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From greenways to blueways: the evolving greenway network in the Pearl River Delta, China

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Abstract

The Pearl River Delta has been the leading region of greenway development in China, in which greenways became a special policy tool in a three-year political campaign, with over 15, 000 km of greenways developed between 2010 and 2019. Recently, in response to the issues of lacking ecological concerns and recreational resources and the establishment of the River Chief System in China, Guangdong Province started a new round of top-down greenway campaigns, namely *Guangdong 5,000-kilometer Ecological Belts*. A series of planning interventions have been widely deployed, which include the water pollution remediation, the integration of recreational trails and the redevelopment of waterfront public spaces. Starting with the introduction of the development of greenways and blueways in Guangdong, this paper explains the reasons for the evolution from greenways to blueways, and takes Guangzhou as a case study of blueways planning and implementation. After that, we will further investigate the environmental benefits of blueways based on the analysis of representative blueways cases. The empirical findings show that planning interventions for blueways have significantly changed the water environment in Guangzhou, especially in terms of addressing pollution issues.

Keywords: blueways, greenways, evolution, Guangzhou

1 Introduction

Greenways have been widely implemented in China for the last decade and have become a well-received planning strategy nowadays. A growing number of studies show the various forms, functions, and related issues of the emerging greenways in the Chinese context (see Chung et al., 2018; Chen et al., 2019; Liu, et. al., 2019; Liu et al., 2020; Zhang et al., 2020; Zhao et al., 2021). The development of greenways could be traced back to 2010 when Guangdong Province initiated a political campaign to develop a greenway network across the Pearl River Delta (PRD). At that time, the greenway scheme was recognized as a special symbol representing more emphasis on environmental governance. According to Liu et al. (2020), 15,000 kilometers of greenways were developed in nine PRD cities between 2010 and 2018, which further evolved into two new greenway projects, the *South China Historical Trails* and *Guangdong Ecological Belts*. This paper will introduce the origins of

the new blueway project (i.e. *Guangdong Ecological Belts*) and its relations to the previous greenway project (i.e. *the PRD Greenway Network*). After that, we will illustrate its planning goals and implementation effects with a case study in Guangzhou.

2 Literature review and research background

2.1 Greenways as a new planning strategy in the world

Greenways are linear green corridors that are planned, designed and managed for multi-use purposes and sustainable land use (Ahern, 1995; Fábos, 1995). Fábos (1995) established a cornerstone-like typology, including greenways of ecologically significant corridors, recreational greenways, and greenways with historical heritage and cultural values. Since the 1990s, it should be recognized that greenways have been further implemented in different countries in the world with diverse forms serving different purposes. To the increasing heterogeneity among the diverse greenways, researchers have to admit that a precise definition of greenways cannot be achieved (Palardy, Boley and Gaither, 2018). However, it is the endless possibility of greenways that makes greenway practice and research more interesting, especially for greenways in countries like China that are still new to the greenway concept.

2.2 The greenway development and related issues in the PRD

In 2010, Guangdong Provincial Government initiated a political campaign to develop a greenway network in the PRD. Its purpose was to mitigate the urban-rural disparities by establishing greenway connections between urban areas and rural areas, which was also an initiative to show government commitment to environmental governance (see Liu et al., 2019). In this case, greenways were adopted for their ecological functions, recreational values, and particularly their linear form, because of the low cost of linear land resources. Between 2010 and 2012, over 7,000 kilometers of greenway were developed, and the number kept growing after the campaign that was ended in 2012. A study shows that in 2018, over 15,000 kilometers of greenways were developed (Liu et al., 2020).

Characterized by the top-down institutional arrangements, the PRD greenways have been widely recognized for their functions in promoting rural tourism and providing non-motorized transportation infrastructure (Liu et al., 2019). However, researchers, officials and planners argued that too much emphasis had been placed on the transportation function of greenways, while the ecological functions had been overlooked. For instance, according to the investigation conducted by Liu et al. (2020) in Shenzhen Municipality, most Shenzhen greenways are bikeways along motorized roads and have green corridors less than 12 meters, which can neither enhance wildlife migration nor provide sufficient recreational resources. The primary reason is that the Pearl River Delta has been intensively

developed, while linear land resources that are suitable for ecological corridors are quite rare. In the meantime, the local governments refuse to acquire land to develop greenways, because the acquisition could consume valuable land quotas (see Chung et al., 2018; Liu et al., 2019). As a result, the corridors of green spaces along transportation roads became the most convenient resources for greenway development.

2.3 *River Chief System* as a new opportunity for ecological greenways

In 2016, the central government set up the *River Chief System* as a special political tool to protect water resources. As one of the major institutional reforms of environmental governance, the *River Chief System* requires the ranking officials' commitment to the protection of rivers. In other words, the *River Chief System* turns the issue of water pollution from a departmental issue into a political task. The responsibilities of protecting rivers and streams now not only belong to the department of water resources but also to certain executive officers in the same jurisdictions.

In 2018, as a special pilot project of the *River Chief System* and a follow-up project of the greenways, Guangdong Provincial Government initiated the *5,000-kilometre Ecological Belts*. This new greenway project aims at developing 5,200 kilometers of blueways, in which not only the water quality should be improved, but also the riverside spaces should be planned and designed for ecological and recreational purposes. By the end of 2021, the total number of blueways reached 2,563 kilometers. And most importantly, the water quality of these blueways has been largely improved. According to the government report, after the implementation of blueways, 24.6% of the rivers were found water quality significantly improved, and 26% of the embankments are now transformed from hard surfaces to eco-friendly slopes.

2.4. The advantages and challenges of developing blueways in the PRD

Located in the Pearl River Estuary, the PRD is characterized by its high density of rivers and streams. As a result, the rivers, streams and riverfront green spaces become the primary existing natural corridors in the region. Moreover, these water areas are state-owned and managed by the departments of water resources, which means the local governments do not acquire them from private landowners. While the *River Chief System* is now established and coordinated by the local government chiefs, these water areas could be easily integrated as a whole for blueway development. In addition, the department of water resources controls a large sum of funds for river management and improvement, in which the investment for blueways only account for a small part.

However, developing blueways in the PRD also leads to a series of issues. First, because of modern industrialization, the rivers and streams had been seriously polluted. According

to the provincial government report, the water quality of Guangdong failed to meet the national standard in 2017 and 2018. Second, because most of the factories had been built along rivers, most of the riverfront area had been privately used, which makes the connection of the riverside corridor very difficult. Third, the PRD region is also facing serious risks of flood, which came from not only the storms but also the typhoons. As a result, the blueway planning in the PRD requires in-depth investigation and design, and special policy support in implementation.

Furthermore, the previous greenway development provides valuable experience for blueway planning and implementation. On the one hand, the “top-down” institutional structure has been adopted again to mobilize multi-government and multi-department cooperation. On the other hand, the issues of overlooked ecological functions and lacking corridor protection have been recognized in the blueway development, which leads to efforts for improvement of water quality and riverside ecology, as well as inter-department cooperation and management in corridor areas.

In the end, along the river corridors, blueways become multi-functional corridors that can provide cultural, recreational, ecological and economic benefits for communities nearby. Moreover, both greenways and *South China Historical Trail* could be incorporated into the corridor areas, as a part of the blueway system.

3 The history and practice of blueways in Guangzhou Municipality

3.1. The origin of waterway management in Guangzhou



Fig. 1. Blueways in Litchi Bay Stream in 2009 (left) and 2021 (right)

(Left: Image from the internet; Right: Photo by the first author)

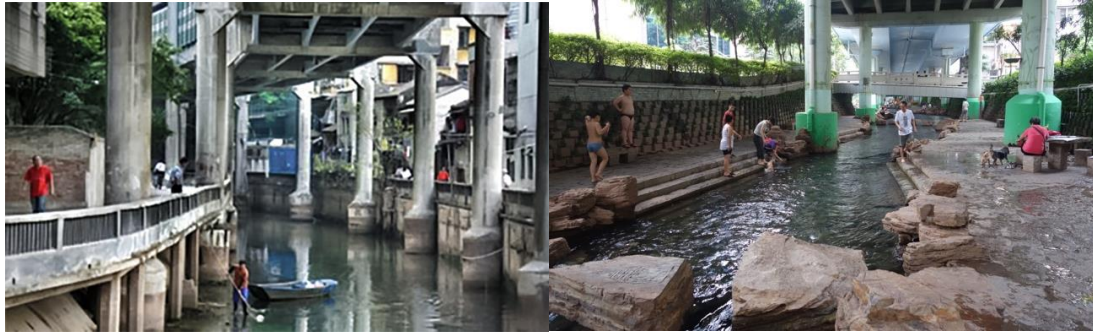


Fig. 2. Blueways in Donghao Stream before restoration (left) and after restoration (right)

(Left: Image from the internet; Right: Photo by the second author)

In Guangzhou, the early efforts for blueways can be traced back to the restoration of the Litchi Bay Stream and Donghao Stream in 2010. Both streams are situated in the city center and had been seriously polluted, in which the Litchi Bay Stream had been paved and the Donghao Stream had been covered by an elevated road (see Zhao et al., 2020). On the eve of the 2010 Asian Games in Guangzhou, the local government initiated a restoration action to both streams. In the Litchi Bay Stream, a 743-meter-long stream was transformed from a hidden channel under Pantang Road to an open stream that now is planned with improved amenities and trails along the river (Fig. 1). In the Donghao Stream, the water quality has been largely improved, so that residents could have leisure time in greenways along the stream and also close to the water surface (Fig. 2). Moreover, children could now swim in the stream.

3.2 The blueway planning and practice in Guangzhou

In 2018, mobilized by the provincial blueway project, Guangzhou followed the blueway scheme and transformed it into efforts to integrate urban water management. The plan proposes using blueway to link 34 urban green areas and over 220 historical villages and heritage spots in Guangzhou, enhance the public facilities, promote urban regeneration, and support water sports along the rivers. It was planned that by 2022, the city aimed at 1,000 kilometers of blueways, with benefits of improved water quality, green spaces, and waterfront economy. In the end, between 2019 and 2021, the city had completed a total of 800 kilometers. For 2022, Guangzhou further propose a planning goal of 1000-kilometer blueways, which accounts for 19% of overall plans in Guangdong (Fig.3)

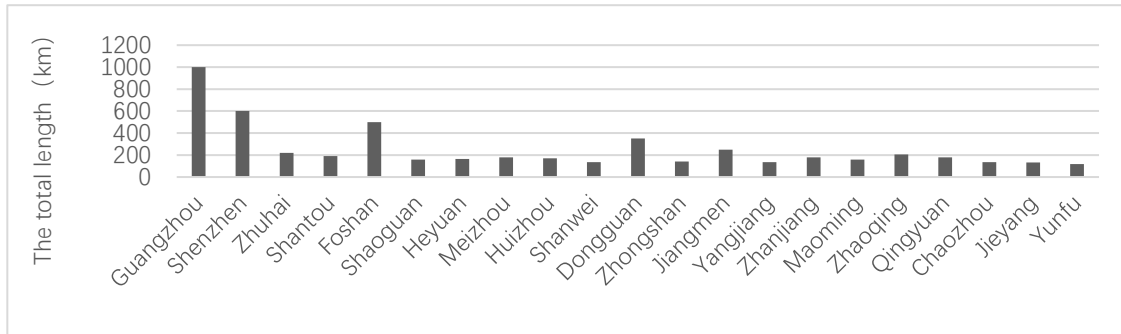


Fig. 3. The blueway development goals by cities in Guangdong Province in 2022

3.3 A multi-department integration of urban water management

The management of Guangzhou blueways is shared by multiple departments, which are managed by the Water Department inside the embankment edge but by many different departments outside the embankment edge (Fig.4). For example, the developing space is managed by the Landscape, Natural Resources, Road and Municipal administration Department, so there are often many conflicts in the interdepartmental coordination.

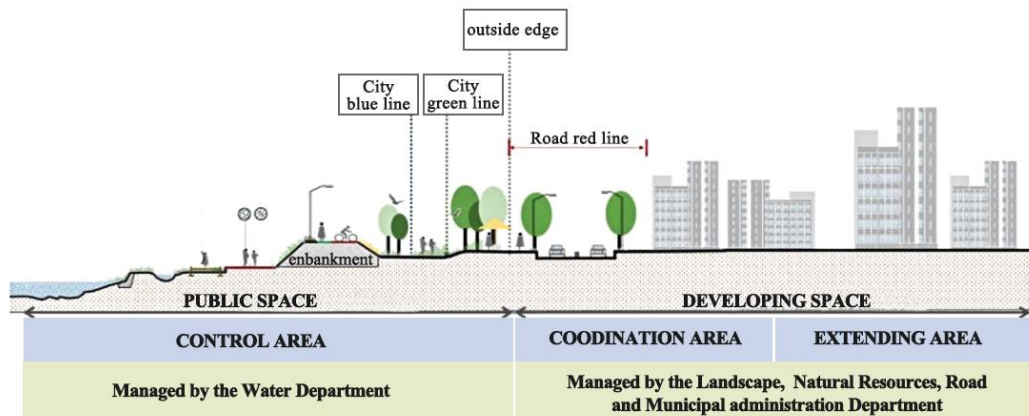


Fig. 4. The spatial elements and management of blueways in Guangzhou

(Source: Department of water resources of Guangzhou Municipality, 2021)

3.3 The benefits of Guangzhou blueways

In Guangzhou, a new model of greenway development could be found. First, the quality of water has been the core objective of blueway planning. The government report shows that all 147 seriously polluted rivers have been restored. According to our investigation on the public website, in 53 monitored streams, the proportion of seriously polluted (i.e., V class water, *liewulei* in Chinese) has decreased from 84% in 2015 to 60% in 2019, and the overall water quality improved during the blueway practices. Second, the aquatic habitat was comprehensively protected in the blueway practice. Special efforts have been made to

protect the habitats of birds and fishes. Third, riverside recreational activities have been promoted by developing trails and bikeways, leading to fishing, camping, and dancing in the open spaces.

In addition, the awareness of public participation has been largely increasing in blueway practice. For instance, in the Tianhe District, over 800 volunteers established 38 patrol teams to regularly monitor the water quality in the streams. In the meantime, the provincial river chief office developed an app for the public to file complaints about water pollution and upload images of the actual sites. They are open to the public through the website (Fig. 5).

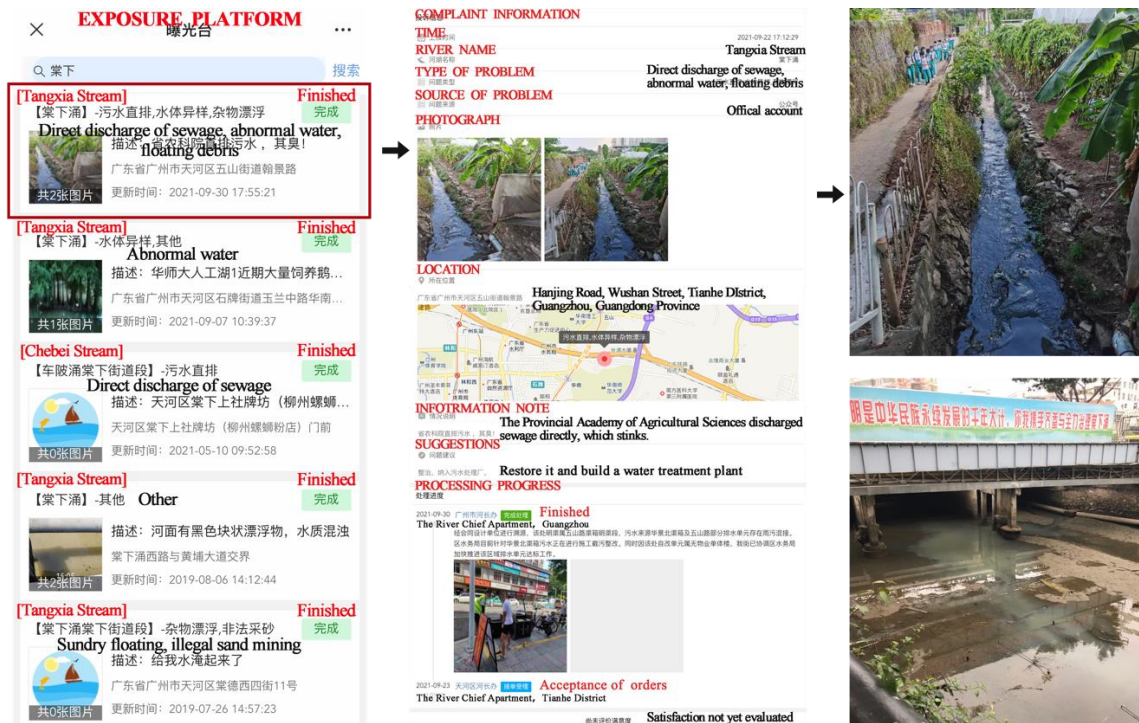


Fig. 5. The blueways' Public Supervise Website and the sewage in Tangxia Stream

(Source: the Guangzhou Smart River Chief)

4 Discussion and Conclusion

In this paper, we introduce evolving greenways in the case of blueway development. In Guangdong, blueways are a follow-up project to the previous greenway development, with more emphasis on the water quality and the multiple functions of corridor spaces. After literature review and case studies, we conclude that the blueway scheme is based on a PRD-greenway-like top-down institutional structure, while the existing river corridors have been found as crucial resources for new greenway development with strategic potentials, including open spaces, public accessibility and natural aesthetics. Blueways not only

improve the water environment but also optimise the recreational facilities on both sides of the river. And the development of the blueway has had a broad economic impact by increasing the nearby property values and promoting commercial prosperity. While the blueway practices are still in progress, further analysis of the socio-economic impacts should be made, as well as actual improvements in the water quality and ecology.

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