direction of Western Europe [8].

First of all, there has not been any in-depth study on landscape and landscape differentiation of the whole territory of Lang Son province, thus the topic is not duplicated in the previous study area.

Secondly, the author has chosen a different method rather than studying the landscape of Western European countries today with a multi-dimensional, comprehensive approach, adhering to the maximum local reality to produce the hierarchical landscape paintings of the mountainous Lang Son locality.

Thirdly, the results of the research on hierarchical structure of landscape types but not entirely according to the traditional classification levels in the landscape as previous studies on the Vietnamese landscape, but focused on distinctive factors of the study area,

multi-scaled research on type with 2 main levels, each landscape name will reflect the local characteristics without being duplicated in other territories.

Fourth, the research results do not apply to a specific purpose or service of developing a specific economic sector, but depending on the views and orientations of each sector, field, planning of the locality. Using this result to refer to different levels accordingly, or in other words, the results can be used for different purposes at different levels.

3. Conclusions

The orientation of landscape research in Western European countries based on the European Landscape Convention has proposed many new developments and is suitable for the change of the current world context. This research approach will help us approach and master reality, sketch the overall picture and the changing trends of territorial nature. Landscape science research of Vietnam has made certain contributions mainly following the landscape science research methods of Russia, but at present, many new studies are approaching the trends of Western European and North American countries. The territory chosen to study Lang Son is a rather unique area, the author follows the direction of studying the landscape of Western European countries today with a multi-dimensional, comprehensive approach, closely adhering to the local reality to offer typical hierarchical landscape overview of mountainous areas. The author hopes to contribute a small part to the new landscape research in general and the sustainable development of the homeland in particular.

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