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Analysis and Development Research of Traditional Village Landscape Based on Pattern Language—A Case Study of Changyushan Village

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Abstract: This study focuses on the analysis and development research of the traditional village landscape using a pattern language approach, with Changyushan Village in Changli County as a case study. The introduction of pattern language provides a robust research method for understanding the intrinsic logic of rural landscapes, revealing information about site morphology, and understanding the rules governing the generation and development of village landscapes. The objective is to explore a pattern language-based planning and design model for preserving traditional village landscapes, inheriting village cultural context, and showcasing regional characteristics. The study, rooted in the Changli County region, utilizes the intuitive research method of pattern language to investigate the emergence and development patterns of village landscapes in the area.

1. Introduction

The introduction of the language of landscape patterns provides a powerful research method and means for the protection and development of rural landscapes. Landscape pattern language can, from the perspectives of regional characteristics and ecological culture, reveal the intrinsic logic of rural landscapes, uncover information about site texture in rural and surrounding areas, and elucidate the patterns and development rules of rural landscapes. By applying pattern language to the study of traditional villages, the aim is to identify a planning and design model for preserving traditional rural landscapes, inheriting village cultural context, and showcasing regional features. This model can serve as a reference for the sustainable development of future urban and rural planning and construction.

The Eastern Hebei, with its significant geographical location and advantageous ecological resources, has become the "right wing" of development in the Beijing-Tianjin-Hebei region. However, the number of traditional villages in this area is limited, and their landscape features are not prominent, restricting the expression of rural regional styles. The discovery, protection, and development of traditional villages are urgently needed. Therefore, this study is based in the Eastern Hebei, utilizing the intuitive research method of pattern language to explore the occurrence and development patterns of rural landscapes in this area.

2. Relevant Concepts

2.1. Landscape Pattern Language

Scholars define pattern language as a fundamental language symbolized by patterns, treating landscape space as the research object. It explores the basic landscape elements, spatial units, and spatial combinations, along with their formation into the overall landscape space's basic vocabulary and logical relationships. This provides a theoretical foundation for the vocabulary, grammar, and pattern language system essential in shaping new landscapes. Throughout the past decade, the research achievements of pattern language in landscape architecture in foreign countries have covered multiple scales. They include pattern analysis of specific landscape elements such as squares[1], as well as pattern analysis of urban landscapes and even regional ecosystem[2].

2.2. Traditional Villages

Traditional villages refer to settlements with early formation, rich traditional resources, and significant historical, cultural, scientific, artistic, social, and economic value that should be preserved. The unique historical and cultural characteristics and overall heritage of traditional villages are reflected in their site selection, spatial patterns, traditional buildings, and intangible cultural heritage. Throughout their formation and development, these villages consistently demonstrate the integration and adaptation of humans with nature, form with function, offering valuable insights for modern rural landscape planning and the development of human-environment relationships.

3. Analysis of Landscape Pattern Language System in Changyushan Village

Changyushan Village, located in the northern part of Liangshan Township, is scattered in a 3.5-kilometer-long north-south-oriented valley, hence it’s named "Changyushan" [3].

3.1. Landscape Pattern Vocabulary—Characters

The vocabulary of village space includes three hierarchical levels: "characters", "words", and "phrases"[4]. The "character" pattern is the smallest unit of space. The village space in Changyushan is divided functionally into living space, production space, and ecosystem space. The landscape elements of these three types of spaces are analyzed, deconstructed, and then summarized as "characters" in the landscape pattern language. In the living space, "characters" include basic spatial elements such as buildings, courtyards, roads, squares, ponds. In the production space, "characters" include basic spatial elements like farmland and orchards. In the ecosystem space, "characters" comprise basic spatial elements such as mountains and water system.

Most of the buildings in the village are residences, with a few public buildings. Some residences exhibit traditional features, while public buildings are modern in architecture. Traditional building structures include stone-wood and brick-wood structures, all single-story dwellings. The traditional architectural features are mainly reflected in the roof, gatehouse, and building materials. Influenced by Northeastern Chinese Residence, the roof is dome-shaped, slightly lower in the front and rear, with a central arch for drainage, defense against wind and sand, and to reduce roof load. Due to the surrounding mountains and convenient access to stone, the walls are constructed with stone, and the roof frame is wooden. In the recent past, due to geological disasters and population migration, architectural forms have not entirely adhered to traditional styles, with roofs having various forms like four-slope and two-slope. However, most buildings have only one story, and the overall village

skyline remains relatively unaffected. Courtyards follow the northern residential courtyard form, mostly single-entry with fewer double-entry and triple-entry courtyards.

The main roads in the village are arranged in a "one vertical and seven horizontal" pattern. The roads in the village generally follow a dendritic structure, with a clear main road and shorter, more scattered side roads. Due to the terrain variations, there are fewer squares in the village, which are primarily located near public buildings and road intersections. The squares that are integrated with the roads have irregular shapes. There are fewer ponds with small areas, and most of them have regular shapes.

Farmland is mainly distributed around residential buildings, adopting a terrace-style layout for growing vegetables and crops. The edges of the terraces are constructed with square-shaped stone. Orchards are located on terraces near the village and on surrounding hillsides, with large areas and a wide range. The Dongsha River flows through the village, and the main river channel is prominent, with a few small tributaries. The river shows distinct seasonality, and the main channel has hardened over time. The mountains are distributed in strips on both sides of the village, with slopes on both sides of the village transformed into terrace-style orchards (see Figure 1).

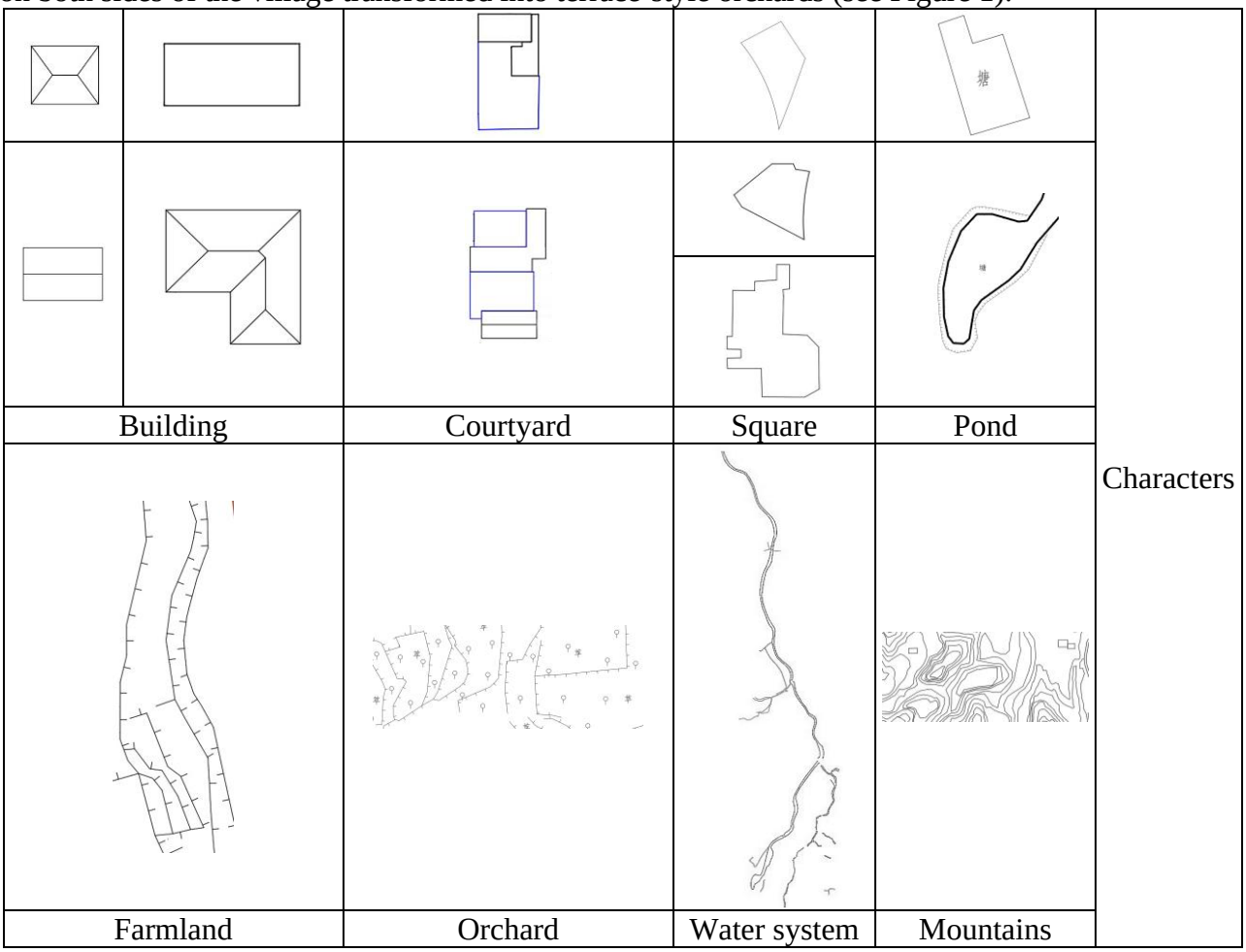

Figure 1: "Characters" of Changyushan Village.

3.2. Landscape Pattern Vocabulary—Words

"Words" are composed of "characters". Words in the landscape pattern language are generally combinations of two or more "characters." The landscape pattern words in Changyushan Village include street space, building-square combinations, road-square combinations, road-river

combinations, and farmland/orchard-settlement combinations.

The street layout of Changyushan Village adapts to the terrain changes, presenting a flexible and diverse layout that integrates well with the natural geographical environment. Residential buildings are freely distributed on both sides of the street, without forming obvious parallel or perpendicular relationships. The distance between buildings and streets varies, creating a rich spatial variation. The width-to-height ratio (D/H) of streets also varies, ranging from 1:4 to 1:1. Due to significant changes in the topography of village land, the primary consideration is to address residential needs, followed by the demand for square spaces. As a result, the number of squares is relatively scarce. Squares combined with buildings are surrounded on two to three sides by public buildings and residential buildings. The combination of roads and squares is more flexible, either located on the roadside or expanding intersections into squares. The main village road and the main river channel exhibit a predominantly parallel spatial relationship, with four intersections connected by bridges, which do not affect traffic functionality. Influenced by topography, the combination of farmland, orchards, and settlements in the village shows a flexible and changeable form. Some areas around settlements with large flat spaces are used for planting crops and vegetables, while other areas are divided into strip-like terraced fields and plateaus for farmland and orchards (see Figure 2).

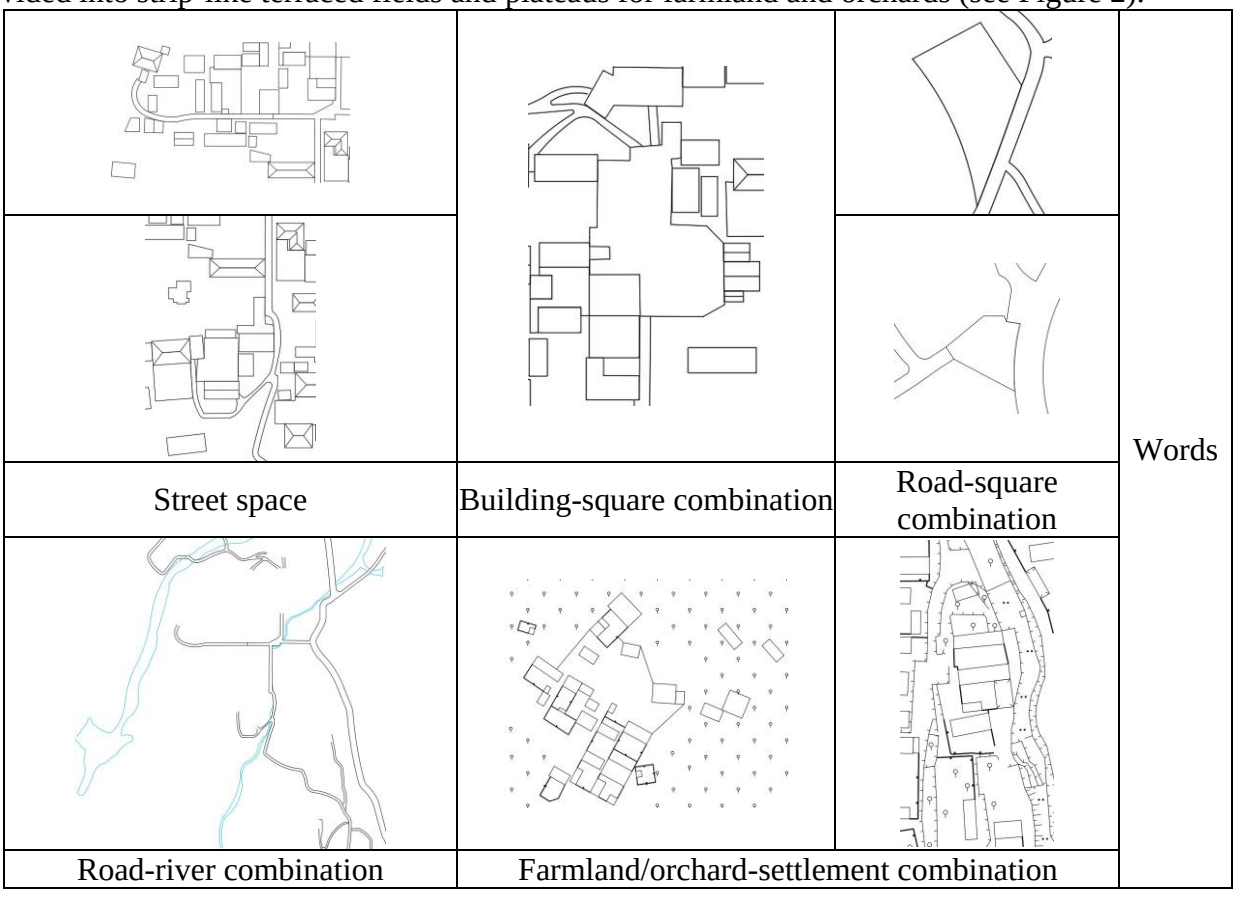

Figure 2: "Words" of Changyushan Village.

3.3. Landscape Pattern Vocabulary —Phrases

Analyzing the combination patterns of typical spaces in traditional villages from the perspective of "phrases" can be categorized into four major types: living-production space combination, living-ecosystem space combination, production-ecosystem space combination, and living-production-ecosystem space combination.

3.4. Context of Pattern Language

The "characters," "words," and "phrases" of landscape pattern language exist within specific contexts, encompassing both natural and human contexts. Changyushan Village is located in the hilly area, with a high terrain in the south and a low terrain in the north, and high terrain on both sides and low terrain in the middle. The highest point reaches an altitude of 630 meters, while the lowest is at 84 meters, with the majority of the land concentrated below 300 meters. The gullies and terrain are highly undulating, with steep slopes and deep crevices. A river named Dongsha River originates from the southern part of Changyushan Valley, passing through the village approximately 50 meters to the west. The local segment of the river in the village is 7,000 meters long [3].

Changyushan Village consists of 13 incorporated villages, with a total of 8 surnames. It is different from the southern clanship or family-based settlements, and belongs to the northern villages with multiple surnames and mixed residences. The primary economic sources for villagers include fruit tree cultivation, migrant work, and tourism. The village boasts a wide distribution and variety of fruit trees, with a long history of pear tree cultivation, accompanied by folklore. In modern industrialized management, chestnut and apple cultivation has become more prominent. The village also has traces of the red culture from the Liberation War period.

3.5. Grammar of Pattern Language

Pattern grammar consists of morphology and syntax, revealing the inherent relationships between village landscape words or phrases, forming relatively complete internal relationships of landscape space, and establishing logical rules for the transformation of basic spatial units or compound spatial units into complete village landscapes.

3.5.1. Morphology

(1) Interlocking

Influenced by the topography of the village, there are a few strip-shaped slopes around residential buildings. These slopes near residences are transformed into strip-like terraced fields, with farmland, orchards, and other production spaces embedded within the living space. The two types of spatial elements are interlocked with each other.

(2) Enclosure

Outside the construction land of the village, there is a large ecosystem space primarily consisting of mountains, forming a three-sided enclosure by the mountains.

(3) Strip-apparent

The main village roads and waterway channels extend parallel to each other, with living spaces distributed on both sides of the main roads. The mountains form a constricted shape on both sides of the construction land, resulting in ecosystem and production spaces that are also strip-shaped. Therefore, the overall village space develops in a strip-like manner.

3.5.2. Syntax

(1) Scale

Scale is an essential technique in the composition of village space, revealing the relationships between spatial elements and the relationship between space and humans. The scale of landscape elements in Changyushan Village is based on the physiological scale of humans, reflected in the pleasing scale of building volumes and street space.

(2) Integration

The ecosystem space of Changyushan Village is composed of the Dongsha River and the

surrounding mountains. The interweaving arrangement of living, production, and ecosystem spaces in traditional villages demonstrates a sophisticated understanding of spatial utilization. This approach effectively utilizes village spaces while minimizing disruptions to the ecology. It reflects the wisdom behind the genesis and development of traditional villages. The integration and development of habitat, production, and ecology landscapes collectively form the village's overall landscape.

(3) Regionalism

The traditional buildings in Changyushan Village exhibit distinctive characteristics in their appearance, materials, and colors, aligning with the traditional architectural features prevalent in the rural areas of the Eastern Hebei. Simultaneously, they incorporate architectural features of Northeast China, creating a localized architectural style. The shaping of the terrain into terrace-like structures for building houses or planting fruit trees and crops reflects the regional characteristics. The widespread planting of local trees also establishes a continuity of regional landscape features.

4. Development Strategy for Landscape in Changyushan Village

With the development of overall tourism in Changli County and leveraging the geographical advantage of being near the Jieshi Mountain Scenic Area, Changyushan Village has been promoting rural tourism in recent years. The enhancement of the rural landscape is not only a demand to improve the living environment but also a necessity for the development of the tourism industry. However, the construction and development of the landscape must protect and inherit the characteristics of traditional villages, passing down the context of the landscape. Therefore, based on the study of its landscape pattern language system, the following development strategies are proposed.

4.1. Continuation of the Original Layout, Preservation of Road Texture

The strip-shaped spatial layout of Changyushan Village is the result of the integration of villagers' activities and the natural environment over 300 years, reflecting the respect and rational utilization of nature. The tree-like road system cleverly utilizes the terrain, showcasing the distinctive features of the village. In the subsequent development, there are some contradictions between the village layout and expansion of village, the road system and the increasing use of modern transportation, such as road width and the planning of parking spaces. Overall, the strip-shaped layout of the village should be preserved, and excessive development of the surrounding mountains should be avoided. At the same time, the texture of the roads should also be protected, and road widening should not be overly pursued to avoid squeezing ecosystem space. Parking spaces should be laid out in a decentralized manner to facilitate the production and life of villagers while avoiding concentrated hard surfaces that could harm the ecosystem.

4.2. Continuation of Traditional Architectural Features

The traditional residential buildings in Changyushan Village have all experienced a certain degree of damage. There is a conflict between modern and dilapidated buildings and the traditional buildings on architecture style which needs to be unified. When dealing with traditional buildings, a preservation-oriented restoration approach, adhering to the philosophy of "repairing old as old," should be adopted, and protective zones should be defined. Research should be conducted on the volume, proportions, architectural decorative elements, colors, materials, etc., of traditional buildings. Representative symbolic elements should be extracted and applied to the decorative transformation of modern and dilapidated buildings. Emphasis should be placed on the harmonious

unity of the overall architectural appearance, such as color, height, and materials, to reflect the inheritance of the traditional village's landscape context.

4.3. Constructing “Living-Production-Ecosystem” Spaces Based on Ecosystem

Both living space and production space rely on the stability of the ecosystem. The ecosystem space in Changyushan Village is mainly composed of surrounding mountains and the Dongsha River. The protection of mountain vegetation and geological resources is crucial for constructing an ecological barrier. Meanwhile, the planting of fruit trees and village greening, as artificial ecosystems, also play important roles in the ecosystem space. It is essential to investigate existing vegetation resources, provide scientific guidance for fruit tree planting, and maintain the ecological balance. Currently, the village water system has many hardened river channels and revetments, which are unfavorable for water ecological restoration. Ecological planning, design, and construction should be carried out for the river, revetments, and the surroundings to maximize the ecological benefits of the water system and enhance the environmental quality of the living space.

5. Summary

Based on the internal and external investigations of the landscape in Changyushan Village and the creation of the landscape patterns, an analysis was conducted to identify the elemental composition of the village landscape. This led to the study of the characteristics of landscape element combinations and spatial arrangements, exploring the logical relationships between these elements, resulting in the formulation of the landscape pattern language system for Changyushan Village. The landscape pattern language system of Changyushan Village is composed of 8 basic spatial types at the character level, 5 spatial types at the word level, and 4 spatial types at the phrase level. When applied within a specific natural and cultural context, it utilizes 3 kinds of morphology and 3 kinds of syntax to organically combine these elements.

Based on the research of the landscape pattern language system in Changyushan Village, strategies for the development of the village landscape were proposed, providing valuable insights and references for the protection and construction of traditional villages.

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