

REVIEW ARTICLE

Nantes vs Shenzhen: Comparison and reflection on the development characteristics of green cities in France and China

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ABSTRACT

Under the background that all countries in the world are facing the environmental pollution brought by the industrial revolution, the concept of sustainable development provides a new direction for the economic development of all countries. For cities that are both the center of human activities and the source of environmental pollution, green reform has become a key measure for countries to practice the concept of sustainable development, so green cities came into being. Under the guidance of national policies and in combination with its own characteristics, Nantes of France has successfully completed the transformation of a green city in less than 20 years through the green art transformation of transportation and public space of Shenzhen. China also relies on high technology to continuously reform and innovate in industrial structure, greening, haze control and water control, so as to realize the transformation of green city. The successful green city construction experience of the two cities provides reference for the development of green cities all over the world.

Keywords: green city; contrast; Nantes; Shenzhen

1. Introduction

Since the industrial revolution, people have got rid of the traditional manual labor production mode with high labor cost and low production efficiency. Machines have gradually replaced manpower, productivity has been greatly improved, and the economies of all countries in the world have developed rapidly. However, this industrial production system based on coal, metallurgy and chemical industry also brings a series of ecological problems, such as environmental pollution and resource depletion. The destruction of ecological environment has brought great harm to people's health, life and even social development. Therefore, people began to

think about how to coexist harmoniously with nature while promoting social and economic growth and improving people's living standards.

Sustainable development has become the key to solving problems. Since its birth, this concept has rapidly spread all over the world and has become a research hotspot of many scholars in various countries. This not only shows that it is urgent to solve the contradiction between economic growth, social development and environmental protection, but also reflects the gradual enhancement of people's ecological awareness. As the center of human activities, cities are not only the culprit of environmental pollution, but also the victim of ecological environment

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damage. Naturally, they have become the pioneer of practicing the concept of sustainable development and gradually playing an important role in environmental protection and sustainable development. The concept of “green city” was born. Therefore, under the background of global shortage of resources and environmental pollution, how to effectively control pollution, save limited resources and develop new energy while realizing the sustainable development of urban economy has become a common concern of all countries in the world.

As an earlier group of Europe that carried out green reform, there are relatively mature green city development policies and distinctive green city construction modes. In 2010, the European Commission selected six “European Green capitals”: Stockholm, Hamburg, Victoria, Nantes, Copenhagen and Bristol. Among them, Nantes has completed a beautiful green transformation in less than 20 years, which has attracted the attention of the world and set a good example for countries around the world to establish green cities. Facing the new trend of world economic development, China has also firmly grasped this “green” opportunity. In 2012, the 18th CPC National Congress officially incorporated the construction of ecological civilization into the new layout of “five in one”, which laid a policy foundation for the proposal of China’s green transformation strategic decision. In 2016, the 13th Five-Year Plan formally proposed to adjust the city scale according to the carrying capacity of resources and environment and build a green city. With years of unremitting efforts, China has gradually explored a green development path with Chinese characteristics according to its national conditions, and continuously improved the construction of ecological cities. A number of Chinese ecological cities came into being. Among them, the Great Bay area of Guangdong, Hong Kong and Macao—A world-class urban agglomeration, which has been vigorously developed in recent two years, is also committed to building a high-quality living circle suitable for living, work and tourism. As one of the urban agglomerations, Shenzhen is China’s first “International Garden

City”. According to the EU’s Environmental Quality Bureau, Shenzhen has become a popular word since 2020. Shenzhen’s successful green city transformation experience can provide experience for other cities in Guangdong, Hong Kong and Macao Bay area to carry out green reform. However, generally speaking, most cities in China and even other cities in the world are still in the exploratory stage of green city development.

2. The evolution of the concept of sustainable development and the proposal of green city

As the first country to launch the industrial revolution, Britain is also the country with the earliest germination of ecological consciousness. As early as the 18th century, with the gradual increase of population and the frequent occurrence of war, famine and poverty, British classical economists began to realize that limited resources could not meet the needs of rapid population growth. And they successively put forward the “theory of absolute scarcity of resources”, “theory of relative scarcity of resources” and “theory of natural harmony”. At the same time, due to the improper mining methods of mineral resources, the neglect of government management and people’s inaction on the destruction of the ecological environment, the local water resources, mineral resources, forest resources, fishery resources and wildlife resources have been seriously damaged. Therefore, George Pulgin Marsh, an American geographer, published *Man and Nature* in 1864, which expressed Marsh’s reflection on the negative impact of human behavior on the environment, and explained the concept of harmony between man and nature and the idea of protecting nature.

In the middle of the 20th century, the contradiction between the development of human society and the ecological environment began to highlight, and the problems such as the reduction of cultivated land and environmental pollution became more and more serious, which frequently plagued mankind. In

1962, American popular science writer, Rachel Carson published *Silent Spring*, which explained that although pesticides could improve agricultural production, they also polluted the ecological environment and destroyed the ecosystem on which people live. She suggested that human beings should take “another way”. In 1966, American scholar Kenneth Ewatt Bolding put forward the famous “spaceship economic theory”, emphasizing that the earth, like spaceships, has limited resources. If we rely on the consumption of resources to develop the economy, the spaceships will eventually be destroyed. In 1972, the slogans of “sustained growth” and “balanced development” were first put forward in the book *The Limit of Growth*, published by the club of Rome, which laid the foundation for the birth of the theory of sustainable development. The Declaration on the human environment and “there is only one earth” issued by the United Nations Conference on the human environment, have awakened mankind’s ecological awareness and promoted the attention of countries all over the world to environmental pollution. In 1987, the World Commission on Environment and Development (WCED) formally put the model and concept of “sustainable development” forward in the international community for the first time. They advocated a “comprehensive, coordinated and synchronous development mechanism of economy, society and ecology based on ecological carrying capacity” and defined it as “development that meets the needs of contemporary people without endangering the ability of future generations to meet their own needs”. This concept was officially recognized by the international community at the World Conference on Environment and Development in 1992, and was promoted from concept to action at the Johannesburg World Summit in 2002. Countries began to promulgate relevant policies and take measures based on the idea of sustainable development.

As the center of human activities, cities are also the culprit and victim of environmental pollution. Considering that the fundamental solution lies in starting from the source, cities have naturally become the preferred place to implement the concept

of sustainable development. As early as 1898, Howard, a British architect, put forward the theory of “garden city”. He proposed that cities should be planned scientifically and give prominence to landscaping. Subsequently, at the international city conference held in Amsterdam in 1924, Raymond Enwind, a follower of Howard, put forward the concept and idea of “satellite city”, which aims to control the excessive diffusion of big cities and evacuate the over concentrated population and employment. In 1930, Le Corbusier, a French architect, first put forward the concept of “green city”, and then this concept became the main theme of the process of urbanization in France. After the concept of sustainable development was put forward, building a “green city” has become the goal pursued by countries all over the world. The construction of “green city” is mainly reflected in pollution control, efficient utilization of resources and harmonious coexistence between man and nature, but there is no fixed model. Countries should make targeted planning according to the specific development conditions and characteristics of cities.

3. National green policies of France and China

3.1. France

After the outbreak of World War II, French cities were seriously damaged. After the end of World War II, in order to restore the normal economic order of the country as soon as possible, the French government adopted an active urbanization policy to repair damaged cities and continuously improve the urban planning legal system to carry out rational planning and development of cities. During this period, the urban construction was quite effective, and the national economy grew rapidly. Therefore, France entered the “golden 30 years” after World War II. However, large-scale urban construction has also caused a series of environmental pollution problems. Therefore, since the 1970s, in order to adapt to the changing socio-economic development situation, the focus of French urban construction has gradually changed

from increasing the number of cities to improving the quality of urban development.

Since 1983, a profound institutional change has been carried out in France. The central government has handed over the functions of urban planning, land use arrangement and infrastructure construction to local governments. Local governments have begun to carry out different transformation according to the specific situation of the city. At the same time, new urban planning ideas also began to appear: The first is the strategy of heritage protection and urban revitalization combining the old and the new. Various regions of France have distinctive cultural characteristics. Many cultural heritages left by some cities, due to their long history, have become a witness to the history of the city. Therefore, France has issued a complete set of tools, such as “protection and utilization planning” and “Architecture City and scenic heritage protection area”, to protect landscape lots, architectural heritage and overall urban resources. However, the economic development of the city can't stagnate, so the organic combination of heritage protection and urban economic development has become an inevitable trend. Strict protection and bold innovation have become two important means to realize urban rejuvenation and cultural inheritance. The second is that urban planners have favored the value and advantages of the traditional small grid urban structure in France again. Therefore, many projects since the 1980s have the shadow of the traditional small grid block. In some projects, in order to ensure the accessibility of roads and encourage pedestrian traffic, planners divide the large-scale reconstruction area into small plots of 350m * 80m to ensure appropriate density, greening environment and diversified building environment^[1]. In addition, in order to strengthen the connection between different functional areas of the city, cities also attach great importance to the construction of fast traffic roads, hoping to solve the problem of too far distance between residential areas and workplaces.

Based on these ideas, the urban mutual assistance and renewal law with sustainable development

as the core concept was born in 2000. The law specifies the goal of maintaining the ecological environment and social justice and unity through regional overall planning and mutual assistance, and on this basis, developing the urban economy. At the same time, an urban public policy system with “regional coordinated development planning outline” (SCOT) as the core, has been established, which means that SCOT should be used as a guiding document when making decisions and administration on residence, economic development, rest function, passenger and freight transportation, public transportation, environmental protection and so on. Therefore, SCOT has become an overall reference framework for regional development^[2].

Driven by the law on urban mutual assistance and renewal, urban renewal projects have been launched one after another. These projects are committed to seeking the mixing of functions (residential, office, commercial, etc.), and are often accompanied by the change of the use of large areas of industrial wasteland, abandoned factories or blocks. In order to highlight the different cultural characteristics of each city, urban transformation should recreate the city in combination with the urban historical background and the world sustainable development trend.

3.2. China

Since the founding of new China, China's economic development has been characterized by extensive growth. Many places do not hesitate to sacrifice the environment to achieve economic growth, which makes China's environmental pollution problem more and more serious. In order to effectively curb pollution, Yichun, Jiangxi Province put forward the development goal of building an ecological city in 1986 and carried out pilot work in early 1988, marking the beginning of China's ecological city construction. In 1996, *The National Ecological Demonstration Zone Construction Planning Outline 1996–2050* was issued. Since 1997, when it was decided to create a national model city for environmental protection, the State

Environmental Protection Administration has successively awarded this award to more than 30 cities, laying a good foundation for comprehensively promoting the construction of ecological cities.

After entering the 21st century, although China's eco city construction has made some progress, there are still "big" problems in China's ecological environment. For example, the average surface temperature in China has appreciated twice the world average level. Many cities have low domestic sewage treatment rate, serious air pollution, degradation of ecological environment and increased cost^[3].

With the first proposal of the concept of "green water and green mountains are golden mountains and silver mountains" in 2005, people began to question the traditional economic development model and began to realize that protecting the ecological environment is the key to achieving sustainable economic development. The 18th CPC National Congress officially incorporated the construction of ecological civilization into the new layout of "five in one", which laid a policy foundation for the strategic decision-making of China's green transformation. In 2016, the 13th Five-Year Plan formally proposed to adjust the city scale according to the carrying capacity of resources and environment, implement green planning, design and construction standards, implement ecological corridor construction and ecosystem restoration projects, and build a green city^[4]. The 2017 eco city green paper subdivided eco cities into five types: Environment-friendly, green production, green living, healthy and livable, and comprehensive innovation, providing a more detailed standard for the evaluation of national eco cities. Each city can find its own weaknesses and advantages, according to the standards in the report, make up for the defects and continue to maintain its own advantages.

Through the analysis and comparison of the policies of the two countries, it can be seen that under the background of increasingly serious environmental pollution caused by economic develop-

ment, both countries have put forward the requirements for the transformation of the traditional urban development model, and the construction of green cities has become the common choice of the two countries.

4. The green development of Nantes and Shenzhen

4.1. Nantes

Nantes, the largest city in western France, is also the historical capital of Brittany Peninsula, with many historical buildings. In addition, it is also one of the cities with the largest inland water area in France, known as "Venice in the west". Its urban area is located in the lower reaches of the Loire River, the largest river in France. There are tributaries passing through it, which has strong hydrological characteristics. Before the abolition of slavery in the 18th century, as the largest slave trade center in France, Nantes became the first port and prosperous city in France through the slave trade. The existence of ports has also led to the birth of shipbuilding industry, agricultural food processing industry and handicraft industry. In the 19th century, with the development of modern industry, Nantes became an industrial city. The handicraft industry born in the 18th century began to become a real industry at this time: shipyards, sugar factories, biscuit factories, cannery and other factories and warehouse areas began to appear among them, the shipbuilding industry is the most developed. It has become the core of Nantes' economic development and once made Nantes one of the most important shipbuilding centers in France.

In addition to the development of shipbuilding industry, Nantes' land transportation has also been greatly developed. In 1826, the world's first bus was born in Nantes, and the mass transportation system began to appear. In 1851, the railway reached Nantes, which promoted the development of transportation between cities. Then cars also entered the life of Nantes people, while the vigorous development of land transportation has driven the urban

economic growth, the contradiction with the natural environment also began to appear. The periodic flood of rivers in Nantes. The existence of some rivers brings inconvenience to the passage of railways and cars, and the connection between the South and North banks. There are also health problems in rivers. In order to solve some problems, Nantes began to carry out major projects in 1926. Fill the water flow of the Loire River in the city center and along the Edre River downstream, and turn these water flows into underground canals. In the 1930s, the 50 Hostage Street, formed by filling the river, was born and became the main traffic trunk line in the city center. Soon, cars and parking places occupied the street, with traffic jams and serious air pollution. The widening carriageway gradually replaced the pedestrian space. At the same time, this street also cut off the connection between the buildings in different historical periods on its left and right sides, and destroyed the strong commercial atmosphere in the urban center in the past, and the area gradually lost its vitality.

After World War II, due to the siltation of the Loire River, the downstream port activities migrated. The migration of shipbuilding and related industries has led to the gradual decline of Nantes shipbuilding industry with the transfer of industrial centers to Asia, factories in large industrial areas have also been moved away. This series of changes has led to the stagnation of Nantes' economic development, and idle industrial plants and warehouses can be seen everywhere in 1987. The last shipyard on Nantes island was also forced to close. The once glorious port city is gradually declining, the population is sharply reduced and the economy is depressed.

In order to help Nantes out of its decline, under the guidance of national policies and guidelines, Nantes began to carry out urban reconstruction with unique Nantes characteristics and its own situation. In 1989, Jean-Marc Ayrault, the mayor of Nantes, found that although Nantes declined due to the loss of the core of economic development—Shipbuilding industry, its long history and culture left rich historical and cultural heritage to the city. Therefore,

Jean-Marc Ayrault decided to give full play to the characteristics of history and culture and use artistic transformation to reinvigorate the city. At the same time, the strong desire for global sustainable development puts forward new requirements for Nantes urban planning. Therefore, it has become the perfect integration of art transformation and sustainable urban transformation.

Renovation of old cities and artistic transformation

During the large-scale reconstruction of the city, Nantes government stressed that on the basis of protecting the original buildings and the main spatial structure of the city, the height and materials of new buildings should be strictly controlled to ensure coordination with the surrounding historical buildings, to maintain the beautiful skyline and highlight the overall characteristics of the city. Through large-scale restoration and modernization of historical buildings, Nantes government not only retains its unique historical and cultural value, but also adds artistic and aesthetic value to it. At the same time, the strict requirements for new buildings have led to the birth of more excellent design works, such as La Bellus Hotel, Nantes library, etc. For the abandoned factories and warehouses left by the industrial decline, a group of artists has carried out large-scale renovation and artistic transformation. For example, the abandoned factory on Nantes island has been transformed into a mechanical theme park. The former Lu factory has been transformed into Nantes National Theater, and the former warehouses have now become bars, restaurants, art galleries, concert halls and so on. The way of using artistic transformation to renovate the old city makes the buildings in various historical stages organically combined, reflecting the evolution process of urban landscape.

Green travel

In the early 1990s, in order to disperse the traffic flow into the city center, Nantes built two new bridges across the Loire River to improve the ring road traffic outside the city, so as to reduce the traffic congestion and air pollution in the city cen-

ter^[5]. In addition, in order to fundamentally reduce the use of cars by citizens and reduce the emission of carbon dioxide gas causing green house effect, Nantes municipal government began to vigorously develop other more environmentally friendly travel modes that can replace cars, such as tram, bus, bicycle, walking, etc.

Nantes is not only the birthplace of the first bus in the world, but also the first city in France to establish a modern tram system after World War II. In order to promote the development of public transport, Nantes municipal government reconstructed the motorway and introduced the bus tram line into the urban center. For example, the reconstruction of 50 Hostage Street: By reducing the original 8-lane car traffic and a large amount of parking space to 2 lanes plus the width of temporary parking car traffic, the original 5 hectares of traffic area is now reserved for public walking and rail traffic^[6].

In order to encourage citizens to use public transport for travel, the municipal government is committed to improving the service of public transport and the coverage length of public transport network. In 1999, the distance between 80% of Nantes' houses and bus stops was within 300 meters. By 2009, the proportion had risen to 95%. Moreover, the municipal government stipulates that if there is a residential area within 300m from the public transport, the public transport should run at least once an hour. In addition, Nantes municipal government has carefully designed flowerbeds, benches, street lamps, paving, etc. and flexibly arranged various activity spaces in combination with the twists and turns of the road. While carrying forward the urban history and culture, strengthening the connection between the historical blocks on both sides of the street, promoting public activity exchanges and regional commercial development, they improved the infrastructure construction of the surrounding environment of public transportation and provided convenient and comfortable green travel environment for citizens. These measures are effective. After decades of increase in car use, the proportion of citizens who choose to drive alone in

the overall travel began to decrease from 2001 to 2002, while the number of citizens who use public transport is increasing year by year. In addition, in order to further reduce carbon emissions, Nantes municipal government began to vigorously develop buses and trams using clean energy, which is consistent with the objectives of the climate plan.

Bicycle and walking are very popular among citizens because they are pollution-free and have low noise. In order to meet the citizens' demand for green travel, the municipal government continues to expand the citizens' walking space and extend the bicycle lane. In 2001, the length of bicycle lane in the city was 225 kilometers, but by 2009, the bicycle lane was extended to 376 kilometers, an increase of 66%. At the same time, with the help of TAN, SNCF, LILA, OTNA organizations and advertising, the bicycle service quality is getting better and better. The developed bicycle rental system has greatly improved people's enthusiasm for bicycle travel.

Green space

According to the report in 2013, 61% of Nantes consists of natural space, half of which is used for suburban agriculture. This amazing green space coverage has undoubtedly become a highlight of Nantes, which is inseparable from the construction of urban green space by Nantes municipal government. The first is the construction of urban forest. The more famous is the Shezna Forest in the northwest of Nantes, which was originally an abandoned farmland. On the basis of making full use of the existing grassland resources, Nantes municipal government transformed it into a forest by introducing plants and wetlands, so as to increase the habitat environment of wild animals. Today, this forest is not only a good place for citizens to relax and entertain, but also has made great contributions to the improvement of urban air quality and the protection of biodiversity^[7]. In addition, the substantial growth of Nantes green area is inseparable from the wide participation of citizens. Nantes government has set up a special agency to show the progress of urban forest scheme to the public and

receive consultation. All participants discuss and determine the scheme of the next stage together. Now, the per capita green area is 37 square meters, there is a green rest area every 300 meters, and there is a park within 500 meters near each living area^[7]. Moreover, the famous Nantes island project also attracts people's attention. The project plans to turn 350 hectares of industrial "Brown" in the city center.

"Land" is transformed into an ecological area with complete infrastructure, strong creative art culture and advanced green circulation system. In addition to tram, bus rapid transit facilities and a bicycle lane around the island to encourage citizens to travel green, the island also has an advanced waste treatment system and a photovoltaic power plant, which truly infiltrates green into all aspects of life. The realization of this ecological area is undoubtedly the perfect integration of art culture and green ecology.

4.2. Shenzhen

Although Shenzhen is located in China with a civilization history of more than 5,000 years, it has been a sparsely populated and underdeveloped border for a long time in the long history, and there are no many historical sites. After the founding of new China in 1949, although the city's national economy has developed to a certain extent, the people's income level is still very low, which is in sharp contrast to Hong Kong on the other side of the river. Therefore, many labor forces fled to Hong Kong to make a living, and Shenzhen has become more desolate and depressed. The real development of this city should benefit from China's reform and opening up in 1978. In the early stage of reform and opening up, although Hong Kong, Taiwan and developed foreign enterprises had advanced technology, they were faced with the problems of land shortage and high labor cost. At that time, Shenzhen was waiting for development, with a large area of idle land and abundant labor force. Therefore, this way of providing equipment (including foreign investment in building factories), raw materials and samples by foreign investors, and providing land, factories and

labor by domestic enterprises, which makes the two hit it off. Relying on the preferential policies of the special zone granted by the central government, Shenzhen has rapidly accumulated construction fund, technology and management experience through the processing and manufacturing of incoming materials, sample processing and incoming parts assembly. The large-scale and clustered OEM plants have been growing and set off another round of upsurge of investment attraction. The export-oriented economy dominated by industry was established. Since then, Shenzhen has embarked on the road of industrialization and trade from agricultural economy^[8].

The development of industry has driven the rapid growth of Shenzhen's economy, but this low-end industrial structure not only has a lot of pollution, but also consumes a lot of energy, which is undoubtedly a heavy burden on Shenzhen, which is small and resource scarce. Therefore, at this time, Shenzhen's economic growth began to slow down and people began to face the new problems caused by industrial development. The first is air pollution. Some factories and enterprises discharge dust all over the sky, resulting in heavy haze in the city. Among them, the industrial waste gas discharged from power plants, printing and dyeing plants and other enterprises contained sulfur dioxide that can cause acid rain. In addition, the sharp increase of motor vehicles has also led to more and more serious air pollution caused by vehicle exhaust. The second is water pollution, due to the serious lag in the construction of sewage treatment facilities in Shenzhen. Water pollution is increasing. At the beginning of 2016, there were 159 black and smelly water bodies in 310 rivers in the city, ranking first among 36 key cities in China. The contradiction between the ecological environment and the development of human society is becoming more and more prominent. Therefore, since the acid rain incident on Nantou Peninsula in 1998, people began to attach great importance to the treatment of environmental pollution.

Like Nantes, Shenzhen is also a port city. However, the difference is that Nantes is a historical

ancient city, while Shenzhen is an emerging city. After learning from the example of “pollution first and treatment later” of some cities at home and abroad, Shenzhen has always adhered to the policy of “prevention first and combination of prevention and control” in the process of urban planning, construction and economic development, so as to control pollution and protect the ecological environment. As a frontier city of reform and opening up, high and new technology has always been the core driving force and advantage of Shenzhen’s economic development, and innovation has also become a major feature of Shenzhen. Therefore, in the process of transformation to a green city, Shenzhen has also given full play to its innovative characteristics and technological advantages to achieve green development.

Optimize the industrial structure

Shenzhen municipal government has carried out a series of industrial upgrading and changes after realizing that the traditional industrial manufacturing industry will damage the ecological environment. According to the first edition of the urban master plan of Shenzhen, the government first deals with the “three supplies and one compensation” processing industry, which is the source of pollution: stop introducing new “three supplies and one compensation” enterprises and remove the enterprises that pollute the environment. At the same time, the strategy of “revitalizing the city through science and technology” is put forward. At this stage, in order to develop the science and technology industry, the government formulated a series of strategic plans, targeted the layout of strategic emerging industries, including electronic information and new materials, and took the high-tech industry as the leading industry driving the economic growth of Shenzhen. In 1996, the second edition of the urban master plan of Shenzhen proposed to vigorously develop high-tech industry, modern service industry and modern logistics industry at this stage, high-tech development has become the focus of industrial development in Shenzhen, and the high-tech park has developed and expanded rapidly under the strong leadership of the government^[8]. In 2010, the third edition of the urban

master plan of Shenzhen was issued, which proposed that while further consolidating and strengthening the four pillar industries including high-tech industries, we should use high-tech, combined with advanced applicable technology and modern management technology to upgrade and transform traditional advantageous industries and cultivate leading enterprises with independent innovation ability. At this stage, independent innovation has become the key word of Shenzhen industry^[8]. The government has successively issued and implemented seven strategic emerging industry plans and supporting policies including the Internet, new energy, new materials, energy conservation and environmental protection. And the government accelerated the cultivation and implementation of four future industrial plans and policies for life and health, robots, wearable devices and intelligent equipment. It can be seen that the new industries to be vigorously developed in Shenzhen and directly or indirectly related to the protection of the ecological environment, which greatly promotes the construction of a green city in Shenzhen.

Green

Relying on forest, wetland, green space and other resource elements, Shenzhen carries out ecological restoration through new forestation, building a green water network, building an open Wetland Park and other measures, expands and optimizes the ecological space, and constructs an interconnected, hierarchical and species rich forest ecological network and green barrier. After years of efforts by the Shenzhen government, the nature reserve composed of the whole Shenzhen Bay, Futian Mangrove Reserve and Hong Kong Mai Po Wetland has become the most important transfer station and gas station for bird migration in the world.

In addition to reshaping the ecological base, Shenzhen took the lead in putting forward the concept of provincial, urban and community greenway network in the province, and built a greenway network at all levels with a total length of about 2,443 kilometers. In addition to connecting the mountains, forests, cities, lakes and seas in Shenzhen, it can

also directly access scenic spots, parks, seaside and other leisure places. It can be said that the greenway extends to every corner of the city. In order to strengthen the function and quality of Greenway services, Shenzhen innovated and released the “Shenzhen greenway map”, made the two-dimensional code of the map, compiled the green map website online, etc., to facilitate citizens to view greenway information, transform waste containers into post stations to provide rest, simple medical rescue and leisure viewing areas for tourists^[9]. The high-quality greenway slow travel system makes environmental protection travel modes such as cycling and walking more and more popular with the public.

In addition, under the condition of limited land resources, in order to meet the needs of ecological construction land, Shenzhen innovated to implement three-dimensional greening for public buildings and municipal facilities, such as school roofs, overpasses, waste transfer stations and public toilets. The above vigorously promoted and applied new materials, new processes and new technologies for three-dimensional greening, strengthened the publicity of three-dimensional greening and encouraged public participation. A large number of high-quality three-dimensional greening projects began to emerge, such as the green wall of the highest environmental monitoring building in Futian District in China, the roof greening of Baihua Primary School in Futian District, Shenzhen, and the greening of the most beautiful parking lot in Shenzhen in the two years from 2017 to 2018. The new three-dimensional green area in Shenzhen reached 660,000 square meters^[9]. The increase of green area has effectively alleviated the heat island effect: From 2016 to 2017, the intensity of urban heat island effect has decreased by 0.2 °C.

Haze control and water control

Since the main leaders of Shenzhen put forward the coordinated development concept of “bluer sky, clearer water, greener ground, and more green space and space for future generations” at the

Eighth Party Congress of Guangdong Province in 1998, Shenzhen has begun to implement measures according to local conditions and precise treatment according to the sources of air pollution.

The Shenzhen government first changed the fuel used by the thermal power industry from highly polluting heavy oil to clean natural gas, to realize all clean production in the thermal power industry, which reduced the annual emission of sulfur dioxide by more than 60,000 tons and the emission of nitrogen oxides by nearly 20,000 tons. In addition, in combination with major projects such as West to East Power Transmission and West to East Gas Transmission Line 2, the Shenzhen government has continuously increased the proportion of clean energy use in power plants and boilers, and gradually replaced traditional civil fuels with liquefied natural gas. In 2011, Shenzhen completely banned the use of coal, heavy oil, firewood and other highly polluting fuels, completely eliminated civil bulk coal and industrial and commercial coal, and became the only city in China that banned the burning of highly polluting fuels^[10].

Next, in view of motor vehicle pollution, Shenzhen has effectively curbed motor vehicle pollution through the overall idea of controlling increment and reducing stock, strengthening source control, process supervision, end elimination and supporting measures, and implementing 12 measures such as I/M system, scientific and technological monitoring and road sampling inspection^[10]. At the same time, the emergence of subways, shared bicycles and new energy vehicles also provides citizens with a variety of choices for travel, thus reducing the use of cars.

In addition, aiming at the pollution of ports and ships, the Shenzhen municipal government promotes the use of shore power and low sulfur oil by ships, and sets up PM2.5 in and around the eastern and western port areas. The monitoring points control pollution by means of real-time monitoring of their air quality and other measures.

Since Hong Kong's return, a series of strategic plans for air pollution control in the Pearl River Delta have been issued one after another, creating a precedent for China's regional governance, joint prevention and control. At the same time, the establishment of cooperation between Shenzhen and Hong Kong, and the cooperation between Shenzhen, Dongguan and Huizhou mechanism has also greatly promoted the overall improvement of air quality in Shenzhen and the Pearl River Delta.

As a high-density city, Shenzhen has complex underground projects and pipe networks, and any problem will have a serious impact. Shenzhen adheres to the way that one party and government leader is responsible for governing a river. Leaders at all levels go deep into the front line to carry out targeted governance of the rivers they are responsible for, forming a water control mechanism of linkage from top to bottom and joint management innovative implementation of Basin wide systematic governance in Shenzhen. They break the previous practice of "segmentation and fragmentation", Shenzhen municipal government plans to package all water control projects in the basin, recruit and select large enterprises for unified implementation, promote the substantial acceleration of the project, adhere to the source treatment, and unswervingly promote the technical route of rainwater and sewage diversion. Since 2016, Shenzhen has focused on the pipe network, built 6,274 kilometers of sewage pipe network, completed 13,793 rectification and reconstruction of communities and villages in the city. And Shenzhen adhered to co-construction, co-governance and sharing, gathered more than 50 domestic first-class institutions to form Shenzhen water control technology alliance, exchanged water control experience and technology with each other, and formed a good atmosphere of open water control and water protection for the whole people.

5. Conclusions

Combined with its strong historical and cultural characteristics, Nantes municipal government uses artistic innovation to transform the city based on

protecting traditional historical buildings. While showing its characteristics to the extreme, Nantes municipal government realizes sustainable development of the city through green travel and green public space transformation, the perfect integration of historical culture, artistic innovation and green construction has successfully made Nantes complete the green transformation. All of the above attracted the attention of the world in a short time and became Nantes' unique green city development model.

Unlike Nantes, Shenzhen is not a historical ancient city. Since the reform and opening up, Shenzhen has developed from a small border town to an international metropolis. It is also because Shenzhen is a frontier city of reform and opening up. In its early stage, it was able to get in touch with the advanced technology of the international community by absorbing the economic development mode of foreign enterprises to develop industry. High and new technology has gradually become the driving force of Shenzhen's economic development, which has created a green city construction mode, in which Shenzhen relies on high and new technology to continuously reform and innovate in industrial structure, greening, haze control and water control in order to achieve sustainable development.

Although the historical backgrounds of the two cities are different, the ultimate goal to achieve is the same—to build a green city, and both have achieved great successfully. The main reason is that the ecological urban planning of the two cities is based on their respective historical backgrounds and environmental conditions. This is also the reason why it is difficult for some cities in the world to succeed in the construction of Green Cities: Some cities only want to achieve certain indicators, but ignore the actual situation and needs of the city, resulting in the design of ecological planning is too macro and operational, or lack of overall and long-term prediction. There is also the blind pursuit of large-scale greening and the lack of urban characteristics. Therefore, from the successful cases of Nantes and Shenzhen, it can be seen that when countries around the world carry out green city construction, they should carry

out green city construction according to the urban historical background and environmental conditions, combined with their own urban characteristics, and create a unique green city construction mode. Of course, in order to realize the sustainable development of human society and ecological environment, we can't just rely on the government. Each of us should also contribute to the protection of the environment. We should start from ourselves and the small things around us, advocate green life and build our common "green global village".

Conflict of interest

The authors declare no conflict of interest.

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