

# Understanding the Evolution of Landscape Planning Strategy in China: From "Fragmented" Urban Green Space System to Regional Greenway Network across Cities

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## 1. Introduction

In China, urban green space system (UGSS) is defined as a network of all sorts of green spaces in city built-up area which supports ecological and recreational functions (Wang, 2009). The implementation of UGSS indicates several common problems, such as overemphasizing green spaces in the built area of city, losing stability and rationality in spatial patterns, and mismatching the progress of ecological restoration cycles (Liu & Wen, 2007; Wang, 2009).

Greenways represent a distinctly strategic approach to landscape planning through combinations of spatially and functionally compatible land uses within a network (Ahern, 1995). Specially, four principal strategies (Protective, Defensive, Offensive, and Opportunistic) are recognized as an overall planning strategy for greenway (Ahern, 1995). Inspired by the greenway concept, China has constructed 2,372 kilometers of greenway network at Pearl River Delta (PRD), in order to maintain regional ecological safety, to improve regional livability, to stimulate economic growth, and to protect cultural and historic resources (He et al, 2010). Meanwhile, various cities in China have initiated their own greenway network planning for implementation. This indicates a potential greenway movement during the next few years in this country, following the global interest in greenways as a sustainable landscape planning strategy. Through historical review of urban green space system in China and a case study of PRD greenway network, this research attempts to answer the following questions: (1) how contemporary greenway network is planned and implemented in China? (2) How Ahern's four principal strategies (protective, defensive, offensive and opportunistic) have been applied within PRD regional greenway network as landscape planning strategy?

The purpose of this research is to provide a holistic perspective on greenway planning and development in China. Specially, this paper will (1) present evolution of UGSS planning and recent greenway development in China; (2) discuss the practice of implementing greenway network as landscape planning strategy; and (3) discuss the future greenway development in China.

## 2. Background and Literature Review

### 2.1 Green space, Greenway, and Contemporary Landscape Planning Strategy

Green space is broadly defined as "open, undeveloped land with natural vegetation including parks, forests, playing fields, and river corridors" (Mitchell & Popham, 2008). Since the garden city idea advocated by Ebenezer Howard (1898) in UK and the urban park movement propounded by Frederick Law Olmsted in US during the 19th century, urban green space has become a crucial part of the urban environment that supports the physical, social, and mental health of the entire region.

From 1960s, a plenty of landscape planning has adopted a “defensive” strategy, based primarily on McHarg’s theory (1969) of “constraint-based exclusionary planning” (Ahern, 1995). The core idea of “constraint-based exclusionary planning” is to assess and save resources on their intrinsic and individual values during the planning process. Although this “defensive” planning strategy has achieved successes in many cases, the defect of the strategy is evident as well: landscape fragmentation. Thus, ecologists and landscape planners suggest offensive strategies to confront landscape degradation and advocate a sustainable form of ecological infrastructure which has “connection” to link isolated natural areas (Forman & Godron 1986). The debates on which form is more sustainable are continuing; yet, greenway (or named ecological infrastructure, ecological network, or extensive open space system) might be a good solution. Through combinations of spatially and functionally compatible land uses along linear areas and within a network, greenways represent a distinctly strategic approach to achieve multiple benefits; rather than a framework for comprehensive landscape planning (Ahern, 2002). Four principal strategies (Protective, Defensive, Offensive, and Opportunistic) are recognized as an overall planning strategy for greenway (Ahern, 1995): Protective strategy focused on eventual landscape pattern; defensive strategy often applied on fragmented or isolated landscape; offensive strategy attempted to regenerate disturbed landscape; and opportunistic strategy tried to explore unique landscape features.

## **2.2 Evolution of urban green space system (1950-2010) in China**

### **The Early Urban Green Space System from 1950s to 1980s**

In China, the UGSS planning was originally developed in 1950s while the Soviet Union model, was learnt and adopted by Chinese scholars. The Soviet Union model focused on urban parks and recreational function, and its content includes quantity index, such as the green space ratio, green space coverage, and public green area per capita (Qian & Chen, 2004; Wang, 2009). However, before 1980s, China has implemented restricted policies, causing slow urbanization process and low investments in urban green space construction.

### **Exploration of Urban Green Space System from 1980s to 2000s**

UGSS planning has become a part of city master plan until 1989 when the “National Urban Planning Act” issued (Wang, 2009). A series of regulation on UGSS planning successively initiated to promote the quality and quantity of UGSS in terms of green space overall layout, city parks, community parks, parkways, and greenbelts. Meanwhile, researchers in China have started to explore the ecological benefits of UGSS. During this period, because of lacking a complete framework theory to support, UGSS planning is hardly to serve a strategic function, in order to solve urban environmental issues. Still a considerable number of cities do not have their UGSS plans.

### **The Contemporary Urban Green Space System from 2000s to 2010s**

Regulated as an individual and mandatory document in 2001, UGSS planning is no longer a supplement of city master plan. Inspired by patches-corridors-matrix pattern of landscape ecology, UGSS planning has initiated its core pattern: nodes-lines-areas, in order to form systematic and ecological network of green space (Pan, 2006). Usually, nodes refer to urban

parks, community parks and open space; lines refer to urban rivers, linear green space and greenbelts; and areas refer to urban forests, urban agricultural lands, and large lakes. Since a great number of cities in China have planned and implemented their own UGSS to amend their environment, UGSS has started to play a significant role in the development and conservation of urban areas over the past several years. However, general limitations of UGSS practice in China include: (1) overemphasizing green spaces in the built area of city (Liu & Wen, 2007); (2) losing stability and rationality in spatial patterns; and (3) mismatching the progress of ecological restoration cycles (Wang, 2009).

### **2.3 Emerging Regional Greenway Networks**

Although the concept of contemporary greenway originated from the Western World, in China the origin of greenway can be traced 3000 years ago (Yu, 2006). Historically greenways are categorized into three types: riparian greenways along rivers, streams and water channels, greenways along transportation corridors and greenways along farmland for wind protection (Yu, 2006). Until 2010, China has started to build up its first contemporary greenway network, which is located in the Pearl River Delta. The purpose of developing PRD greenway network is to conserve regional ecological environment, and to improve life quality of residents (Guangzhou Housing and Urban-rural Construction Bureau, 2010). In China, Greenways are primarily planned and implemented through top-down planning application, which is highly effective under a centralized system (Yu, 2006), especially at a national dimension. Besides Pearl River Delta, a tremendous number of regions and cities in China have started to plan their own greenway network, and also a national landscape security pattern has proposed to address meager natural resource, fragile ecosystems and urbanization (Yu, 2012). Greenway has already been recognized as a new strategy of spatial development of Chinese urban and town green space (Liu, 2012). Chronologically greenways have evolved in China from protection to multiple functions.

The literature indicates UGSS planning is a considerably mature and dominant approach with decades' practice while regional greenway network is an innovative approach in China; yet few studies discussed regional greenway network as a new landscape planning strategy.

## **3. Method**

This paper will conduct a case study of regional greenway network at Pearl River Delta in three main phases: (1) describe the case study area to give a comprehensive context to help understand greenway planning and development; (2) analyze PRD Greenway comprehensive plan to illustrate landscape planning strategy; and (3) compare UGSS and regional greenway network to discuss the transition.

## **4. Case Study**

### **4.1 Study Area**

The term Pearl River Delta (PRD) refers to the dense network of cities that covers nine cities (Guangzhou, Shenzhen, Zhuhai, Dongguan, Zhongshan, Foshan, Huizhou, Jiangmen and Zhaoqing) of Guangdong Province in China. It is one of the most densely urbanized regions

in the world with the population of 120 million, and it has become one of the main hubs of China's economic growth since the launch of China's reform in 1979. However, with the great economic achievement, the traditional growth method (unlimited sprawl of urbanized regions and built-up areas) has negatively impacts on the natural environment, which is not sustainable developing. Thus, the Pearl River Delta initiated regional greenway network as an alternative strategy to amend ecological environment, to enhance living conditions, and to stimulate economic transformation.

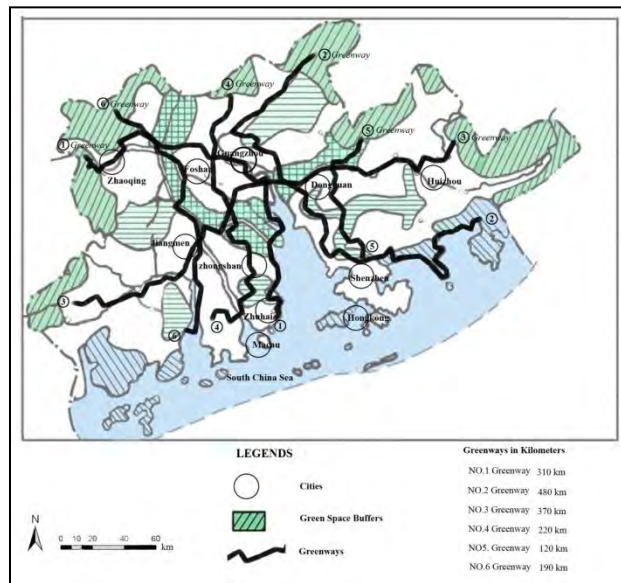


Figure 1. Regional Greenway Routes Network, redrawn by Di Lu

Source: Guangzhou Housing and Urban-rural Construction Bureau, 2010

## 4.2 Analysis of PRD Comprehensive Greenway Network

Launched in 2009, the first contemporary, comprehensive greenway network in China have planned and constructed at Pearl River Delta area, including six regional greenway routes (Figure 1) and covering more than 200 tourist attractions in nine cities (He et al, 2010). Besides six regional greenway routes in Pearl River Delta, city level greenways and community level greenways are also proposed sequentially as extending of greenway networks into the inner-city fabric to satisfy ecological and social demands. These greenways connect to the shopping districts, sports venues, office building blocks, and residential estates, boasting beautiful scenery and convenient bicycle paths and providing local residents with easy access (Guangzhou Housing and Urban-rural Construction Bureau, 2010).

### Purpose

The purpose of developing regional greenway network at Pearl River Delta includes:

(1) Maintaining regional ecological safety.

To employ green buffers as ecological context, PRD greenway network could connect fragmented ecological matrix and corridor to help repairing ecological network; maintain diversity of wildlife and provide them habitats and migratory corridors; absorb pollution and

purify the air.

(2) Improving regional livability.

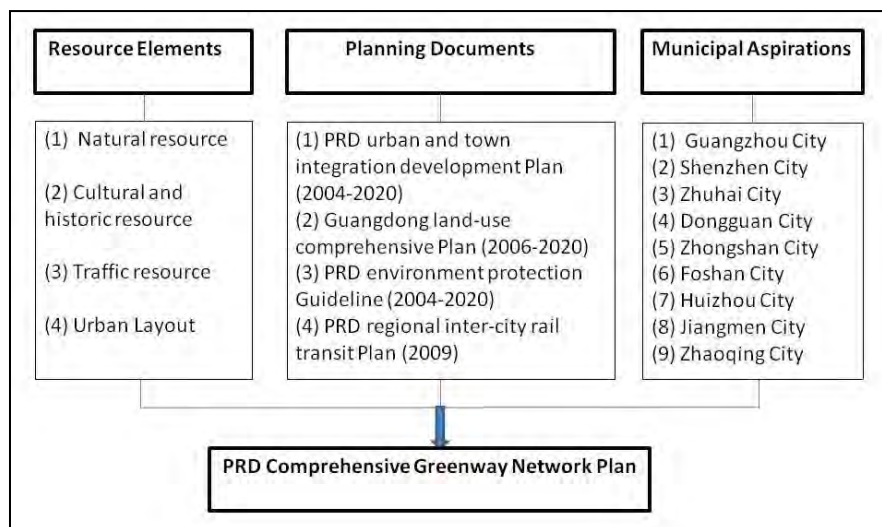
PRD greenway network would connect urban parks, open space, rural parks, wetlands, and national forest parks to provide network of green open space for recreation and ecological protection.

(3) Increasing domestic demand in order to stimulate economic growth.

Besides ecological benefits, PRD greenway network would directly stimulate tourism industry, recreation and leisure industry, food and beverage industry, and also indirectly stimulate agriculture, construction industry, and real estate industry by providing more working opportunities and increasing domestic demand.

(4) Protecting cultural and historic resources.

PRD greenway network would protect cultural and historic resources and connect them with the surrounding environment, to enhance the city's cultural identity and citizens' place belonging.



## Layout

The layout of PRD comprehensive greenway network plan is synthesized primarily basing on resource elements, planning documents and municipal aspirations (Figure 2).

(1) Resource elements

Four major elements are recognized as resource elements: natural resource, cultural and historic resource, traffic resource, and urban layout. Thus, the criteria of selecting greenway route include: be close to rivers, valleys, and mountains; be able to connect cultural heritages and historic villages; be accessible to communities; and take advantage of existing road and abandoned railways.

(2) Planning documents

Referred from existing planning documents, the layout planning of PRD greenway network tries to integrate with urban and town layout, regional traffic network and regional ecological pattern.

(3) Municipal aspirations

The layout of PRD greenway network also absorbs aspirations from local governments. In

addition, the opinions from local bicycle association and local hiking association are also considered.

### Landscape Planning Strategy

Four principal strategies (Protective, Defensive, Offensive, and Opportunistic) are employed within PRD regional greenway network as an overall landscape planning strategy (Ahern, 1995), through combining ecological planning, tourism planning and urban transformation to achieve. Protective strategy defines eventual greenway landscape pattern is protected while surrounding landscape might experience changes (Ahern, 1995). Overall, PRD regional greenway network is protective in terms of its policy, purpose and layout towards sustainable development.

#### (1) Ecological Planning

Regional ecological corridors refer to paths that connect large ecological patches and natural area, which is usually broken up by urban blocks. When the existing landscape is fragmented, and the core areas isolated, a defensive strategy is often applied (Ahern, 1995). At Pearl River Delta, defensive strategies are applied to connect eco-sensitive areas within cities through regional greenway network to construct systems of ecological corridors and ecological patches, in order to ensure regional ecological safety.

#### (2) Tourism Planning

Through connecting urban parks and green space, urban greenway creates pedestrian-friendly environment and provides space for recreation and leisure activity that would stimulate urban tourism. In order to facilitate residences and tourists to use greenways, the regional greenway network is also allocated with signage system, public transit system, parking lots, lighting system, restrooms and service areas.

Landscape contains unique features, such as cultural or historic landscapes might provide outstanding opportunities for greenway planning (Ahern, 1995). At Pearl River Delta, Erxianguan greenway in Shenzhen is mainly developed basing on historic hiking trails. Through renovation, the planners preserved most original paving, designed more access points, and connected communities to ecological forest, in order to facilitate tourists.

#### (3) Urban and Town Transformation

Offensive strategy often employs nature development to build new elements in previously disturbed landscape (Ahern, 1995). As a great opportunity, PRD greenway network has not only promoted urban ecological infrastructure construction, but also helped urban transformation: facilitating public infrastructure construction and helping brown-field redevelop, to improve the urban environment. For example, financed by PRD greenway project, an abandoned factory with a 250-Acre brown-field in Nanzhuang, has been transformed into a recreational wetland with multiple-functional greenways.

### 4.3 Transition

Table 1. Comparing Urban Green Space System with Regional Greenway Network

Name	Urban Green Space System (UGSS)	Regional Greenway Network (RGN)
Scale	Municipal	Regional (across cities)
Spatial Structure	System of Distributed Nodes, Lines and Areas	Connected Linear Network

<b>Function</b>	Recreational Ecological Social	Recreational, Historic/ Cultural preservation Ecological Economic Social
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Directly influenced by UGSS planning, the landscape planning strategy has chronically emphasized green spaces in built area while ignoring surrounding area of cities; emphasized quantity of green spaces while neglecting connectivity (Wang, 2009). Today, the landscape planning strategy in Pearl River Delta has gradually evolved from a city-based "fragmented" UGSS approach to a holistic regional greenway network approach (Table 1). A multi-level, multi-function and comprehensive Pearl River Delta Greenway Network has been built while incorporating principles of sustainability, increasing connectivity of multiple land use, and expanding of public participation. The Pearl River Delta greenway network is not only a supplement of urban green space system, but more importantly, it indicates an innovative landscape planning strategy at an extensive scope. Greenway is an essential feature of integrating rural with the urban landscape system, and it is also a form of ecological network (Liu & Wen, 2006). Regional greenway network could be illustrated as a kind of "extensive green space system".

## 5. Discussion and Conclusion

### 5.1 Discussion

The central thesis presented in this paper is that greenway network is a significant landscape planning strategy to address challenges of urbanizations and sustainable development in China. In North America, centralized planning approach is less common; while greenway plans initiated at local and regional scale, and then greenways tend to involve a diverse and broad supports (Ahern, 2002). In China, top-down planning approach is still dominating while providing an excellent opportunity for large scale planning, such as regional greenway network. The pilot application of greenway network at Pearl River Delta demonstrates that it is feasible to construct greenway network to connect high-density compact Chinese cities, and also to connect green space within and outside of cities.

The benefits of greenway are obvious: social, ecological, economic, and recreational. However, there are a lot of issues to deal with: guideline formulation, policy support, organization structure, public participation, and funding source. For example, government investment should be a guarantee, because greenway is a public project and in China land property belongs to the nation.

Besides, there is a considerable potential for China to establish national greenway network through combing existing and proposed regional greenway networks. Currently, to establish regional greenway network is a strategic landscape planning approach. Hopefully, this landscape planning strategy could be applied at a broader scope soon.

### 5.2 Conclusion

A historical review of urban green space system and a case study of PRD regional greenway network were presented to illustrate how greenways are planned and implemented in Pearl River Delta; how Ahern's four principal strategies (protective, defensive, offensive and opportunistic) have been applied within PRD regional greenway network; and this will also provide a model for future greenway development in other Chinese regions. The key findings revealed that:

(1) Although UGSS planning approach has dominated in China for a few decades, the implementation of PRD regional greenway network indicates a transition of landscape planning strategy in China: from "fragmented" urban green space system to regional greenway network across cities.

(2) Four principal strategies (Protective, Defensive, Offensive, and Opportunistic) are successfully employed within PRD regional greenway network as an overall landscape planning strategy.

(3) Top-down planning approach provides an excellent opportunity for developing regional and national greenway network; yet, public participation is still lacking.

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