

Ecological Infrastructure and Urban landscape Identity

— A Case Study of Weihai, Shandong

1 Introduction

It has become an important issue for Chinese cities that they are gradually losing their diversity and unique landscape characteristics in the course of globalization and rapid urbanization. (Wu, 2002; Qiu, 2004, 2005; Ruan, 2004; Cai, 2005). Urban Landscape Identity, regarded as a valuable "rare" resource, is increasingly becoming an important means to the city management and a sharp weapon to compete in the globalization for the local government (Cai, 2005) . Although planning about urban landscape identity has not been formally included in China's planning system, the related planning or research has been developed one after the other in many cities around the country since 1980. Many concepts, theories and methods emerge from these practices (Zhu, 1993 ; Hu, Guo, 2002 ; Jin 2003 ; Cai , 2005). However, there is still no a unified definition and an approach of Urban Landscape Identity conducting the practices at present time. Some scholars state that the problems are in the following three aspects (Li, 2005; Yu, Xi, etc.,2008):

- (1) Over-stress the impact of physical and visual environment while neglect urban natural environment and cultural context;
- (2) Focus mostly on the form and individual characteristics of urban architecture, while ignore comprehensive regional-urban landscape pattern;
- (3) Inadequate integration of the community and public resources in practical work.

2 Theory and methodology

Urban Landscape Identity which is also called urban character is defined as the individual identity of a city which clearly distinguishes it from other cities. It is the combination of the city's natural landscapes and cultural landscape as well as the city's history and social life carried by them. In Chinese context, we generally call it "Feng Mao", which means that it is the "connotation and appearance" of the city. "Feng", which means "connotation", is the abstraction of non-material characteristics of the social and human orientation in a city and the concrete embodiment of city culture like the social customs, local traditions, opera, legend, etc. It is the spiritual sustenance of urban residents inspired by their living environment (Cornelsen and Franz,1995) and the "atmosphere" overwhelming in the urban air according to phenomenologists (Norberg-Shulz, 1979) ; "Mao", which is " appearance ", refers to the overall expression of the physical characteristics of a city and a sum total of the form and space of the whole city and it's a constitution element. "Mao" is the carrier of "Feng". The tangible "Mao" and invisible "Feng" complement each other and organically integrated to form urban landscape identity. (Chi, 1989; Zhu, 1993; Cornelsen,Franz,1995;Taylor,1999;Cai,2005; Chen, Hong,etc.,2006;Yu,Xi,etc.,2008).

The American scholar Garnham (1985) states specifically that urban character is mainly composed of three parts: physical features and appearance, observable activities and functions, and meanings or symbols. He points out that unique character or strong sense of place is often based upon such items as architectural style, climate, unique natural setting, memory and metaphor, the use of local materials, craftsmanship, sensitivity in the siting of important buildings and bridges, cultural diversity and history, people's values, high quality public environments which are visible and accessible and town-wide activities, daily and seasonal, etc.

Based on the theories discussed above, this paper argues that Urban Landscape Identity of a city is mainly determined by its natural process, historical and cultural process as well as its social economic activities. Eventually it reflects the structural and morphological characteristics of the city's landscape, and thus it is characteristic of visual scene, habitat and cultural symbol of the city. It is the object to visual aesthetics, the basis of orientation, and the identification of its residents. It is also the carrier of the ecological process and the social economic process telling the historical stories of the city. Therefore, Urban Landscape Identity should be not only visually "beautiful", but also "healthy" and "meaningful".

It follows that the combination of urban landscape identity and the ecological infrastructure planning is an optimal way. Ecological infrastructure (EI) is the key spatial pattern to keep land and life safe and healthy and to maintain the historical and cultural features. It is the basic security for the city and citizens to obtain durative natural service (ecological service), as well as the rigid frame for urban and land development.(Yu, Li, 2001,2002,2005;Yu, Zhang, 2007). Figure 1 shows the three steps to combine these two approaches:

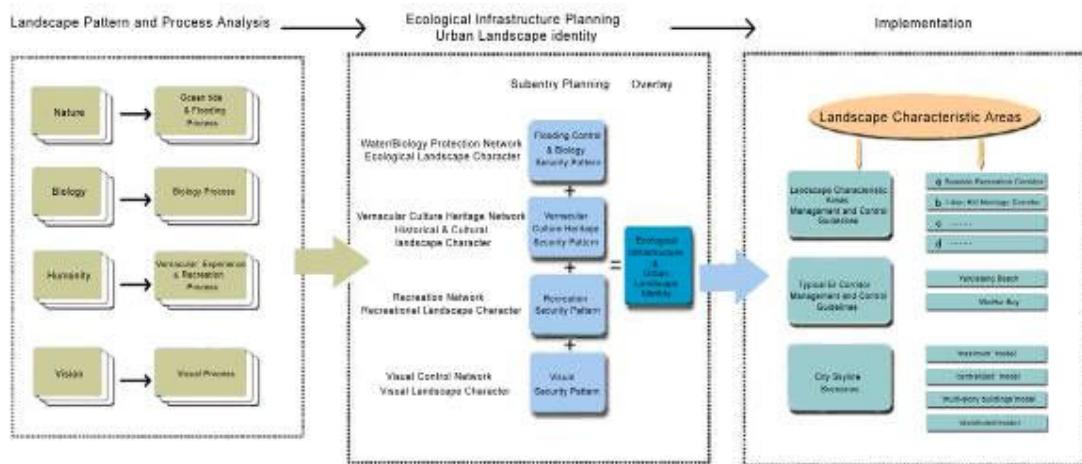


Fig.1 Research Framework

2.1 Landscape Pattern and Process Analysis

Landscape pattern and process analysis concerns two specific issues:

- (1) Describe the types and characteristics of natural, biological and cultural resources of a city, and try to answer the question "what is the status of present urban landscape characteristics?"
- (2) Analyze the process of natural, biological, cultural and visual processes of cities, and evaluate the processes above, based on the integrity and continuity of the overall pattern, and answer "what kinds of existing problems of the present urban landscape characteristics?"

2.2 Urban Landscape Identity Based on the EI planning

EI planning can make city avoid flooding, protect the diversity of species and habitats and the cultural heritage, as well as provide the recreation experience and great visual landscape. It is the prerequisite and guarantees to form into a unique landscape characteristics.

Landscape security pattern (Security pattern, short for SP) is an approach to identify and establish EI, which is based on the theory and methodology of landscape ecology

and also the relationship between landscape process and pattern. It can identify the landscape pattern which is critical to the health and safety of these processes through analysis and simulation of the landscape process (Yu, 1995, 1996; Yu 1998, 1999).

The following two steps help to integrate urban landscape identity and EI

(1) Use different security standards (high, medium and low) to establish five different SPs of flood control, biological conservation, cultural heritage, recreation and vision, thus to construct the comprehensive urban EI, answering the question of "how to solve the existing problems in the urban landscape characteristics?".

(2) Summarize the overall urban landscape characteristics in the following four aspects, and answer the question of "what kind of urban landscape characteristics will be in the future?"

1) Establish the conservation networks for ocean tide and flooding control and biological protection, forming the ecological landscape character;

2) Establish the cultural heritage network, shaping historical and cultural landscape character;

3) Establish the recreational network, emphasizing the recreational landscape character;

4) Establish networks for visual corridor and mountain background protection and restriction of the building height, shaping the visual landscape character.

2.3 Implementation

As a non-statutory planning, EI planning must take necessary measures to resolve implementation. Urban control planning has important practical significance for the implementation of results of EI planning as well as a great help for the local management. Therefore, this paper puts forward an approach to this problem. The concrete steps are as follows:

(1) Divide the city into different landscape characteristic zones according to the different emphasis of landscape types and landscape elements on macro-scale and middle-scale;

(2) Carry out corresponding management and control guidelines regarding the important cross-regional EI corridor on the macro-scale and landscape characteristic zones on the middle-scale;

(3) Integrate these management and control guidelines with urban control planning.

4 A Case Study

As a case to study urban landscape identity in this paper we take the city of Weihai, Shandong province as an example. Weihai is located in the eastern end of Shandong Peninsula, and it borders on the Yellow Sea in three directions with an urban area of 769 Km square, among which there is 91.24 Km square for the city construction and the city has a population of 820,000 (in the end of 2004). This city has an abundance of cultural landscape resources with the natural landscape of vicinity, integration of mountains and the sea as well as large numbers of historic relics including commemorative sites of Sino-Japanese War and others. In recent years, Weihai has been awarded many awards such as the United Nations to improve living environment best practices Award, National Garden City, etc.

Rapid urbanization and globalization have negative impacts on Weihai city since 1980s. If urban landscape characteristics are not protected in time, it will disappear gradually in the trend of urbanization resulting in unredeemable loss. Hence, as a famous seaside city in China, research on urban landscape identity before a new round of urban construction help to maintain and form unique landscape

characteristics and ensure sustainable development in the process of urbanization in the future.

4.1 Objectives

The purpose of this research project is to build Weihai as a city with unique urban landscape identity of “linking of mountains, the sea, merging of the town and villages, harmonious symbiosis of nature and culture, and an ecological city in which people live and work in peace and harmony.”

- (1) Maintain the security of natural processes including water processes (ocean tide and flooding), biological processes and others, thus ensure the ecological security and sustainable development of the city;
- (2) Protect, promote vernacular culture heritage, and then maintain the security of vernacular culture heritage;
- (3) Reveal the mountains and the sea, merge the city and the country, and maintain the spatial linkage of sea and land, town and country, nature and culture;
- (4) Protect diverse natural, biological and cultural resources and thus make it as a foundation for public education and recreation;
- (5) Optimize development model and the spatial features of the city.

4.2 Analysis on landscape patterns and processes of Weihai

As mentioned above, Weihai is a city enjoying outstanding natural and cultural landscape. Urban construction has affected the city greatly in the course of rapid urbanization that includes three aspects:

4.2.1 Natural and biological processes

The integrity of mountains is destroyed, which triggers soil erosion and decline of visual quality.

Water process are strongly affected by urban construction, which causes high threat of tidal inundation, mountain torrents and waterlog. (Song, 2007)

Wetland reclamation, industrial parks and freeways cause fragmentation of wildlife habitats, decline of population and other problems.

4.2.2 Cultural ,recreational and visual processes

Protection and management of vernacular cultural heritage are inadequate; effective publicity measures and clear identification system are in absence; integral experiences network of vernacular culture heritage is not yet formed.

Integrated recreational experiences process is segmented; accessibility of open space is poor; network system of recreation is not shaped.

Height of high-rise buildings is not guided by uniform planning, which causes randomness of city skyline, sheltering of important backdrop of ridges and visual corridors, and other serious consequences. (Han, Li, 2007)

4.3 EI planning and urban landscape identity

On the basis of high, medium and low security levels, five SPs have been established for ocean tide and flooding control, biological protection, vernacular culture heritage, recreation, and vision (Fig.2-Fig.7) according to which comprehensive EI for the city has been established. Then urban landscape identity of Weihai city is composed by ecological character, historical and cultural character, recreational character and

visual character corresponding to each SPs.

(1) Constructing storm water management system by establishing integrated flooding SP, restoring the natural form of wetlands, pond system and watercourse as well as establishing biological corridors to protect biodiversity and habitats in order to compose sustainable landscape in which human beings and nature coexist in harmony and thus form into landscape characters.



Fig.2 Ocean tide and flooding SP & Ecological landscape character



Fig.3 Biology SP & Ecological landscape character

(2) Protecting historical and cultural character of Weihai city effectively by composing vernacular culture heritage network and strengthening functions of heritage on city character and environmental education in order to shape into historical and cultural feature of landscape.

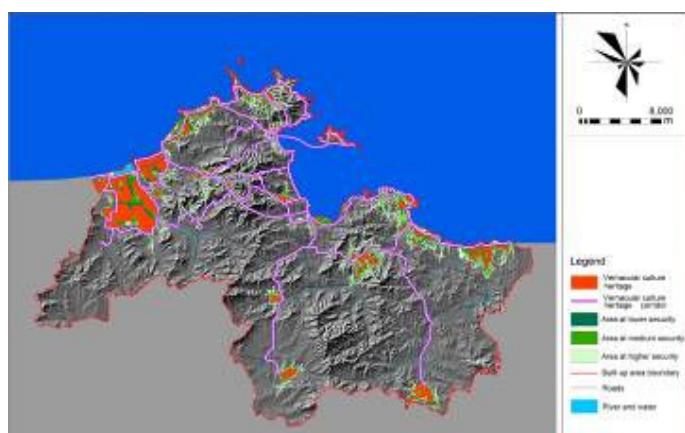


Fig.4 Vernacular culture heritage SP & Historical and cultural landscape character

(3) Constructing successive recreational corridors in seaside area, hilly area and urban area by building and enhancing public outdoor activity space, thus making it possible for citizens and tourists to enjoy convenient and accessible recreational system, which eventually emphasizes urban recreational character of the city as a city for habitable demonstration and tourism.

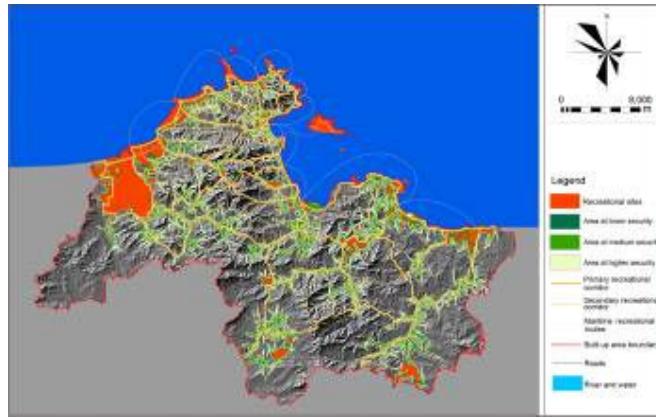


Fig.5 Recreation SP &
Recreational landscape character

(4) Composing harmonious and well-ordered visual images by controlling city horizon and important visual corridor as well as constructing unique visual character of integration of mountain landscape, seascape and building-up area landscape.

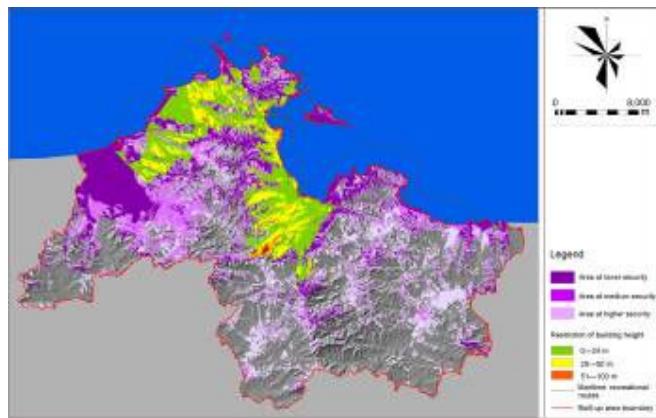


Fig.6 Visual SP &
Visual landscape character

By integrating the mentioned above SPs for natural processes, biological processes, and cultural processes, the comprehensive EI is composed. Not only Ecological infrastructure provides guarantee for healthiness and safety of regional ecosystem services, but also it makes the unique urban landscape identity possible.



Fig.7 Comprehensive EI &
Urban landscape characteristics

4.4 Implementation

The task of this research is to make certain how to make EI planning becoming the direct basis for urban control planning and the real rigid confine in order to ensure ecological safety and urban landscape identity. It is embodied in three aspects: zoning the urban landscape character areas; corresponding management and controlling guidelines to EI corridors (seaside recreational corridors and Likou Hill heritage corridors) and the landscape character areas (17 important area of 35 landscape character areas); scenarios of city skyline based on visual SP (Figure 8).

4.4.1 Landscape character areas

Landscape character areas are geographic areas with specific landscape types. Analyzing current characters of landscape and the relationship between different landscape elements, it is beneficial for zoning of landscape character area, forecasting and regulating urban landscape in the future, and guiding relevant decision making.

The method of dividing city and district landscape character areas according to different landscape types and landscape elements is applied in this research. Afterward, the city is divided into three landscape character areas of “mountain, sea and city” at regional-urban scale, and 35 landscape character areas at urban-district scale (Fig.8-Fig.9). (Wang, 2007)



Fig.8 Landscape characteristic areas
On the region-urban scale



Fig.9 Landscape characteristic areas
On the urban-district scale

4.4.2 Management and controlling guidelines to the typical EI corridors and the landscape characteristic areas

This research constitutes specific townscape management and controlling guidelines on the basis of the zoning of “hills, sea and city”. Typical ecological corridors at the

macro-scale are mainly aimed to meet natural, biological and cultural requests. At the middle-scale it is emphasized on the 17 important areas of 35landscape character areas in the 3 districts, and the guidelines are complied in five aspects: ecological construction, vernacular cultural landscape, open space, traffic arrangement, height and color of buildings. These achievements have been accepted by the local government integrating with the urban control planning in the future.

4.4.3 Scenario of city skyline based on visual SP

Urban development has completely different characters under different urban development approaches. This research brings forward three possible scenarios of physical development form under uniform controlling network based on visual SP for urban building's height (scenario 1-3), and one completely market-oriented scenario (scenario 4) at the same time. Through evaluating the four scenarios in ecological, social and economic aspects give a direct perspective to decision makers helping them make scientific and rational decisions. (Table1).The four following scenarios are visualized by ARCGIS (Fig.10- Fig.13).

Tab1 Scenarios of urban forms based on different development approaches

Serial number	Name of pattern	Concept	Integrated evaluation results	Recommended or not
scenario 1	'maximum' model	Simulate the developing pattern in which multi-story or high-rise buildings are constructed according to the upper limit prescribed in the height control network. This pattern is extreme, in which all the vertical space will be filled.	Best economic benefit Poor societal benefit Poor townscape	—
scenario 2	'centralized' model	Simulate the developing pattern in which multi-story or high-rise buildings are constructed in aggregated sheets.	Preferable economic benefit Preferable societal benefit Preferable townscape	Recommended
Scenario 3	'multi-story buildings' model	Simulate the developing pattern in which all buildings are constructed according to the 24m national criterion for multi-story buildings. It is another extreme pattern.	Poor economic benefit Preferable societal benefit Best townscape	Recommended
Scenario 4	'distributed' model	Simulate the developing pattern in which buildings are oriented by market and scattered.	Preferable economic benefit Poor societal benefit Worst townscape	—

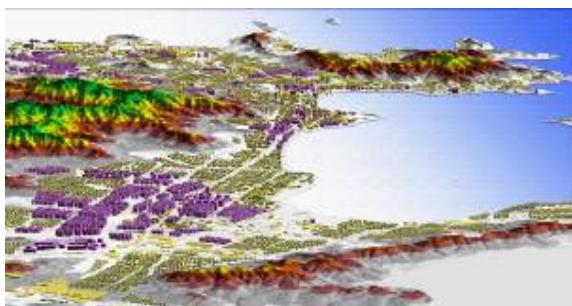


Fig.10 Aerial view map of 'maximum' model

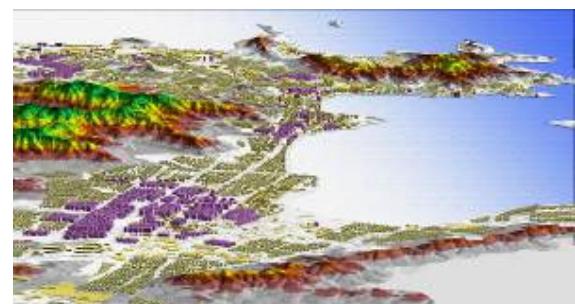


Fig.11 Aerial view of 'centralized' model

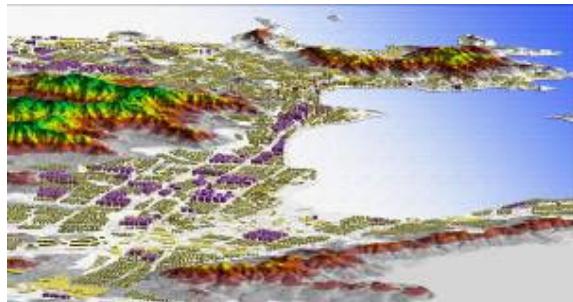


Fig.12 Aerial view of 'multi-story buildings' model

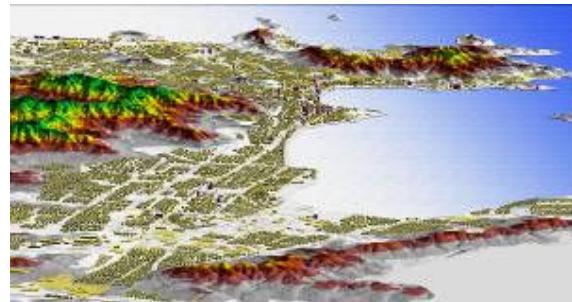


Fig.13 Aerial view of 'distributed' model

5 . Conclusion and discussion

(1) This paper illustrates that urban landscape identity is mainly determined by the natural process, historical and cultural process and the social economic activities of a city, which reflected the structural and morphological characteristics of the city's landscape, embodied comprehensive characteristics of visual scene, and habitat and cultural symbol of a city. It is the object to visual aesthetics, the basis of orientation, and the identification of its residents. It is also the carrier of the ecological process and the social economic process telling the historical stories of the city. Therefore, Urban Landscape Identity should be not only visually "beautiful", but also "healthy" and "meaningful".

(2) It makes a breakthrough into current studies in which methodology mainly focuses on physical environment and emphasizes on forms of a city. It begins with the thought of "negative planning", integrating EI planning and urban landscape identity while adjusting measures to local conditions and composing urban landscape identity at different scale and in different ways.

(3) It divides the city into different natural and cultural landscape characteristic areas by studying region-urban landscape patterns, thus it represents the outstanding ,diverse landscape characteristics of the city. Furthermore, carrying out management and controlling guidelines are compiled by integrating current problems and EI planning. The guidelines could be combined with urban control planning and also be used as the rigid confines to ensure ecological security and unique urban landscape identity.

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