Research on Location Characteristics of Traditional Settlement of Ethnic Groups in the Hainan Island Based on GIS Technologies

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Abstract. Language is an important material carrier of national culture. Based on the language zoning of Hainan Island and combined with Google Earth, GIS technology and field research, the writer used overlay and statistics methods analyzed the key indicators of the traditional settlement such as altitude, slope, waterfront distance and landforms. The characteristics of the traditional settlement of the ethnic groups in Hainan Island are summarized as follows: 1. Compared with the Han nationality, the settlements of the Li and Miao ethnic minority are located on a higher altitudes and a larger slope. 2. Most of the settlements are located on the coast or the riverside. 3. The main landform of the ethnic groups differs from each other. It reveals that the basic characteristics of the traditional settlement in Hainan Island are based on the natural and multi-cultural environment, which provides a theoretical basis for the protection and development of traditional settlement and ecological civilization in Hainan Island.

1 Introduction

Hainan Island is located in a tropical climate zone. The central island's topography is higher than the surrounding plains, forming a pyramidal topography of "mountain-hill-tableland-terrace-plain-shoal". Affected by the topographical condition, the island generates a distinct regional differentiation within the limited geographical space. The geographical elements such as climate, plants and soil on the island have obvious vertical and horizontal zoning characteristics [1], which formed a complex and varied Island. This natural environment can be beneficial for the animals and plants' survival and reproduction, and also provides a variety of living environment choices for human activities. The ethnic groups of Hainan Island select the settlement location based on their own survival, development needs and cultural characteristics. Combined with the unique natural environment and the living choices of local people, a special traditional settlement landscape that has regional features is formed.

2 Land development process and formation of language zone in Hainan Island

Throughout the land development process of Hainan Island, immigrants played a vital role in the development of Hainan Island. During the primitive society, the aborigines of Hainan Island, mainly the Li people, lived in

the low hills and the coastal plains of the island, and carried out preliminary development of Hainan Island. With the frequent wars in the Central China and the strengthening of the central authorities' jurisdiction over Hainan Island, spontaneous or officially organized immigrants have continuously flooded into Hainan Island. Hence, the population and the land development has increased. During the Han-Tang dynasties, the Han people of the Central China had explored the northern and western parts of the island. In the Song-Yuan dynasties, the Hoklo immigrants exploited the underdeveloped eastern part of the island. Gradually, the development of the coastal plains around the island reached saturation. During the Ming-Qing dynasties, the development of Hainan Island gradually shifted to the central mountains [2]. On this basis, the cultural exchange between different ethnic groups has never been on an equal stage. Specifically, the aggressive Han people basically occupied the better living environment, while the Li ethnic minority and other ethnic groups on the weak position gradually retreated from the plains to the hills, and even moved to the mountains, created isolate cultural barriers by using natural terrain. Ultimately, the formation of the ethnic groups settlement of the whole island with six major language divisions has been formed [3]. Among them, the western and the northwest parts of the island are Lingao dialect area, multi-language area and Hakka dialect area, the eastern parts is the Minnan dialect area, and the central mountain area is the Li language area and the Fan dialect area. This distribution pattern shows the distinct characteristics of the same ethnic groups live

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together in general, but mix with each other in some areas [4].

Figure 1. Immigration migration and dialect map of Hainan Island.

Figure 2. The distribution of the research samples.

3 Comparative analysis of traditional settlement location

According to the language zone, the ethnic zoning of Hainan is formed, and the traditional settlements of different language zones are screened and counted by GIS in combination with the list of traditional Chinese villages, the list of Hainan historical and cultural villages, cultural relics protection units, records of places and google earth satellite maps. In each language zone, representative traditional settlement with complete historical landscape are equally selected as the research samples with a number from 15 to 20, and 94 in total, covering all cities and counties in Hainan province. In addition, by collecting and consulting historical documents, field research as well as key information of the research samples, the important factors affecting the location characteristics of settlements were determined, so that a sample database was established. Finally, overlaying and statistical analysis by GIS thematic map, every factor is visualized.

3.1 Analysis of the altitude of settlements

Through analysis, the characteristics and differences of the altitude distribution of the settlements in each

language zone are as follow: (1) The settlements in Minnan dialect area and Lingao dialect area are mainly distributed in the elevation from zero to 100 metres, and settlements with an elevation from zero to 50 metres account for more than 50% of the total in the zone. (2) The settlements in the multi-language area are all distributed below an elevation of 30 metres. (3) The settlements in the Hakka dialect area are mainly distributed between an elevation from 100 to 200 metres, and the distribution of others is in the elevation from 50 to 100 metres or from 200 to 300 metres. (4) The settlements in the Li language area are mainly distributed in the elevation from 100 to 350 metres, and the others with only about 6% are distributed between 50 and 100 metres. (5) The settlements in the Fan dialect area is mainly distributed between an elevation from 100 and 200 metres and above 300 metres, which accounts for approximately 50%. It can be seen that the overall altitude of the Han nationality is the lowest, followed by the Li ethnic minority's and the Miao ethnic minority's is highest. Moreover, among the Han ethnic groups, the overall altitude of the multi-language area is lower than the Minnan dialect area and the Lingao dialect area. The altitude of the Hakka dialect is higher.

Figure 3. Altitude distribution of the research samples.

Figure 4. Altitude data statistical analysis of the research samples.

3.2. Analysis of the slope of settlements

According to the topographic data, overlaying and statistical analysis of the slope shows the following results: (1) The slope of settlement in the Minnan dialect area is mainly 0-5 degrees, accounting for 75% of the total, and the others is 5-10 degrees and 10-15 degrees, which accounts for 19% and 6% respectively. The average slope was 4.4 degrees. (2) The slope of settlement in Lingao dialect area is mainly below 10 degrees, and the others with only about 13% is 10-15 degrees. The average slope is 5.8 degrees. (3) The slope of settlement in Multi-language area is mainly 0-5 degrees, accounting for 87%, and the average slope is 2.7 degrees. (4) The settlements in Hakka dialect area are similarly distributed in the slope from zero to 5 degrees and from 5 to 10 degrees, accounting for 39% each, and the others with 22% are

distributed in the slope from 10 to 15 degrees. The average slope is 6.5 degrees. (5) The slope of settlement in the Li language area is mainly 0-5 degrees, which accounting for 50%. Some others are distributed in the slope from 5 to 10 degrees and from 10 to 15 degrees, accounting for 25% respectively. The average slope is 6.2 degrees. (6) The slope of settlement in the Fan dialect area is mainly 5-15 degrees, with 36% of 5-10 degrees and 43% of 10-15 degrees. The average slope is 8.5 degrees. It can be seen that in addition to the settlements in the Hakka dialect area, the overall slope is smaller than that of the Li and Miao ethnic minority. Among them, the Han settled in the most flat, followed by the Li ethnic minority, the most steepest is the Miao ethnic minority. In addition, among the Han ethnic groups, the location of the Multi-language area is the most gradual, followed by the Minnan dialect area and the Lingao dialect area, and the Hakka dialect area is the steepest, similar to the Li and Miao ethnic minority.

Figure 5. Slope distribution of the research samples.

Figure 6. Slope data statistical analysis of the research samples.

3.3. Analysis of the waterfront distance of settlements

According to the river system data of Hainan island, the 2km buffer zone of the coastline and the 0.5km and 1km buffer zone of the river were respectively established to find out the relationship between the settlements and the river or coast, and the following results were obtained by superimposed analysis as follow: (1) Most of the settlements are located on the coast or the riverside, the settlements far away from the river are mainly located in the central part. (2) the settlements in the Minnan dialect area are within the coastline and the 0.5km river buffer zone, accounting for 33% and 45% respectively, the others with 11% are outside the river buffer zone. (3) the settlements in Lingao dialect area and Multi-language area are within the coastline and river buffer zone, with a small

number of samples distributed outside the river buffer zone. (4) Settlements outside the river buffer zone in the Hakka dialect area make up 47%. (5) The settlements in the Li language area are all within the 0.5km and 1km river buffer zone, accounting for 73% and 27% respectively. (6) the settlements in the Fan dialect area are mainly within river buffer zone, and settlements with 28% are outside river buffer zone. Therefore, it can be seen that the geographical location of the ethnic groups has a tendency to distribute on the coast and near the river. Among them, the location of the settlements in the Li language area is most closely related to river, and the location of the settlements in the Hakka dialect area is the most distant from the river. In addition, the location of the settlements in the Minnan dialect area, Lingao dialect area and Multi-language area tend to near the sea, which makes the settlements have obvious maritime characteristics.

3.4. Analysis of the landform of settlements

According to Hainan Landform Division and Classification[5], Hainan terrain types are roughly divided into marine deposition plains, alluvial plains, marine accumulation plains, river terraces, lava tablelands, erosion-denudation tablelands, hills, and mountains. The settlement results can be summarized as follows: (1) The settlements in the Minnan dialect area are mainly located on the marine deposition plains and the lava tableland, accounting for 39% and 28% respectively. (2) The settlements in Lingao dialect area are mainly distributed on the lava tablelands, accounting for 53%. (3) The settlements in Multi-language area are mainly distributed in the plains, of which the marine deposition plains account for 74%, and the alluvial plains and marine sedimentary plains account for 13% respectively. (4) The

Hakka dialect area is mainly distributed in the erosion-denudation tablelands, accounting for 88%, and a small number of settlements are distributed in the marine sedimentary plains and hilly areas. (5) The Li language area is concentrated in the erosion-denudation tablelands, hills and mountains, each proportion is 33%, 20%, 40%, scattered in the river terraces. (6) Fan dialect area is mainly distributed in mountainous area, accounting for 58%, partly distributed in river terraces, erosion-denudation tablelands and hilly areas, each proportion 14%. From the above analysis, it can be seen that the location of the site of the Lingao, Multilingual, Hakka, and Fan districts is dominated by a single type, and the geographical locations of the settlements in the Minnan and Li language area are balanced. In addition, the main landform types of settlements in each language zone have obvious differences, which promote the formation of settlement diversity.

4 Influence factors of site selection

The influencing factors of settlement location are intrinsically related to the economic production mode and producing technique conditions adopted by each ethnic groups. Among them, the Han people generally adopt intensive farming mode, and tends to locate in flat and open plains, while the Li and Miao ethnic groups use extensive ploughing mode, they tend to be live in the

valleys of the dense forests and help them to farming, fishing and hunting and other original production methods[6]. Moreover, corresponding to the immigration migration and land development sequence, the ethnic groups moving into the island in the process of competing for high-quality living resources, with more advanced production technology, have the priority of occupying best environmental resources. The immigrants who moved into the island in the Han Dynasty have mastered advanced farming techniques and used ironware to carry out production activities and been much more civilized

than other ethnic groups. At the same period, the Li people were still in the primitive society. So that the Han people had obvious advantages in the process of competing with them. Therefore, the Li people had to move from plain area to mountain area, and the location condition of the Miao people that moved in next period were even worse. Finally, the overall distribution pattern of locations is that the Han nationality is around the island, the Li and Miao ethnic minority is in the middle of the island.

5 Conclusions

1. Through the analysis of the key indications of traditional settlement site selection, it is believed that under the joint action of natural geographical conditions, land development sequence and immigration culture, the settlements of ethnic groups in Hainan show the characteristics as follow: 1. The vertical distribution of the Han nationality is located on a lower altitudes and a smaller slope than the Li and Miao ethnic minority. 2. Most of the settlements are located on the coast or the riverside. 3. The main landform of the ethnic groups differs from each other.

2. The unique location of the traditional settlements of various ethnic groups in Hainan Island provides a rich natural base for the settlements development, promotes diverse landscape formations and enriches landscape resources with regional features, which is an important part of the ecological civilization of Hainan Island.

3. The location of traditional settlements reflects the harmonious of man-land relationship, reveals the interaction between ecological and cultural diversity, it has significance reference for the international tourism island with a distinctive island ecological civilization.

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References

1. Yao, Q.Y. (1983) Relationship between landforms of Hainan Island and other natural conditions. *Tropical Geography*, 04: 35-39.
2. Situ, S.J. (1987) *Land Development Research in the History of Hainan Island*. Hainan Publishing House, Haikou.
3. Xu, S.J. (1988) *Nature, History, Current Situation and Future of Hainan Province*. The Commercial Press, Beijing.
4. Liang, Y.G. (1984) Classification of Chinese Dialects in Hainan Island, Guangdong Province. *Dialects*, 04: 264-267.
5. Yuan, J.P., Yu, L.S., Deng, G.Q., Li, T., Bi, H., Zhao, Z.Z. (2006) Geomorphologic Division and Classification of Hainan Island, *Natural Science Journal of Hainan University*.24 (04): 364-370.
6. Yang, L.G. (2002) Ecological Effect Analysis of Historical Population Economic Activities and Industrial Structure Evolution in Hainan. *The New Orient*, 11 (03): 91-95.