Traditional Settlements Study on Sciences of Human Settlements in Erhai Lake Region

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Abstract. Five systems of sciences of human settlements are adopted in this paper. The research objects are Malong site of Cangshan Mountain, Nanzhao Taihe City site, Dali Ancient City, Xizhou Ancient Village, Shuanglang Ancient Town and Jinsuo Island Village. All the research objects are near the Erhai Lake region and they are traditional settlements with different historical periods. The natural, human, social, residential and supportive systems of traditional settlements are analyzed as well. The environmental and ecological view of complying with nature, the social and economic view of emphasizing development and the cultural and technical view of embodying characteristics of traditional settlements in Erhai Lake region are also concluded. This paper offers theoretical references for the sustainable development of traditional human settlements.

1. Introduction
The Greek scholar C.A. Doxiadis put forward the concept of human settlement[1] to study the relationship between man and environment. The emphasis of this concept is to treat human settlement as a whole and study human settlement from a comprehensive system including political, economical, social, cultural and technical aspects. Mr. Wu Liangyong put forward the definition of sciences of human settlements[2]. Mr. Wu also points out that the places of human settlement are closely related to human existing activities and are bases where we people need to live by. In the meanwhile, the places of human settlement are the main places for human to make use of and reform the nature. Human settlement interacts with and exerts impact on different levels of natural, human, social, residential and supportive elements to form the colorful culture of human settlement. Settlement is a spatial area for human. It is also a production of social activities, social organization cultures, social relations and common lifestyles of a certain area formed by people. Besides, settlement is a representative of the relationship between man and the area[3]. Traditional settlement shows the historical changing and development of human settlement in different regions. Erhai Lake area has unique natural conditions and ethnic cultures, forming some colorful traditional settlements with specific features. This study is about rich sciences of human settlements and it exerts great impact on sustainable development of settlement in the contemporary era.
2. Research objects
The research objects in this paper are traditional settlements with different historical periods near Erhai Lake, namely Malong site of Cangshan Mountain, Nanzhao Taihe City site, Dali Ancient City, Xizhou Ancient Village, Shuanglang Ancient Town and Jinsuo Island Village. Comparative analysis is carried out to analyze the site selections, sociocultures, cultures and technologies of the traditional settlements in order to discuss the features of these traditional settlements.

Figure 1. Location map of research objects
Source: spatial data modified from Google Earth (20 January 2019)

Table 1. Features of research objects (All the contents in the table were organized by the author)

| Research Object          | Position                                      | Altitude (m) | Firstly built period | Morphology and Characteristics of the settlement                                                                 |
|--------------------------|-----------------------------------------------|--------------|----------------------|---------------------------------------------------------------------------------------------------------------|
| Malong site of Cangshan  | At the foot of Malong Peak of Cangshan Mountain. Near Long Brook and Qingbi Brook.       | 2266         | Before Nanzhao period | Mountain settlement; Rectangle pattern, built on the tableland of Cangshan Mountain; Six gates in the outer city; East and West Gate in the inner city; Ditches both in outer and inner city; The unearthed potteries are of characteristics of the central plains. |
| Mountain                   |                                              |              |                      |                                                                                                               |
| Nanzhao Taihe City site   | Between Ma’er Peak and Foding Peak of Cangshan Mountain. Tingming Brook flows through the site. | About 2100   | During Nanzhao period | Flat terrain settlement; Divided into inner city, imperial city and outer city; Semi-circle Wengcheng (enclosure for defense outside the inner city gate); South-north street is in front of Nanzhao Dehua Stone Tablet with stone and wood as the main building material; Outer city walls are built by black sludge and gravels; Foundation site, well and ditches are still preserve to this day. |
| Dali Ancient City         | Near Zhonghe Peak in the west, near Tao, Mei, Central and Lvyu Brooks.                   | About 2000   | During Dali Kingdom period | Flat terrain settlement; Square pattern, locates in the west, facing the east side; Many streets and roads are divided by the main streets from south to north, from east to west, just like a chessboard; Four gates with watchtowers and crenels and moats are out of the city; Complete streets pattern are preserved until now. |
| Xizhou                    | Cangshan                                      | About        | During               | Flat terrain settlement; Like a dough                                                                          |

Table 1. Features of research objects (All the contents in the table were organized by the author)
3. Discussions

This paper uses five systems (namely natural, human, social, residential and supportive systems) in the sciences of human settlements trying to analyze the sciences of the human settlements in traditional settlements near the Erhai Lake region.

3.1. Natural system

The whole natural and ecological environment is the basis for settlements to product and function. It is also the place for human to settle down and get on with their pursuit. Cangshan Mountain (with nineteen peaks and eighteen brooks) and Erhai Lake are natural environment offering abundant natural resources for the local people. Enough sunshine and the pleasant climate make Cangshan-Erhai region a livable place for human all the time.

Malong site of Cangshan Mountain locates at the west side of Erhai Lake and it is at the foot of Malong peak of Cangshan Mountain. Long Brook is on its north and Qingbi Brook on its south. Nanzhao Taihe City site locates between Ma’er peak and Foding peak of the Cangshan Mountain. It is actually on a slope of a narrow east-west alluvial fan. This site is higher, steeper in the west and lower, plain in the east[4]. Besides, Tingming Brook flows through the site. Dali Ancient City is near the foot of Cangshan Mountain on the west and near Erhai Lake on the east. Tao and Mei Brooks are on its north while Lyu and Long Brooks on its south[5]. Xizhou Ancient Village shares its border with Wutai Peak on the west, and is close to Erhai Lake on the east, also close to Wanhua Brook on the north. It locates in the flat area with fertile lands[6]. Shuanglong Ancient Town is connected to Jizu Mountain on the east and near Erhai on the west. Village of the Jinsuo Island locates in the southeast of Erhai Lake, and is surrounded by water. In the past, people selected places with waters and mountains for their traditional settlements because the natural conditions provided people with necessary material guarantee for living.

3.2. Human system

Human are the reformers of the nature and the creators of the mankind society. The human system indicates all the people live in a certain area. Its emphasis is on the mechanism and principle analysis of material needs, physical, psychological needs and behaviors. People built houses to live. They built

| Ancient Village | Mountain on the west and Erhai Lake on the east, Wanhua Brook on the north side. | 1980 | Yuan and Ming Dynasties | centered by Square Street stretching out; Street ditches are connected; Commercial stores on the main street; Zhengyi Gate, Dong’an Gate, Bai people’s building complex, ancient wells and trees are preserved. |
|-----------------|---------------------------------------------------------------------------------|------|----------------------|----------------------------------------------------------------------------------|
| Shuang-lang Ancient Town | Border with Jizu Mountain on the east and near Erhai Lake on the west | About 1970 | During Ming and Qing Dynasties | Waterfront settlement; Zonal distribution; Locates at the bottom of mountain, facing water; Yuji Nunnery, Fetyan Temple, Kuixing Pavilion, drama stage, Bai people’s courtyards are preserved until now. |
| Jinsuo Island Village | An island in the southeast part of Erhai Lake, surrounded by water | About 1970 | During Ming and Qing Dynasties | The central area is the middle part of the island, zonal distribution; 30 meters of altitude difference; Witnessed the Neolithic Age, Nanzhao period; Residence are all fisherman; Tourism is the main industry nowadays; Zhenhai Temple, Wanghai Pavilion and Nanzhao King summer palace are preserved. |
high walls, moats and other things to satisfy their security needs. Different needs made people form their different settlements and architectural spaces.

Malong site of Cangshan Mountain has ditches both in the inner city and in the outer city. Six gates were designed in the outer city, namely the northeast, east, west, southwest and south, southeast gate. East and west gates were designed in the inner city. Nanzhao Taihe City has inner city, imperial city and outer city[7]. Dali Ancient City seems like a regular square with four gates. Watchtowers, crenels were designed as well. Besides, moats are outside the city[8]. Xizhou Ancient Village looks like a dough with the Square Street as the center stretching outside[9]. Zhengyi Gate and Dong’an Gate are still preserved until now. Shuanglang Ancient Town is zonal distributed. The ancient street is in parallel with the coastline of Erhai Lake from south to north[10]. Jinsuo Island Village is centered by the central area of the island with zonal distribution. The different spatial arrangements of traditional settlements show that people have different needs and characteristics in different social and cultural periods under various natural conditions.

3.3. Social system

The social system of human settlement environment represents the public administration, laws, social relationship, population tendency, cultural characteristics, social differentiation and economic development etc. The social needs of people need to organize all kinds of relationship including families, different families, ages, classes or even local people and foreign guests. The final pursuit is to promote the harmonious and happiness of the whole society.

The ditches-design in Malong site reflects the flood prevention awareness and the gates, moats’ design shows the security needs of Malong people during the Neolithic Age. The site of Nanzhao Taihe City emphasizes military defense with different sections of various classes. Semi-circle wengcheng (enclosure for defense outside the inner city gate) was designed for the inner city. The core region of this site is the west part of the East Partition[11]. Except for the security defenses such as walls, moats, Dali Ancient City embodies its governing office in its sectors in order to show its core position during the Qing and Ming Dynasties. Xizhou Ancient Village was called Dali City in ancient times, yet the development of commence injected it with new innovation in the architectural and decoration techniques for Bai people’s building complex development. With the promotion and development of today’s tourism, Shuanglang Ancient Town and Jinsuo Island Village have changed their morphology of the settlements. The development of traditional settlements in various social and historical periods shows great impact on the morphological development and changing of the settlement spaces.

3.4. Residential system

Residential system of human settlement means housing, community facilities, city downtown and so on. It also means the useful material environment and artistic features for human system and social system.

From the archaeological and cultural layer as well as the unearthed relics, it is easy to predict that the local people in ancient times live by the side of the brook or far away from the brook. The building material of the imperial city and outer city is stone in Nanzhao Taihe City site. However, the building material inside the palace of Jingang City is basically wood. Many reliefs such as foundation site, wells and ditches are still preserved until now. There are three main streets from south to north and six roads from west to east in Dali Ancient City. These roads and streets divide the ancient town into different parts. The main residential complex is courtyard here. Shuanglang Ancient Town is near the Cangshan Mountain on its back and near Erhai Lake on its front. Bai people’s courtyard is the main residential building style in Shuanglang. Nowadays, the people in Shuanglang strive for better view in order to develop tourism. The traditional villagers who live in Jinsuo Village gather in the central area of the island, and they live in single lane courtyards. Because of the development of tourism, the east coast of the island develops comprehensive residential buildings combining accommodation and entertainment.
The Residential system and public infrastructure of different times show the various needs and development that people strive for.

3.5. Supportive system
Supportive system means to provide support for human activities and serve for the settlements. In the meanwhile, supportive system is to connect all the artificial, natural and technical systems together. Economics, laws, education and political systems are to connected as well. There are three principles for Chinese architecture in ancient times: firstly, see the good virtue both in man and thing; secondly, make use of the natural resources; thirdly, make people’s lives prosperous and make the society a harmonious one. The trinity of the three principles is called “Weihe” in Chinese which means to create a space for harmony and pursue harmony in the highest state. The Chinese people also promote a thought called “Harmony in diversity”[12]. This thought is perfectly showed in the traditional settlement’s supportive system in Erhai Lake region.

The unearthed relics from Malong site show some of the characteristics of the central plains. The Nanzhao Dehua Stone Tablet keeps the exchange between its local culture and Han culture during the ancient time. Dali Ancient City makes fully use of the construction thought to build its city pattern, adjusting measures to its local conditions as well. The combination style of cathedral with Bai people’s architectural style can be a good example. The western architectural style appears in the arch over gateway of Bai people in Xizhou Ancient Village. Under the development of the current tourism, the architectural styles of Shuanglang Ancient Town and Jinsuo Island Village show diversified development trend. Supportive system provides important technical guarantee and political system for the development of traditional settlements.

Figure 2. Nanzhao Dehua Stone Tablet, The South Gate of Dali Ancient city, Bai Nationality Residence in Xizhou Ancient Village, Shuanglang Ancient Town Street (All the photos were taken by the author)

4. Conclusion
As above mentioned, the sciences of human settlements on traditional settlements in the Erhai Lake region can be described as follows:

4.1. The environmental and ecological view of complying with nature
The natural source of Erhai Lake region is the Cangshan Mountain and the Erhai Lake. It is the natural climate and geographical condition of the place that form the unique human settlement environment. It is the foundation for development, providing rich material resources for human to live. In the site selection and construction of traditional settlements in the Erhai Lake region, people fully complied with nature and respected nature. Only live harmonious with nature, a livable environment for human settlement can be guaranteed.

Malong site made use of the flat area to build settlement, building ditches to prevent floods. Nanzhao Taihe City site made use of the landform to form a defensive settlement. Dali Ancient City used the flat terrain and abundant water resource to form the political, economic and cultural center at that time. Xizhou Ancient Village took the advantage of its location to develop agriculture and business. Shuanglang Ancient Town and Jinsuo Island Village made fully use of their natural
resources to develop local tourism which shows the recognition and usage of the nature and environment.

To understand and respect nature, we human can coexist with nature in a harmonious way. This is the key to carry out the sustainable development on sciences of human settlements.

4.2. The social and economic view of emphasizing development
Being as the main driving force for the sciences system of human settlements, human system is a double-edged sword. It not only plays out human’s subjective initiative to promote the active development of systems, but also forms an obstacle for the system to prevent the sustainable development of human settlement environment. The only way is to fully make use of its role in order to ensure a perfect sustainable development on sciences of human settlements in the Erhai Lake region.

The inner and outer city in Malong site show the people’s social outlook on the security defence in Neolithic Age. In the meanwhile, the outer, inner and imperial city of Nanzhao Taihe City represent the military defence of settlement system. The spatial structure of social hierarchy of traditional settlement is also represented. The chessboard-like Dali Ancient City shows its function and pattern, embodying the social development and economic condition of that particular time. Because of the impact of modern economic development, Xizhou Ancient Town has the change to develop and perfect its function of settlement. The changing of tourism development of nowadays in Shuanglang Ancient Town and Jinsuo Island Village represents the changes made by traditional settlements to adapt to the current social and economic development.

The focus of social and economic view is development. This focus has become the feature of traditional settlement on sciences of human settlements in Erhai Lake region.

4.3. The cultural and technical view of embodying characteristics
The main residence in the Erhai Lake region is basically Bai people. As one of the minority groups with knowledge-absorbing and culture-absorbing habits, Bai people made this region have the impact on the culture of the central plains.

The unearthed relics from Malong site show some of the characteristics of the central plains. The Nanzhao Dehua Stone Tablet keeps down the influence of Han culture exerting on Erhai Lake region. The spatial pattern of Dali Ancient City shows the witness of Han culture in the past. Besides, the modern Bai residential complex in Xizhou, the new residents in Shuanglang Ancient Town and Jinsuo Island Village all represent the combinations of local culture and foreign culture in different eras. At the same time, the unique culture view has formed. The ditches in Malong site and the walls of Taihe City site all used special materials in their specific position. Dali Ancient City used its terrain to form the double-cross pattern. The building and decoration of Bai people’s residence in Xizhou, the residence inns in Shuanglang and Jinsuo Village shows the unique technical view of traditional settlements in Erhai Lake region.

The featured cultural and technical views have great impact on the development and evolution of sciences of human settlements in Erhai Lake region. Meanwhile, the featured cultural and technical views have become an important part of the local sciences of human settlements.

Traditional settlements have witnessed different historical periods and are of great intelligence of human development. People can offer some referential strategies or methods on the sustainable development of traditional settlements if they get the sciences of human settlements. This can also offer theoretical references for the sustainable development of human settlement in the Erhai Lake region.
Figure 3. Five Systems on Sciences of Human Settlements in Erhai Lake Region (All the pictures were drawn by the author)

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