Digital Protection of Regional Cultural Landscape: A Case Study of Mani Heap in Riwoqê County, Tibet

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Abstract: The landscape of Mani Heaps is an important carrier for the study of the culture and history of the Tibetan people. Which accompany the development of economic and tourism, in a time of great social and environmental change brought about by continued urbanization in China, it is of great significance to protect regional landscape by digital means. This paper aims at the digital preservation of the landscape based on its ethnicity and locality. Digital reconstruction of Mani Heaps are realized by using digital technologies such as geographic information, data visualisation and 3D modelling, geographic information and then the geographical distribution and Tibetan cultural characteristics of the Mani Heaps are analysed and studied, so as to promote the digital preservation of the Mani Heaps culture.

1. Introduction

The landscape is a humanistic scene created by people relying on the natural environment, which not only reflects the technical, ideological and aesthetic characteristics of each nationality, but is also an important carrier for studying the integrated role of each nationality's culture in its geographical expression. With the development of Chinese society and the continuous advancement of urbanization construction, the inheritance and regional environment of some ethnic landscapes have been impacted, and even the phenomenon of "cultural convergence" has occurred. A large number of modern-style architectural forms have entered the construction of towns in various regions, and the regional environment on which the heritage and development of the landscape depend is gradually shrinking. The regional characteristics and national features of the landscape are under real or potential threat.

The analysis and conservation of landscapes through digital technologies have become an important direction in current landscape research work. Digital technologies are now relatively mature, and their rapid development have provided more diverse approaches and platforms for research on the preservation and dissemination of ethnic culture. At present, some countries have made successful attempts to preserve and disseminate their traditional landscapes through digital means, effectively preserving and passing on their traditional cultures. In Japan, virtual reality technology was used to create digital archives of "Toshodai Temple" through SGIOnyx2 Infinite Reality image workstation, recreating a virtual three-dimensional scene of the temple with real-time interactive capabilities, which allows visitors to complete a tour of the temple through this virtual system [1]. In China, Dunhuang research has used non-contact 3D digitizing, computer image processing and 3D modelling to digitally capture and virtually recreate the architectural landscape, precious statues, murals and documentary texts of Dunhuang, establishing a complete database of Dunhuang documents and cultural heritage archives [2,3].

However, some of the current research on the digital preservation of ethnic landscapes is biased towards digital technology, and humanities academic research cannot be effectively combined with digital technology, only digitally recording the appearance characteristics and quantity of cultural landscapes, ignoring the intrinsic cultural values of cultural landscapes and the great advantages of digital means in passing on and promoting culture. Digital studies of cultural landscapes should not exist in isolation, but need to explore the value of the data and highlight the relevance and logic of the data. This paper takes the digital protection of Mani Heaps in Tibetan as a case study, to explore the digital protection research methods of ethnic landscapes under urbanization, so as to promote

the inheritance of excellent ethnic culture.

2. Digital preservation of cultural landscape for research objectives

Cultural landscape is the result of long-term development of human history, and through the continuous integration and precipitation of cultural characteristics in different historical stages in the same region, the multiple cultural attributes and characteristics of cultural landscape are formed. As a product of locality, cultural landscape is always influenced by the natural geographic environment of the region in the process of generation and development, and the landscape of each nationality in different regions shows rich diversity. Therefore, in the study of digital preservation and dissemination of today's ethnic landscapes, the core objective is to scientifically record and analyze the cultural characteristics and interconnections of landscape ethnicity and regionality.

Mani Heaps are mainly made up of stone Heaps of Mani stones, combined with elements of Tibetan culture such as the turning cylinder, wind and horse flags, rubbing kang and stupas, and incorporating the ritual activities of Tibetan people praying for blessings, which is one of the representatives of Tibetan national cultural products as shown in Figure 1. In the process of constant carving, stacking and praying, the mani heaps accumulate cultural elements such as art, beliefs, symbols and values, which constitute a cultural landscape integrating material and non-material culture. The unique plateau geography and social environment of the Tibetan Plateau region, where the cultural landscape of Mani Heaps is located, has had a profound impact on the cultural landscape of Mani Heaps. With the development of urbanization and industrialization in the Tibetan region, the original natural environment and socio-economic activities in the Tibetan region have undergone major changes. Many villages with Mani Heaps have become hollow villages. Mani Heaps located in grasslands, mountains and other areas where people are less active are even gradually being abandoned, and Mani stone carving techniques are also at risk of being lost. Therefore, in the study of the digital preservation and dissemination of the Mani Heaps, this paper aims to explore and reconstruct the ethnic and regional characteristics and values of the Mani Heaps based on Tibetan culture and the plateau geographical environment, focusing on the integrated links between Tibetan culture, Tibetan geographical environment and the Mani Heaps.

Figure 1 A traditional mani at a high altitude grazing land of Tibetan Plateau.

3. Research framework for digital preservation of cultural landscapes

The creation and development of cultural landscapes is influenced by both national culture and the natural environment. According to the regional and ethnic research objectives in the study of

landscape digitisation, the landscape can be analysed and studied in terms of its structural characteristics and functional properties on two levels: the ethnic culture and the geographical environment. Riwoqê County in Tibet is an important concentration of Tibetan Buddhism, where the landscape of Mani Heaps are large and rich in form, with an overall good state of preservation. Riwoqê County has a typical highland geography and a mixed farming and herding lifestyle, and the structure and functional characteristics of the Mani Heaps are clearly influenced by the unique geography and social environment of the region. The framework of the study is shown in Figure 2, in the field study of the Mani Heaps in Tibet during 2020, this study uses aerial photography, panoramic cameras, 3D scanners and interviews with local residents to digitally record and study the structural features and functional attributes of religious elements, geographical distribution, ethnic elements, scale of form and function, based on both ethnic culture and geographical environment.
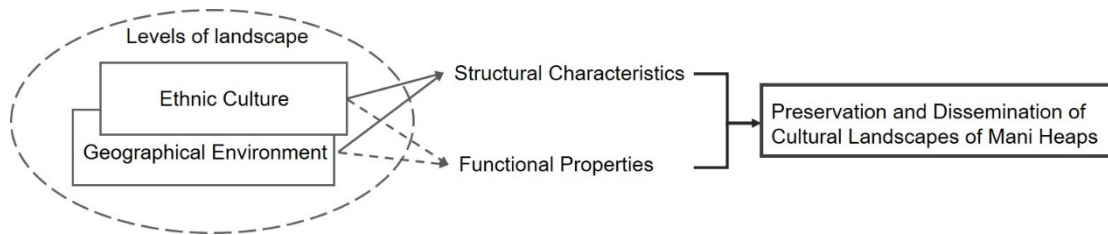

Figure 2 A research framework for digital preservation of mani heaps

4. Visualization study of digital preservation of cultural landscape

Visualisation is an important component of digital analysis and conservation of cultural landscapes. In this study, ArcGIS 10 is used as a geographic information analysis platform to transform the longitude and latitude information of the Mani Heaps landscape data obtained from the research into point elements with coordinate information, and integrate them into the geographic base map of Riwoqê County. The spatial distribution characteristics, surrounding geographic information, temples, settlements and other elements of the Mani Heaps landscape in Riwoqê County are visualised in ArcGIS 10 through the kernel density analysis module, and the results are shown in Figure 3-a. Through MAYA software, the stone carvings, transcendental cylinders, rubbings and stupas of the Mani Heaps landscape are modelled in 3D based on the digital collection data of the Mani Heaps as well as fieldwork and local human geographic information, as shown in Figure 3-b.
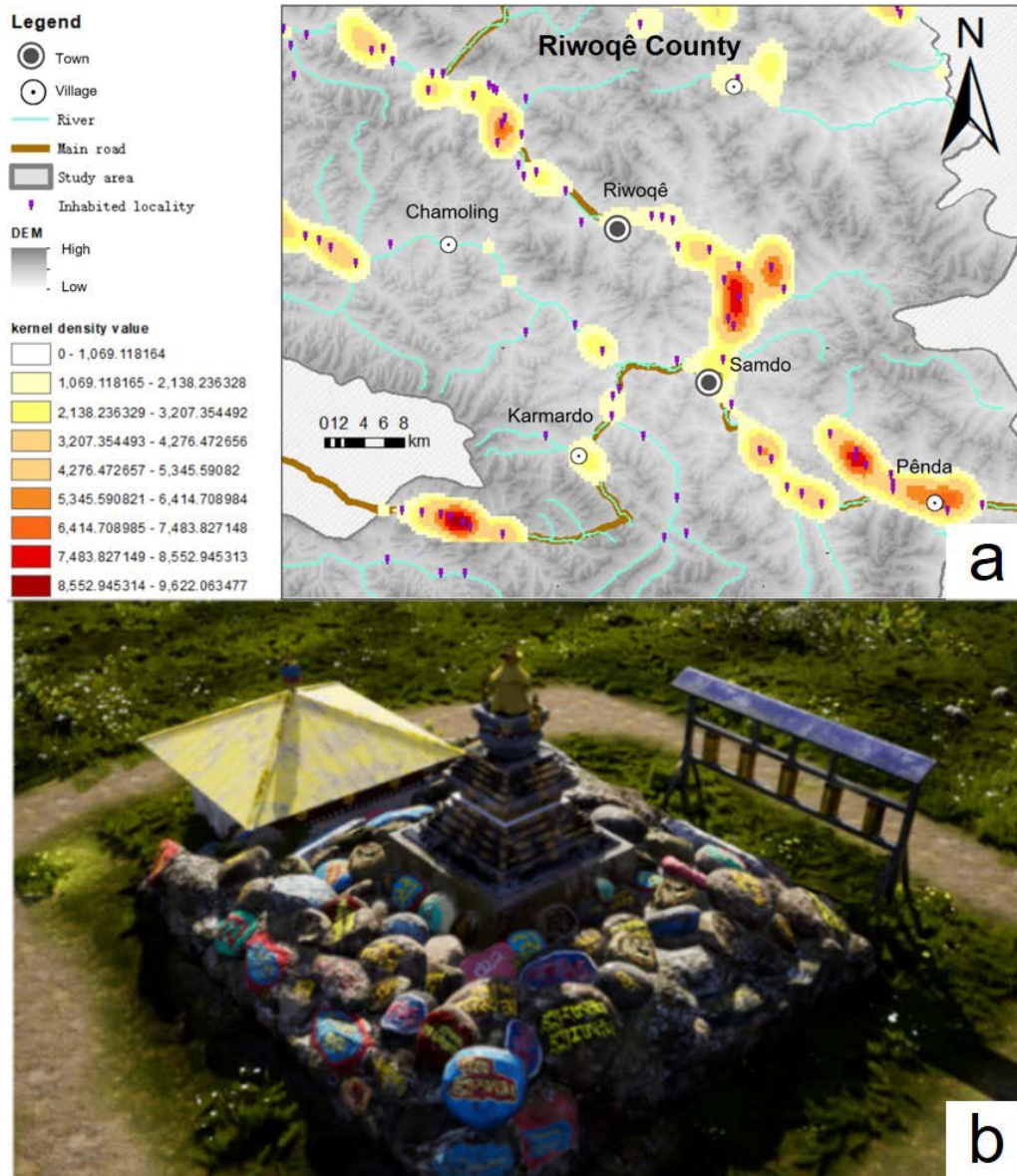
Figure 3: (a) The kernel density analysis module of mani heaps

(b) A 3D model of a mani heap

In the visualisation of Mani Heaps landscapes, 78% of the Mani Heaps landscapes are located in populated areas such as towns and villages, while 22% of the Mani Heaps landscapes are located in sparsely populated areas such as natural pastures and woodlands. Mani Heaps located in towns and villages are generally large in scale, with more than 20 covering an area of over 100 square metres, and generally have Buddhist elements such as meridians, wind and horse flags, rubbings and stupas, and their overall distribution is also based on town settlements as the core and gradually dispersed along the transport routes. Mani Heaps in natural meadows and woodlands are small in scale, generally covering an area of less than 50 square metres. They are usually located at road junctions, mountain passes and pastureland intersections, serving as roadsides and boundary markers.

5. Summary

In the environment of rapid social and economic development, landscape, as an important combination of national culture and natural environment, has been affected by the changes of social and natural environment brought about by modernization and urbanization. In the study of digital

analysis and protection of cultural landscape, it is particularly important to study and display the national and regional characteristics of cultural landscape. In addition to the scientific recording and reconstruction of landscape features, digital technology should also aim to explore the deeper cultural and natural connotations contained in cultural landscapes. Through the digital case study of Mani heaps in Tibet, this study hopes to further explore the digital preservation research methods of such cultural landscapes systematically based on the study and preservation of Mani heaps.

Acknowledgement

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