

Article

Dependence on Mountains and Water: Local Characteristics and Regeneration Patterns of Rural Industrial Heritage in China

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Abstract: In most Chinese villages, mountains and water are essential resources for human life, which residents have established close connections with through subsistence and production activities. These connections involve geographical, functional, and spiritual effects, which create the unique cultural identity of a place. As a kind of rural heritage, rural industrial heritage is a concrete result of the interaction between local activities and mountains and water, thus presenting specific local characteristics. The conservation and re-use of rural heritage have become an important issue in global rural studies. Different cases that have been transformed and re-used are analyzed in this paper, in order to explore the influence of mountains and water on their local characteristics, the effects on their conservation and re-use in both spiritual and functional aspects, and suitable regeneration patterns based on local characteristics. Comparative analysis of 3D maps, diagrams, and literature materials indicate that: (1) mountains and water dominate rural industrial heritage geographical characteristics, including their layout, size, and form; (2) the direct or indirect supports of mountains and water, in terms of functional and spiritual aspects, have changed after regeneration, where spiritual supports are becoming increasingly important; and (3) regeneration patterns with different focuses represent new habitats combining natural and artificial landscapes, indicating new relationships that shift from the single utilization of mountain and water resources in the past to symbiosis and mutual benefits between residents, heritage, nature, and local communities in the modern context.

Keywords: rural cultural landscape; geographical relationship; locality; regeneration; industrial heritage



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1. Introduction

Mountains and water are an important part of the natural landscape of China and are the basis for the development of agricultural civilization, where mountainous areas account for two-thirds of the total land area [1]. Mountains and water have gone beyond the material level of the natural landscape, becoming an important factor in forming local cultural, social, and economic characteristics [2,3]. As natural resources supporting local development, mountains and water have also evolved into Feng Shui cultural concepts, stipulating local construction activities and even serving as ethical totems to build ideal settlements [4,5]. In traditional culture, mountains and water are equivalent to landscape, and there are regional differences in landscape characteristics [6]. In the functional aspect, mountains and water provide insurance of available natural resources, military defense, and natural disaster resistance for local people. In the spiritual aspect, Chinese culture always advocates nature, taking mountains and water as the objective reference object for human life and, inspired by their aesthetic characteristics (e.g., shape and seasonal changes), repose emotion and compare ethics [7]. Compared with the short life cycle of human beings, mountains and water serve as spatial landmarks for constructing local cultural beliefs and life memories, which can provide people with a psychological sense of security and place [8].

The phrase “depend on mountains and water” is a straightforward summary of the interaction between local people and nature, which originated from a Chinese proverb of the Ming Dynasty [9]. This proverb emphasizes the full use of natural resources to live and produce [10]. First, it indicates that local people should use natural resources, such as land, water, trees, minerals, and animals, to develop agriculture, fisheries, animal husbandry, and industry. At the same time, based on the detailed environmental physical characteristics, such as the climate, rainfall, and sunshine, they should adaptively carry out production activities to obtain the most advantageous living conditions. Second, this is a traditional ecological strategy, which focuses on developing natural resources and the dynamic balance of use and protection at the same time, stressing the consistency of production activity and natural replacement law, and pursuing sustainability in resource use for the harmonious coexistence of humans and nature. Local people constantly adapt strategies to the environment to obtain better living space through their interactions with mountains and water. In this case, the historical experience of dealing with nature and the gradual expansion of functional needs shape the local characteristics, suggesting that the meaning of “depend on mountains and water” has changed [11]. Especially with the development of rural productivity [12], mountains and water have gone beyond natural resources for rural agriculture and industry.

Rural industry originates from rural agriculture and has the dual attributes of agriculture and industry [13]. Rural industrial heritage is a facet of rural civilization. As with other rural buildings, industrial buildings and facilities are strongly related to the territorial context, natural environment, and agricultural activities [14]. Therefore, from the perspective of industrial archaeology [15], rural industrial heritage should include tangible and intangible remains built and used in rural areas, reflecting traditional handicrafts or modern industrial production (e.g., buildings, facilities, landscapes, associated agricultural environments, and unique production processes) [16,17]. Unlike urban industrial heritage, rural industrial heritage is related to its contribution to the rural landscape environment and agriculture [18]. The construction and use of these heritage sites leads to the accumulation of local empirical knowledge, manifesting high historical, technical, and cultural values [19]. In the past, rural industrial heritage supported rural development together with agriculture, maintaining close ties with the economic, socio-cultural, and territorial attributes of the countryside. These heritage sites thus help to define the relationship between identifiable settlement units and productive space [20]. Rural industry, like agriculture, is a feasible production plan designed by residents based on the local geography, climate, and resources. However, unlike purely agricultural heritage, rural industrial heritage exhibits diversity in technical solutions with respect to the local natural environment, especially before modern industry [15,21]. In this case, to better understand rural industrial heritage and explore its contemporary value and potential, incorporating rural industrial heritage into a holistic rural landscape structure that contains both artificial and nature aspects is necessary [22].

Rural industrial heritage is typically less noticeable (or even degraded), in terms of construction scale and production technology complexity, but it is as important as natural and agricultural landscapes in contributing to the identifiability and landscape characteristics of rural areas [23,24]. As important landscape resources, the rural industrial heritage should be identified, evaluated, protectively used, and effectively managed to give play to its sustainable socio-economic, cultural, and ecological values [25]. Such heritage should be re-used to promote the benefits for local society, on the basis of respecting its value and original characteristics [26]. With the development of rural tourism, most vacant rural industrial architectural works are broken away from their original function, being re-used as restaurants, B&Bs, shops, and public service facilities, which increase the employment and social welfare of local people [27]. However, rural industrial heritage is disconnected from its native environment in its transformation and re-use through homogeneous approaches. In this way, the unity and continuity of the rural landscape are threatened, and its local characteristics are eliminated. Therefore, the territorial image preservation and space utilization of rural heritage are of the same importance [28,29]. The

use of local materials and traditional technology to repair old buildings provides a positive effect on the identification of rural traditional culture [30], where such visual recognizability facilitates protection of the sense of place associated with rural heritage [31]. As a type of rural heritage protection, ecological museums focus on the synergistic effects of nature, local society development, and the everyday life of residents [32]. Through the protection and re-use of rural industrial heritage, humans, society, and nature are connected, and sustainable development can be achieved by combining the local conditions and policy support, opposing the centralization and standardization of interventions, and encouraging the bottom-up participation of villagers [33].

In China, there are various kinds of rural industrial heritages, which are distributed widely and which present obvious regional characteristics, depending on the rural society; however, the protection and re-use of rural industrial heritage has only been paid attention to in recent years [34]. On the one hand, as one part of the overall environment, the rural industrial heritage is included in the multi-scale urban architectural heritage protection system covering region, settlement, and architecture [35]. On the other hand, as a part of rural cultural heritage, rural industrial heritage is focused on development in the rural development, which is taken as the cultural resources to characterize territorial characteristics, especially in the context of the Rural Revitalization Strategy introduced in 2018 [36]. The Rural Revitalization Strategy is based on the development of rural industry, society, culture, governance, and ecological environment. It bridges the incompatible contradiction between rural cultural heritage protection and rural decay in the context of the urbanization system since the Reform and Opening in 1978 [34], as well as the unilateral development focusing singularly on the economic development under the rural construction system [37]. In recent years, with top-down policy support for the protection of rural cultural heritage in China, with rural cultural heritage protection and re-use focusing on farmers—aimed at promoting the development of the local society and economy, ecological environment sustainability, and cultural diversity maintenance—has become a social practice involving the government, local people, developers, and architects. Under this background, re-understanding of the relationship between rural industrial heritage and the local environment, as well as an awareness of the importance of regeneration and re-use of the rural industrial heritage in the territorial context, are necessary conditions to maintain its heritage value, which is also key to promoting the sustainable development of rural areas.

This paper takes the survival strategy “depend on mountains and water” as the entry point, in order to explore the relationship between rural industrial heritage and the local environment, as well as suitable regeneration patterns. With mountains and water as core factors, the ways in which local characteristics of rural industrial heritage are shaped, in terms of geographical conditions, functional, and spiritual aspects, are also discussed in this paper. In summary, in this paper, we aim to address the following questions:

- (1) Under different geometric conditions, through what kind of environmental relationship do mountains and water shape the local characteristics of rural industrial heritage?
- (2) As key geographical elements, what are the effects of mountains and water on the regeneration of different kinds of rural industrial heritage from functional and spiritual aspects? What changes have taken place in these effects before and after the regeneration?
- (3) In light of the different regional characteristics of rural industrial heritage, what kind of sustainable regeneration mode can be adopted?

2. Materials and Methods

2.1. Materials

Eight rural industrial heritages of five different types were selected for the study (Figure 1). These cases include typical examples of Chinese rural industry, such as brick kiln, warehouse, military factory, quarry tea factory, and agricultural and sideline product processing facilities. These cases also represent the local people’s production choices and adaptive solutions, in response to different mountains and water conditions. With the urbanization process, most rural industrial production has declined. Whatever the function

or type, rural industrial production faces the challenges of starting over, considering the local conditions. In addition, the current rural revitalization policy, as an irresistible external force in rural society, has been forcing the regeneration or disappearance of heritage in China [34]. Those heritage projects that are more prominent and attractive, in terms of scale, historical, socio-cultural, and economic value, are at the forefront of promoting the revitalization of rural industrial heritage. Therefore, the cases selected for this article were projects that had been updated, for which the design results and core description texts have been published. These projects come from different architects and landscape designers, who show their understanding and corresponding solutions to local conditions from different perspectives, including people–land relations, daily life, economy, community relations, and ecosystems. These projects are the typical representatives of the current state of China’s rural industrial heritage. The different features of these cases help to provide evidence of the diversity of real situations in the study samples, thus reducing the impact of the specificity of individual cases on the accuracy and assessment of the study results. Furthermore, different intervention programs support summarization of the universality and demonstration of the regeneration patterns associated with rural industrial heritage.

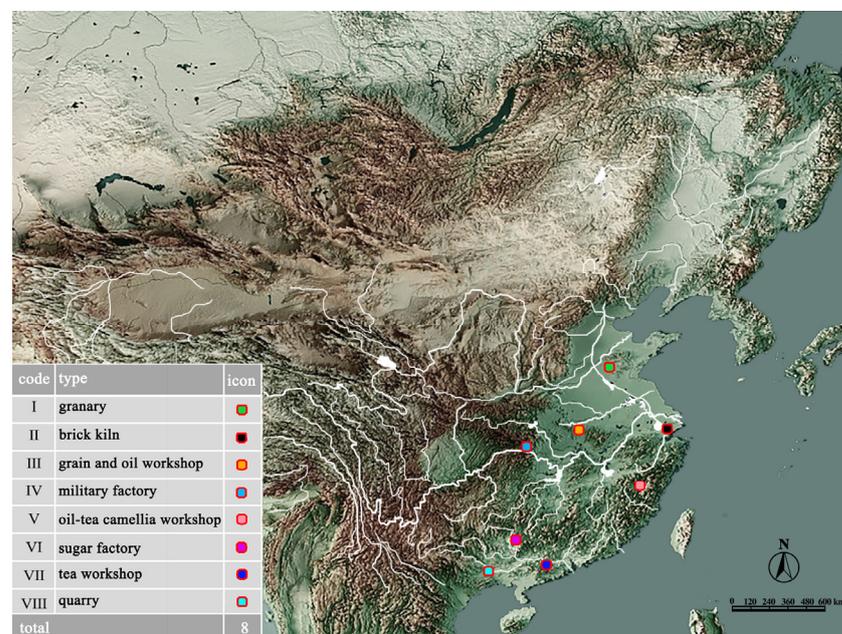


Figure 1. The distribution map and types of cases. Modified from Smart mAPPS Consulting.

From a geographical perspective, mountains and water present different forms, functions, resources, and so on, to local development; in particular, the associated climate, soil, and natural disasters affect habitat construction and agricultural activities [38]. Therefore, it is necessary to analyze the relationships between mountains and water and rural industrial heritage from the perspective of different topographies. The studied cases were distributed in China’s northern plains, southeastern mountains areas, and southern basins, characterized by flatlands, high mountains, river valleys, hills, low mountains, lakes, streams, and karst. The consideration of various different geographical conditions can enrich the interpretation of the relationships between rural industrial heritage and specific mountains and water. In addition, the specific relationships between the eight rural industrial heritage sites and mountains and water conditions provide more possibilities to determine the similarities and differences of these relationships.

The specific materials used were as follows:

1. Google maps, diagrams of the case locations, and related documents on local mountains and water, geological resources, climate conditions, and village development.

2. Historical materials, relevant literature, and public materials from the local government and media for each case. These diverse text materials represent the understandings and responses of designers, the local government, the public, and social media associated with each case.

2.2. Methods

2.2.1. Graphical Analysis

Geographical data with research characteristics can directly reflect the relationship between rural industrial heritage and the local environment and may even facilitate determining the evolution of local experience and landscape characteristics for comparison [39]. In this study, a 1:500 Google 3D map of each case location was selected, in order to obtain mountain and water conditions on a large regional scale. The diagrams were drawn at a place scale, in order to reflect the relationships between cases and around mountains and water, according to the form, size, and layout of rural industrial heritage. Comprehensive comparative analysis at the two scales was conducted to indicate the basic spatial relationship between the cases and mountains and water (Table 1).

Table 1. The landscape analysis with different geographical conditions. Map: modified from Google map; Diagram: own sources.

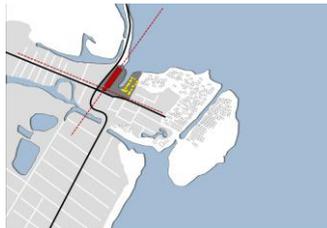
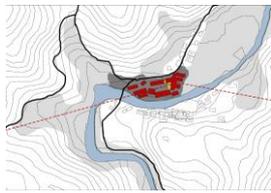
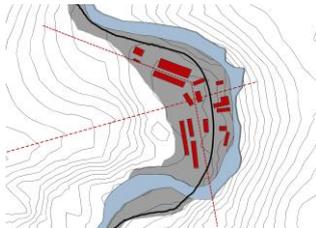
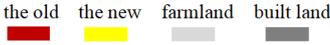
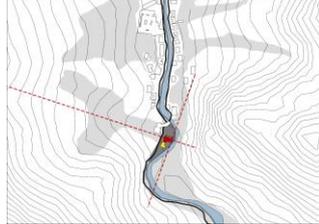
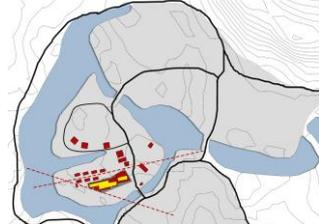
| | Map (Regional Scale) | Diagram (Place Scale) the old (red) the new (yellow) farmland (grey) built land (dark grey) | The Relationship with Local Environment |
|-----|---|---|--|
| I |  |  | The granary is located on a slope high above the village, surrounded by farmland. The rectangular layout of the building is aligned with the direction of the ridge. |
| II |  |  | The brick kiln is set at the water on the bay, and its orientation is consistent with the texture of the farmland. The workshop is adjacent to the residential houses, but at a certain distance, and its scale is significantly larger than that of the houses. |
| III |  |  | The buildings are located as a group on one side of the river, naturally separated from the village. The layout is in line with the direction of the river and is surrounded by farmland. |
| IV |  |  | The buildings are located on a gentle slope. The layout follows the direction of the river and is perpendicular to the direction of the ridge. |

Table 1. Cont.

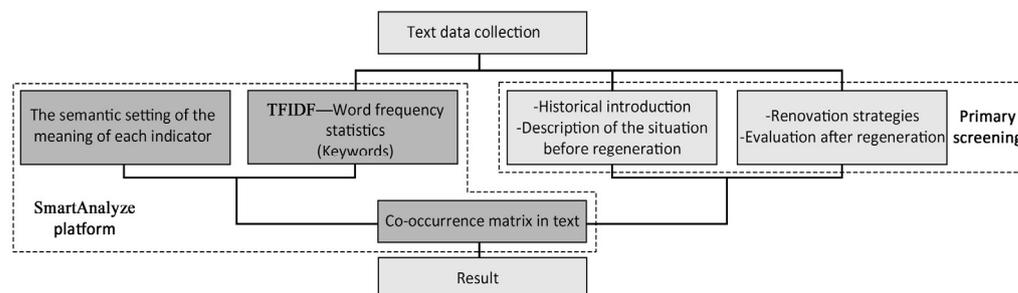
| | Map (Regional Scale) | Diagram (Place Scale) | The Relationship with Local Environment |
|------|---|---|---|
| | | the old the new farmland built land | |
| | |  | |
| V |  |  | The oil mill workshop is located on a separate open space in front of the village. The horizontal layout faces the col, and the vertical layout is parallel to the contour lines. The building is surrounded by farmland. |
| VI |  |  | The factory is located between two hills. The historical buildings face the river and the distant col. The orientation of the new addition corresponds to the top of the hill on the left and is parallel to the hill on the right. |
| VII |  |  | The tea workshop is located on an independent island, and the two layout directions are consistent with the circular water. The long building form increases the view of the water-oriented landscape. |
| VIII |  |  | Mine pits are transformed into pools of various shapes. Free paths, small hills, and pools form a patchy landscape shape. |

2.2.2. Text Keyword Statistics

The functional and spiritual aspects of mountains and water have direct or indirect impacts on the production and life of residents [5]. Farmers play the roles of managers, builders, and workers in local industrial production [13]. Therefore, it is necessary to consider the relationships between mountains and water and industrial heritage from the perspectives of local farmers and industrial production. According to previous studies [40–44], evaluation indicators that have been verified to reflect relationships directly or indirectly between rural industrial heritage and mountains and water were selected for use in this paper. These indicators describe the specific effects of mountains and water on the cases. They also describe characteristics reflected by keywords of text materials, in order to compare the situations before and after the regeneration of each case (Table 2). The detailed method adopts intelligent analysis of big data and a semi-artificial combination approach (see Figure 2), as follows:

Table 2. Case profiles and text sources.

| | Brief Introduction | Text Source |
|------|---|-------------|
| I | Located in the central mountainous area of Shandong Province, it was built in 1968 as a granary supporting war readiness during the Cultural Revolution, and its special history has been recorded. It has now been transformed into a rural cultural tourism and maker base. | [45–48] |
| II | Located in the Taihu Plain, close to Changbai Lake, it was built to mainly fire red brick and roof tiles in 1981, making it a major source of livelihood for the local people. In 2015, it was transformed into a brick kiln culture and art center. | [49–52] |
| III | Located in the old revolutionary area of Dabie Mountain, it was first built in 1958 to be used as a grain depot and manual oil pressing workshop. It was renewed twice, in 2013 and 2019, and is now the grain and oil museum and rural cultural center. | [53–57] |
| IV | Located in the western mountains, it was built in the 1960s. In response to the international situation at that time, the government supported the construction of military factories in remote western areas. It was called “third-line construction” and was a spiritual symbol of not being afraid of hardship and death [58]. It is now a famous industrial-style boutique hotel. | [59–63] |
| V | Located in the eastern coastal mountainous area, it has a history of more than 100 years. It used to be used to make oil tea with traditional handicrafts. In 2017, it was renovated as an oil tea-making experience workshop shared by villagers and tourists. | [64,65] |
| VI | Located in the southern hilly area, characterized by karst landforms. Built in 1969, this sugar factory was a pioneer and example of socialist construction and was once the pride of the locals. Production was stopped in 1998 due to pollution. It was continuously restored and remodeled from 2007 to 2017 and is now a boutique hotel. | [66–70] |
| VII | Located in the southern hilly area, it was first built in 1951. The tea factory is built on a small island. It began being updated in 2017 and is now a tea culture base for production and experience. | [71–73] |
| VIII | Located in the southern hilly agricultural area, it was once mined for building materials, but was transformed into a garden for the Nanning Garden Expo in 2018. | [74–77] |

**Figure 2.** The methodological framework for text analysis. Own sources.

First, the text materials are used as input into the SmartAnalyze platform, and the rank of the frequency of each text word is abstracted using the TFIDF statistical method. Then, the words with no study value are dismissed, and the ten words with highest rank are taken as the keywords for each case study. At the same time, the association field of the keywords, through the semantic setting of different indicators, is established.

Second, the texts are artificially separated to before-regeneration materials (historical description and current situation description of the case before transformation) and after-regeneration materials (description of intervention strategy and post-use evaluation).

Third, the associated keywords with indicator semantic fields and two kinds of text materials are input into the co-occurrence matrix, in order to abstract the co-occurrence probability of keywords and text before and after regeneration.

Finally, the higher the co-occurrence probability, the more important the corresponding index.

When comparing the indicators before and after regeneration, it is helpful to analyze the focus of the regeneration process in different cases, in order to accurately reflect the characteristics of the regeneration patterns. The specific indicators considered were as follows:

- Indicators reflecting direct relationships Functionality (D–F).
 1. Production resources: Mountains provide mines, clay, wood, and so on, while rivers, lakes, and/or groundwater provide domestic water for production and workers;
 2. Security defense: Mountains have military defense and windproof functions. Highlands and rivers can reduce the impact of flooding. Mountains and water can provide a relatively independent production environment to avoid external risks;
 3. Transportation support: Rivers can support water traffic;
 4. Construction conditions: Construction of workshops on gentle hills or terraces solves problems related to production processes that require height differences. Mountains provide stones, earth, wood, and so on, for construction;
 5. Climate conditions: Mountains and water effectively regulate the local microclimate environment, providing the humidity, temperature, and ventilation for production;
 6. Damages: Natural disasters, such as landslides, mudslides, and major floods, may occur in mountainous areas;
 7. Enclosed space: Mountains and water are physical barriers to communication between communities. Mountain areas hinder transportation, electricity, and other infrastructural elements.

Spirituality (D–S).

1. Geographical memory: As geographical markers, mountains and water have unique names and characteristics and, so, serve as representations of the location of settlements. They are symbolic of the ever-present environmental elements of the area and can also give a sense of belonging and attachment;
 2. Landscape environment: Mountains and water provide a scenic and natural environment and are the main objects of visual aesthetics and the physical perception, giving people a relaxed and happy mood.
- Indicators reflecting indirect relationships Functionality (IND–F).
 1. Protect water: Valleys and hollows can protect the groundwater or collect surface water;
 2. Protect biodiversity: Mountains and water provide sustainable habitats for animals and plants;
 3. Farmland: Mountains provide the available arable land and water facilitates irrigation;
 4. Production technique: Different types of industrial production supported by mountains and water have different construction and production technologies.

Spirituality (IND–S).

1. Brand effect: Natural mountains and water have become important factors in evaluating some rural industrial products, as consumers prefer to purchase agricultural and sideline products produced from the natural environment. Most products named after local mountains or rivers are more easily accepted.
2. Cultural image: Some unique local customs are related to mountains and water. Residents believe that mountain and water gods determine their production and life and, thus, they perform specific sacrifices and prayers.

3. Results

3.1. Data Analysis

Graphical analysis of all the cases indicated that the rural industrial heritage sites were adjacent to mountains or rivers, except for in plain areas, where there are no mountains but there are lakes; mountains and water are inseparable and complement each other. Regional-scale maps show that rural industrial heritage is typically located in small valleys or slopes of various shapes, close to rivers or lakes. This phenomenon also reflects that mountains and water are important conditions for the location of rural industrial heritage. Except for cases V and VIII, the other cases were located near a settlement; but, instead of occupying a flatter or more spacious site nearby, they are separated from the dwellings, yet not far away. Cases III–VI are all located in a dense group of mountains accessible

by only one road, and in a relatively closed space. Place-scale diagrams indicate that the layout and structure of rural industrial heritage did not follow a fixed mode but, instead, conformed to the organic formation of specific mountains or rivers. Whether individual buildings or a combination of buildings, landscapes, and facilities, these heritage sites were concentrated on one side of a river or lake or surrounded by water and were not scattered on both sides. Therefore, it can be concluded that mountains and water define the boundaries of rural industrial production space, such that the corresponding heritage space presents identifiable location characteristics that differ from the surrounding environment. This location is comprehensively expressed through the structure, form, and function of rural industry, representing territorial properties [22]. In the current context of regeneration, mountains and water, together with heritage or newly added buildings, constitute an inseparable overall environment.

From the statistical analysis of keywords occurring in texts with different representations before and after the regeneration, each case reflects direct or indirect relations with different focuses (Figure 3). The other functional roles of mountains and water in direct relationships were typically diminished after regeneration, except for construction and climate conditions. Security defense and two adverse functions (damage and enclosed space) completely disappeared. To the contrary, spiritual roles in direct relationships became increasingly important after regeneration, and mountains and water were more than twice as important as before, especially in terms of the landscape environment (Figure 4).

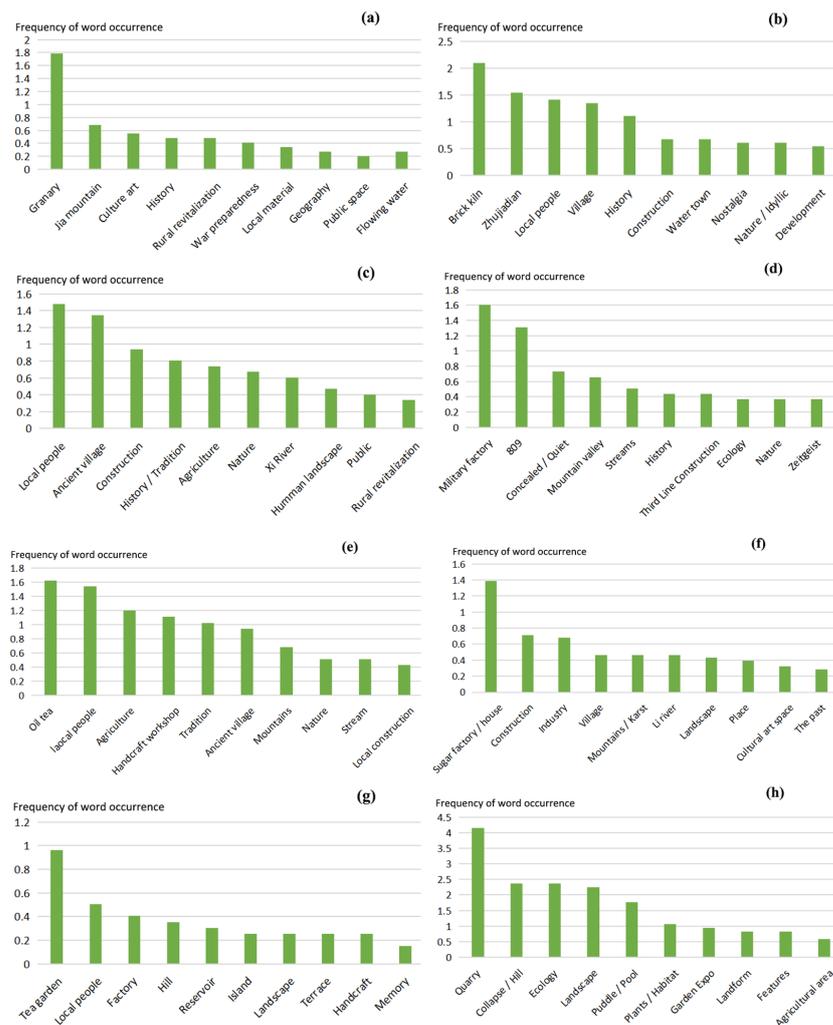


Figure 3. Top 10 keywords by TFIDF statistics: (a) Case I, (b) Case II, (c) Case III, (d) Case IV, (e) Case V, (f) Case VI, (g) Case VII and (h) Case VIII. Own sources.

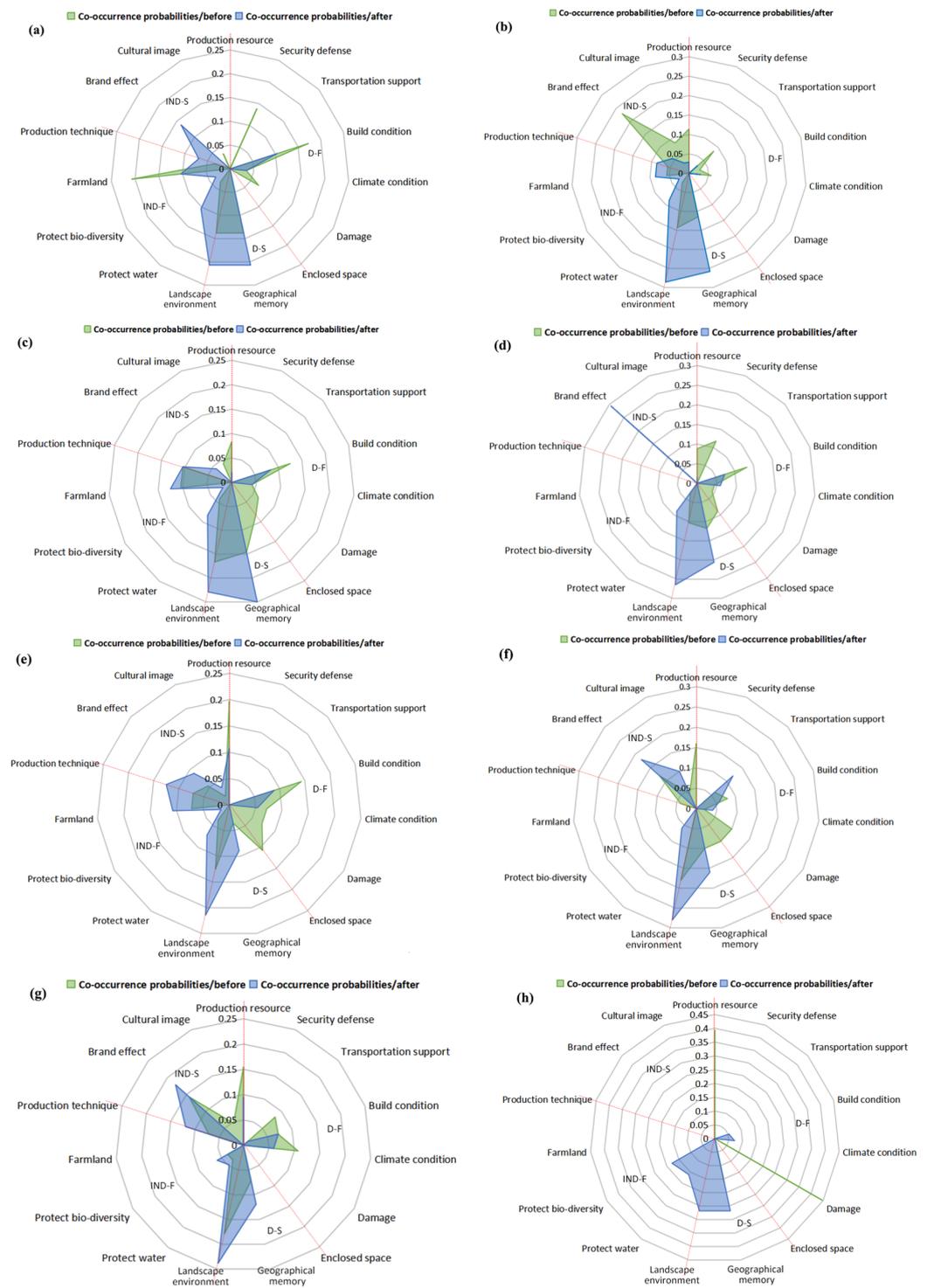


Figure 4. The co-occurrence probability of keywords in the text before and after regeneration: (a) Case I, (b) Case II, (c) Case III, (d) Case IV, (e) Case V, (f) Case VI, (g) Case VII and (h) Case VIII. Own sources.

In terms of indirect relationships, the roles of mountains and water, in terms of the functional and spiritual aspects of the renovated rural industrial heritage, were generally more important than before. Water protection, bio-diversity protection, and brand effect became more prominent after regeneration. In particular, biodiversity protection became more important after the regeneration in the Quarry (VIII) case, while the importance of

farmland was basically unchanged. The production techniques used in the Oil tea (V) and Tea workshop (VII) cases became more important than before.

Judging from the situation reflected in a single case, in terms of direct relationships, except for Granary I, all other cases require mountains and water to provide production resources. In addition to Quarry (VIII), the construction and climate conditions supported by mountains and water are important for the other seven cases. Whether before and after regeneration, all cases reflected the importance of spiritual aspects and the prominent landscape environment. The disadvantages of mountains and water were present before the regeneration in the Grain oil (III), Military factory (IV), Oil tea (V), and Sugar factory (VI) cases.

The Granary (I), Brick kiln (II), Grain oil (III), and Oil tea (V) cases indicated the relationships between farmland and production technique with mountains and water, and these relationships remained basically unchanged before and after regeneration. Except for the Quarry (VIII) case, the brand effect was important for the different rural industrial heritage sites. The roles of mountains and water in influencing rural industrial heritage by acting on local culture were reflected in the Granary (I), Brick kiln (II), Grain oil (III), Oil tea (V), Sugar factory (VI), and Tea workshop (VII) cases. Furthermore, these influences continued in the Brick kiln (II), Oil tea (V), and Sugar factory (VI) cases.

3.2. Sustainable Regeneration Patterns Based on the Relationship of Mountains and Water

According to the graphical and statistical analyses, mountains and water were found to be very important in both the past and present states of rural industrial heritage. Furthermore, different types of rural industrial heritage presented different changes in their specific relationships with mountains and water before and after regeneration. These diversities prove that corresponding measures were adopted to sustainably regenerate rural industrial heritage, according to the local mountains and water (see Table 3).

Table 3. The characteristics of sustainable regeneration patterns.

| Pattern | Characteristics |
|-------------------------|--|
| Complete transformation | Completely change the original function; restore the damaged natural environment; emphasize the contribution of the landscape features of mountains and water to new uses; pay attention to the ecological construction of habitats. |
| Moderate renewal | Maintain the parts of original functions for viewing and experience; keep the landscape awake to the rural memory through traditional production activities and labor; emphasize the continuous interaction between heritage, local people, and the natural environment. |
| Light intervention | Add small-scale public functions to enhance the heritage's contribution to the community; enhance the public's recognition of the local environment through the construction of new buildings or facilities that express a close relationship with mountains and water. |

3.2.1. Complete Transformation by Changing Function and Restoring Mountain and Water Environment

In the past, some rural industries which directly use mountains and water as production materials have caused damage to the local ecological environment. Changing this unfriendly relationship is an important pre-requisite for regenerating such rural industrial heritage. Replacing the original function with an ecologically friendly new one that matches modern life is the first step to changing this relationship. The new function does not involve the erasure of original historical information and local heritage characteristics but, instead, restores the natural ecosystem of mountains and water based on the elimination of unfriendly factors. In this way, heritage is no longer an artificial element, isolated from the local natural environment, but works together with mountains and water

to constitute a sustainable habitat that can be perceived and experienced. The heritage needs to be reshaped into a functional landscape with historical and cultural traces, in order to enhance the readability of the local environment for the public [78]. For example, in case VI, the sugar factory was transformed into a hotel named “sugarhouse”, which has become a famous brand. On the basis of maintaining the original landscape pattern, the renovation was carried out by adding pools and strengthening the axis relationship between the building layout and the mountains and rivers. The old factories and transportation equipment are inlaid in the surrounding mountains and Li River, becoming the focus of the landscape. Heritage and nature create a place with a strong monumental atmosphere. Mountains and water, as the background, together with heritage, constitute an attractive space with the ecological values of nature (Figure 5). In case VIII, a negative situation (i.e., the destruction of hills caused by the quarry) is a significant characteristic of the site. Disparate and desolate artificial traces are preserved as landscape elements of the garden. Rather than being deliberately covered or shaded with trees, these quarries form an impressive habitat with diverse vegetation. In this case, the hills and pools, expressed as garden landscapes, return to the ecological laws of the natural environment with the surrounding free-growing plants [74] (Figure 6).

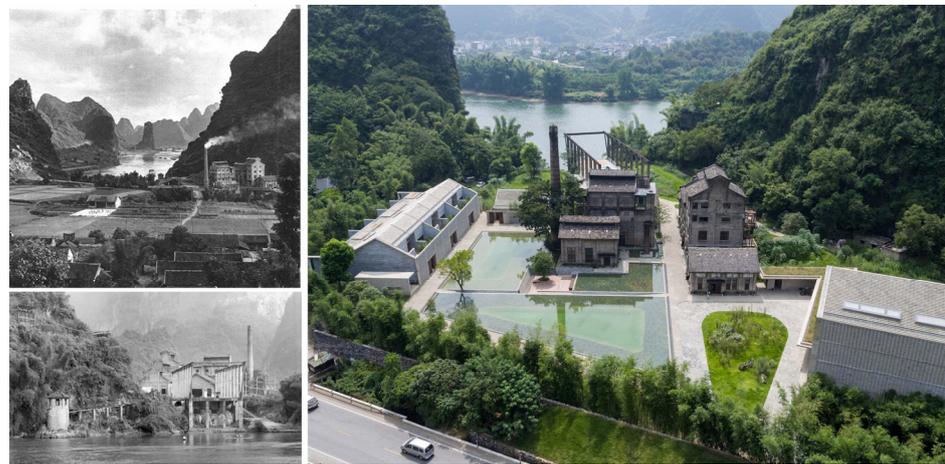


Figure 5. The appearance of case VI before and after regeneration. From Qing, F., [68] and Archdaily, [69].



Figure 6. The appearance of case VIII before and after regeneration. From Archdaily, [77].

3.2.2. Moderate Renewal by Maintaining Function and Strengthening Mountain and Water Interaction

Those rural industrial productions that rely on traditional craftsmanship to establish relationships with the land without the participation of modern machinery make their production process essentially an accumulation of sustainable experience. As the only element to construct human–place relationships, the traditional production activity shapes the local characteristics of rural industrial heritage through the direct or indirect roles

of mountains and water [79]. Therefore, maintaining the original function of heritage is not intended to obtain better economic benefits by restoring productive activities, but to re-establish the organic interactions between heritage, daily production, life, and nature. These traditional production activities are inherently ornamental and experiential. They preserve the memories of the local people and present a dynamic landscape mixed with artificiality and nature for the public. Taking case V as an example, the water mill power device and traditional oil extracting process were restored, in order to transform the original production space into tea oil production experience and leisure spaces, shared by residents and tourists. With the architectural intervention of acupuncture, tourist visits and experiences are integrated with villager activities in a unified place-scale with spatial pattern composed of mountains and water [64] (Figure 7). The harmonious relationship between static heritage and dynamic production activities is poetically presented in nature. In case VII, hills provide slopes and suitable soil for the growth of tea trees. Maintaining the planting, picking, processing, and production of tea for a tea factory maintains the internal relationships between heritage and nature. Tea gardens and tea factories are no longer isolated production spaces but, instead, links between nature, production, life, and rural memory [71] (Figure 8). Traditional handcrafts are activated in these cases, which originate from local mountains and water and are experienced and exhibited in specific local environments. Moderate renewal reinforces the local characteristics of heritage through an open and sustainable approach.



Figure 7. The traditional production and holistic environment of case V. From Archdaily, [65].



Figure 8. The surroundings in the 1970s and after regeneration in case VII. From Archdaily, [73].

3.2.3. Light Intervention by Adding New Functions and Re-Developing Mountain and Water Cognition

Rural industrial heritage reflects the understanding and utilization of local conditions by residents, serving as the material basis for constructing social relations through labor [54]. However, with the urbanization process, some rural industrial heritage has lost the function

of maintaining social relations, where the past labor scene can only become a memory. Consequently, differing from the first two, the third regeneration pattern emphasizes care for residents and communities. It aims to call back memories with more open and inclusive humanism, in order to enhance community awareness and activate rural vitality. First, heritage is transformed into a museum to display relevant tangible and intangible materials. Second, together with the villagers, architects use local materials and techniques to construct several auxiliary small-scale public buildings. These buildings reinforce local construction features and provide public spaces facilitating interactions between villagers and visitors. Relying on new heritage functions, local mountains and water environments are again recognized by modern society. For example, in case I, a new granary music hall was built between the granary museum and the village, which was constructed by locals using stone and gray tiles to demonstrate their relationship with the mountain. The granary music hall provides an open space for communication between villagers and the outside world and connects heritage and the village (Figure 9). In case III, several scattered heritage buildings were connected by the corridors built using pillars and red bricks. The functions of the exhibition, shop, and activity rooms formed a holistic space, shared by villagers, collectives, and tourists. Villagers designed and built the space they wanted (Figure 10), being the users and operators of these spaces, and re-established diverse social relationships with tourists and local communities through daily communications and collective actions. Such a regeneration pattern reconnects the local natural landscape with the cultural environment, in order to realize the sustainable cognition and practice of the locality.

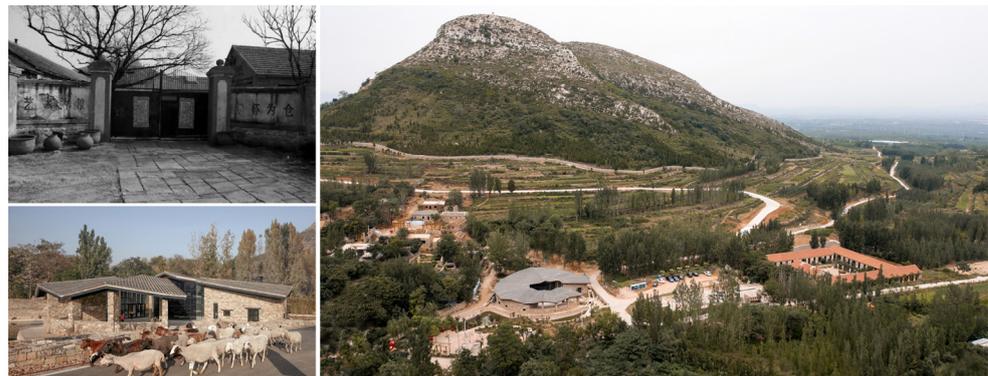


Figure 9. The new parts added to the existing environment in case I. From Archdaily, [47].



Figure 10. Construction activities by villagers and new building in case III. From Archdaily, [56].

4. Discussion

4.1. Contributions of Mountains and Water to the Local Characteristics of Rural Industrial Heritage

The eight considered case studies indicated how mountains and water shape the local characteristics of rural industrial heritage, in terms of geographical, functional, and spiritual aspects, and explain the new roles of different regeneration patterns. Despite different types of heritage and the various roles of mountains and water, all cases proved that mountains and water are necessary for the formation and regeneration of rural industrial heritage. The logic of rural development is that agriculture comes first and industry comes second. Agriculture is the basis for local people to survive. Where there are mountains and water, the easiest and most productive places for agriculture development can be found [24]. The rural industry requires a stable settlement to enhance productivity, including labor, experience, and technological aspects. Therefore, except for special factories such as that in case IV, rural industrial heritage must be an integral part of every settlement. Nevertheless, even in dense settlement environments, rural industrial production is not mixed with the dwellings but, instead, arranged in separate locations nearby. The specific treatment is that rural industrial production facilities are laid out on one side of the river, on a platform, or on an island, but are not separated from the mountain and water environment of the settlement. The living and production space of rural settlements are independent in form and closely related in social relations, which also necessitates the protection and development of rural industrial heritage.

The rural industry does not utilize large modern machinery and equipment and, so, the size of the sites, heritage buildings, and landscape facilities are not large. Most traditional workshops with simple production processes do not need to strictly plan space according to the production flow. The relatively small production scale allows the spatial texture and structural form of rural industrial heritage to be flexibly laid out, according to the geographical conditions. As a result, an overall organic environment, naturally integrated with local mountains, rivers, dwellings, and heritage, is typically presented. Therefore, the surrounding mountains and water must be considered when rural industrial heritage is intervened in the contemporary era.

4.2. The Realistic Significance of “Depend on Mountains and Water” for Rural Industrial Heritage

In traditional society, the production potential of mountains and water supports the order of local settlement life, which is a key factor for constructing sustainable relationships between humans and places, such that the agricultural and handicraft production remain in good order. Except for functional effects, the dependence of the local people on mountains and water also indicates that they are in harmonious coexistence with the natural environment characterized by mountains and water. However, since the 1980s, rural natural resources have been heavily exploited, and most rural industrial production flourished during this period, leading to serious environmental destruction [80]. At present, a large number of rural industrial heritage sites present not only the historical signs of rural development and the scenic memory of the production and life of local people in the past, but also serve as a reminder of the return to the harmonious relationship between people and nature. The realistic significance of mountains and water on rural industrial heritage should be re-understood within an ecological framework.

“Depend on mountains and water” is not a single survival strategy for local people to use natural resources but, instead, can be seen as a new relationship of mutual promotion that integrates the development and protection of local characteristics. Rural industrial heritage and mountains and water are included in the category of sustainable productivity, and the significance of mountains and water has changed from the material basis of rough development to the material and spiritual basis of conservation-oriented development [81]. Heritage, mountains, and water are undoubtedly favorable resources for the socio-economic development of local communities. In contrast to the past understanding, heritage, mountains, and water now move from opposition to unity, as co-evolving

ecosystems. They promote the return of local humanism and the realization of an ecological relationship in which humanity and nature are mutually promoted and harmonized [82]. The mountains and water in “depend on mountains and water” are not just the objective physical environment, but also the reflections of the cultural value of heritage characteristics in the psychology of local people and visitors. Mountains and water represent nature, and heritage represents memory. Thus, heritage and mountains and water together constitute the integrity and authenticity of local identity, becoming the spiritual support of nostalgia [83].

In a landscape setting where mountains, water, and rural industrial heritage come together, locals and tourists are more willing to discover, recall, and enjoy the cultural significance of natural and artificial interactions, reflected in the heritage through the perception and experience of a specific scene [84]. The meanings of mountains and water have changed from passive recognizable geographical conditions to active participants sharing local cultural values [39]. First, this shift of identity proves that the importance of mountains and water to the formation of local characteristics of rural industrial heritage should not stay in the past but, instead, serve to establish a continuous dialogue with the history of heritage and contemporary values. Secondly, rural industrial heritage is no longer the forgotten ruins, but is the bridge connecting organic interactions between local communities and mountains and water, dialectically indicating a new ecological relationship between people, heritage, communities, and nature [85].

4.3. Regeneration of Rural Industrial Heritage Based on A Sense of Place

The present work verified that rural industrial intervention consolidating human–land relationships and obtaining a sense of place is facilitated by the local community and other stakeholders. The mountains and water are the main natural factors in rural landscape environments, rural industrial heritage is an artificial factor providing the local landscape characteristics, and the closed connection between the two is the premise of forming a sense of place [86]. Tuan [87] divided this sense of place into the psychological emotional attachment to the environment and the social construction and identification of identity. Compared with the general re-use of rural old buildings [88] or the re-use of rural farming architecture heritage [26], the regeneration of rural industrial heritage not only takes care of the repair and re-use of the physical space to gain commercial and economic benefits, but further considerations should also be made, in terms of the positive effects of new functions on social identity [89]. These functions should be treated as a means but not a purpose, and potentially changed to promote local development while, at the same time, establishing an internal connection among heritage, humanity, and the environment. The establishment of these connection does not mean to re-build a historical scene which is not consistent with modern life but, instead, to search for an organic combination of past elements and current demands in the existing detailed environment. In the modern era, the tourism is in full swing, and the commercial functions of hotels, restaurants, and shops has become the general mode for re-using rural industrial heritage. These new functions should enable people to experience the imagination and memory of the past through detailed design methods when they occupy the original space, such as the association of the production scene in the past to the whole environment; for example, composed of ponds, industrial facilities, mountains, and water.

The visual characteristics of the landscape are important in the construction of a sense of place [90]. Garcí et al. [91] have studied the landscape effect performance of agricultural and industrial buildings and found that retaining the easily cognized visual image of rural industrial heritage in its local landscape environment facilitates the obtaining of a sense of place. The location and orientation of most rural industrial buildings and production sites are the best choices after long-term experience, which are in a close relationship with the local geometry. Through study of a rural oil workshop in the Cyprus area, Beser et al. [92] have proposed that the definite geometric relationship can promote the route guidance and point remark effects of the local environment. The present case study verified that, first, the

original location and geometric characteristics of the rural industrial heritage should be retained, in order to construct a coordinate relationship with the surrounding environment and to understand the interactions among elements. Secondly, the original dimensions and spatial texture of the heritage environment can retain the integrity and continuity of the local environment, such as the spatial form relationship with mountain outline, river and lake shoreline, farmland and residential texture, road shape, and other elements. Furthermore, special attention should also be paid to the visual differences in color, texture, and other characteristics presented by local construction materials. In particular, for the repaired and newly constructed part of the building façade, people can be made aware of the authenticity of the site by contrasting between the old and new.

4.4. The Synergy of Bottom-Up Community Engagement and Top-Down Policies

At present, driven by the Rural Revitalization Strategy, more and more social power has been devoted to rural areas, making the protection and re-use of rural cultural heritage a complex project [93]. Under these conditions, the participation of local communities plays a key role in retaining the identity during heritage intervention processes. The regeneration in the considered cases indicated the irreplaceable roles of the local community as creators, users, operators, and sharers. In the protective development of rural heritage in most European countries, the local communities not only positively take part in the heritage intervention scheme, but also organize various innovative activities to promote the transmission of heritage value. The result is that the heritage intervention becomes a social cultural practice, promoting resilient development of the local society, economy, culture, and ecology [94]. In Asia, South Korea and Japan have fabricated relevant laws and regulations to protect rural cultural heritage and provide systematic insurance for rural heritage interventions from the government layer [95]. In China, current policies are mainly focused on the comprehensive consideration of rural construction at the scale of the entire country, thus lacking adaptability and flexibility for various types of local practices with different specific conditions [96]. At the same time, through vigorously developing villages, the benefits driven by excessive commercialization can lead to homogenization of the local landscape, ignoring the importance of heritage and community division. These practices require the local government and community to coordinate in macro control and micro implementation. In consideration of the eight studied cases, we propose the following political suggestions for protecting and studying rural industrial heritage:

- (1) The government needs to consider the actual local situation, formulating laws and regulations regarding the protection and re-use of rural industrial heritage in accordance with the local landscape, economy, population, historical, and cultural characteristics. The local mountains and water nature protection work should be brought into the same law insurance system as heritage protection, in order to lessen the cognitive divergence and behavioral failures due to difference in protection objects.
- (2) The local government should establish a consensus on heritage-centered regional environmental protection and the inheritance of historical and cultural values for all stakeholders involved in the heritage intervention, as well as improving the implementation, supervision, and dynamic adjustment mechanisms.
- (3) Local community organizations are encouraged to assume core liabilities for the protection and re-use of rural heritage. The community organizations play an important role in soliciting and communicating the wishes of local residents, interpreting and implementing government policies, and adjusting the interest demands of investors. As the local citizens and community organizations own the established territorial cognition and cultural awareness, their suggestions for the intervention program have an important effect on retaining the authenticity of local landscape environment.
- (4) The local government should establish special funds to cultivate more professional talents devoted to the research and protection of rural heritage. Community organizations should be responsible for constructing communication platforms between universities, social groups, and local residents. A multi-level mechanism led by the

government, involving community organizations, professional knowledge forces, and the cooperation of local residents, not only can extend the social value of rural heritage interventions, but may also promote rural sustainable development.

5. Conclusions

Mountains and water directly or indirectly determine the type, location, layout, production technology, and production relations of rural industries. Therefore, consideration of mountains and water is a pre-requisite for local industrial production. Rural industries reflect the processes of adaptation, re-construction, and re-use with regard to specific local conditions. With urbanization, abandoned workshops, storehouses, quarries, and facilities are key to defining local identity and recording the interactions of locals with mountains and water. The influences of mountains and water are still important in the conservation and renewal of these heritage sites today.

As a traditional living and production strategy of locals, “depend on mountains and water” has shaped the local characteristics of rural industrial heritage, in terms of geographical space, functional, and spiritual aspects. The common characteristics of these heritage sites are the organic separation of production and living spaces of the settlement through rivers or terraces, the formation of a free spatial layout and texture along with the topography, and integration with the surrounding environment. The different production resources provided by mountains and water determine the diversities of production techniques and spatial scales. The direct and indirect functional and spiritual roles of mountains and water on rural industrial heritage were found to change significantly before and after regeneration; in particular, the functional roles became weak while the spiritual roles became significant, especially the roles of mountains and water together with heritage in forming an overall sustainable landscape, which became very prominent after regeneration. In the regeneration patterns, the unfavorable conditions of mountains and water environment were repaired by radically changing, maintaining, or adding functions to rural industrial heritage. The interactions between mountains, water, and the public were strengthened, leading to re-development of the local community’s cognition of mountains and water. From the perspectives of the natural landscape, production techniques, and cultural environment, these three patterns reflect the contemporary progressive significance of mountains and water with respect to rural industrial heritage; that is, a new ecological relationship involving symbiosis and mutual benefit between people, heritage, nature, and local communities.

Through the present study, the following conclusions were obtained:

- (1) As prominent natural elements, mountains and water shape the regional characteristics of rural industrial heritage, from the aspects of geometric spatial relationships, production functions, and their emotional influence on the local people.
- (2) The attribution of mountains and water differed before and after the regeneration of heritage. Ecological habitat protection, landscape aesthetic function, and the sense of belonging brought by geographical indications have become more and more important in the regeneration of rural industrial heritage. The recognition and protection of rural industrial heritage value should, therefore, not break away from the original environment.
- (3) In the regeneration process of rural industrial heritage, changing its function can serve as a means to construct the sustainable mode of synergic development of landscape environment, heritage, local residents, and communities.
- (4) In light of different conditions, there is no common mode for protecting and re-using rural industrial heritage, and the best outcome of heritage intervention is for local people and tourists to experience and obtain happiness and cultural identity based on an identifiable natural environment.

As there exists a variety of rural industrial heritage elements in China with wide distribution, in this study, we only selected eight case studies with different geometric conditions and functions. The analysis started from a traditional discourse on “Depend on mountains and rivers”, but the specific landscape contributions and value characteristics

of rural industrial heritage were not sufficiently analyzed. In future work, two aspects should be focused on: one involves vertically expanding the historical research, in order to fully excavate the relationship between rural industry and local social and cultural aspects in the development process from traditional handicrafts to modern rural industries, establishing theoretical discourse on rural industrial heritage as the local cultural landscape. Meanwhile, the other aspect involves studying rural industrial heritage for classification, analyzing the influence of different types of rural industrial heritage on local natural and cultural environments.

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