Analysis of Low-carbon City Construction Path in Shenzhen

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Abstract. In the face of global climate change characterized by climate warming, in order to protect the natural environment and restore its vitality in the past, human beings began to seek low-carbon development methods. As the center of human social and economic activities and the main source of greenhouse gas emissions, cities play a core role in the development of global low-carbon economy. This paper takes Shenzhen as the research object, explains the existing problems and suggestions of low-carbon cities, and puts forward the low-carbon development approach of Shenzhen under the premise of ensuring steady economic growth. Its green and low-carbon industrial system is accelerating, the clean and efficient energy system is becoming increasingly perfect, the green and low-carbon transportation level is leading the world, the development of green buildings is making solid progress, the ecological livable Shenzhen model is taking the lead, green and low-carbon living consumption highlights, green science and technology innovation plateau is taking shape, and green and low-carbon regional opening and cooperation is rich and colorful. All these indicate that Shenzhen has made remarkable progress in low-carbon construction.

Keywords: Low-carbon city, Development path, Shenzhen.

1. Introduction

With the rapid development of global industrialization and urbanization, the rapid growth of population, some unhealthy lifestyles and over-utilization of conventional energy lead to the increase of carbon dioxide emissions year by year, which brings great harm to human living environment while excessively pursuing economic scale, and seriously threatens the healthy development of human society. Therefore, reducing carbon emissions has become the common demand of all mankind, and it is also the core task of achieving global sustainable development in this century. The grim situation at home and abroad has made the task of vigorously promoting low-carbon development in China more urgent, in the face of a series of problems exposed in the process of urban development, such as tight energy supply, single structure, and environmental pollution. Promoting the construction and development of low-carbon cities is a new and effective reform measure. Among the emission reduction targets proposed in the 2008 Fukuda Blueprint, a very important measure is the mobilization of the whole people to let the awareness of energy conservation penetrate into the national life. Japan attaches great importance to low-carbon education and publicity. In 1975, the Japanese government changed the name of the original "National Primary and Secondary School Pollution Countermeasures Research Association" to "National Primary and Secondary School Environmental Education Research Association" [1]. Popularize low-carbon concept from primary education. In May 2009, Japan implemented the "environmental protection points system". Consumers who buy air conditioners, refrigerators and digital TVS that meet energy efficiency standards will be given "green points", which can be redeemed for consumption vouchers [2]. Under the influence of these measures. The concept of "carbon neutrality" has gradually been accepted by the people, and individuals and organizations have become accustomed to contributing to the energy conservation and emission reduction fund according to the amount of carbon dioxide emitted for environmental protection.

Since 2010, China has carried out pilot low-carbon cities in 81 countries in three batches. The goal of these pilots is to explore green and low-carbon development paths and promote local efforts on climate change and sustainable development. The research method of this paper is literature analysis,

taking Shenzhen as an example to study the path of low-carbon cities, and put forward suggestions and summaries on the problems encountered in Shenzhen's energy structure, climate action plan and project implementation.

2. Background of Shenzhen's Promotion of Low-carbon Development

2.1. Shenzhen Reform Background for Deeply Promoting Low Carbon Technology

Shenzhen is a window for China's reform and opening up, and also a pioneer in China's green and low-carbon development. While the economy is growing rapidly, Shenzhen actively responds to environmental challenges, exploring a green development path from controlling haze to achieving carbon peak and carbon neutrality. Shenzhen's green and low-carbon industries, represented by new energy, safety, energy conservation and environmental protection, and intelligent connected vehicles, have formed a world-class industrial cluster with international competitiveness. Cities are the gathering place of modern social economy, but behind the huge economic development, their carbon emissions also account for 70% to 80% of the entire carbon emissions; among them, buildings consume a large number of natural resources and energy during their construction and operation. According to statistics, 60% of carbon emissions in cities come from buildings. Due to the significant burden of high industrialization on the urban environment, various levels of pollution are rapidly increasing. Low carbon technology acts on both the demand and supply sides of economic activities, which is the key to achieving the low-carbon development vision [3].

At the beginning of the reform and opening up, Shenzhen introduced a large number of labor-intensive "three come and one make up" industries with high pollution, high energy consumption, and high emissions. With the rapid development of the economy, pollutant emissions have also grown rapidly, mainly from motor vehicle exhaust (31%), industrial sources (24%), and thermal power plants (18%).

2.2. The Urban Environment of Shenzhen under the Background of High Industrialization

Under the background of high development, Shenzhen International Holdings has become one of the first batch of national low-carbon city pilot projects. Shenzhen International Low Carbon City Project has been officially launched, and it has become one of the eight national low-carbon city pilot projects. The large amount of energy emissions has brought enormous pressure to cities, so how to create energy-saving and green buildings while developing has become a topic of concern for many years in society. In order to create a national green and low-carbon industry, Shenzhen faced a very challenging task. At that time, it was not only China's first challenge, but also faced great social pressure.

2.3. Difficulties in Developing Low-carbon New Energy Technologies

In the process of building a green industry, it is necessary to create progressiveness, innovative, exemplary and scientific technologies in a very tight construction period. Behind the brilliant achievements of the Shenzhen low-carbon city project are the unknown hardships and efforts. While vigorously tackling environmental pollution, Shenzhen has actively promoted industrial transformation and upgrading, forming seven strategic emerging industries. In the process of industrial transformation, Shenzhen has boosted the rapid development of many green and low-carbon industries through localized applications.

3. Problems Encountered in Building a Low-carbon City in Shenzhen

3.1. Energy Structure Optimization

Optimization of energy structure: Shenzhen, as an economically developed city, has a large demand for energy. At present, fossil energy is the main source of Shenzhen's energy structure, such as coal, oil and natural gas. The consumption of these fossil fuels accounts for a large proportion in the energy consumption of Shenzhen, which not only leads to the excessive exploitation and utilization of energy resources, but also brings serious negative impacts on the environment [4]. Compared with other cities, Shenzhen's clean energy development is also relatively lagging behind. Although clean energy such as solar and wind energy have made some progress in Shenzhen, the proportion of clean energy in the overall energy structure is still relatively low. This makes Shenzhen's energy structure relatively unitary, but mainly involves the use of fossil energy. The use of fossil energy produces large amounts of carbon dioxide and other greenhouse gases, which negatively impacts climate change and carbon emissions.

3.2. Traffic Emission Energy

Traffic emission: Shenzhen is a highly developed city with a large traffic flow and a large number of vehicles, which leads to a large amount of exhaust and carbon emissions, which has a negative impact on the environment and air quality.

Urban planning and land use in Shenzhen is one of the important factors of traffic congestion. Overdevelopment and high-density construction in urban centers lead to excessive concentration of traffic demand and limited road capacity, which is prone to congestion. In addition, the supply of parking Spaces in the central areas of the city is insufficient, causing vehicles to park on the roadside, further aggravating traffic congestion [5].

Shenzhen's rapid economic development and population growth are another major cause of traffic congestion. With the acceleration of urbanization, the demand for transportation is increasing, and the construction of transportation infrastructure is relatively slow to meet the increasing demand for transportation. In addition, the increase in logistics and business activities brought about by economic development has also exacerbated urban traffic congestion. The mode of transportation in Shenzhen is also one of the reasons. Shenzhen citizens rely heavily on cars, which leads to serious road congestion. In contrast, the low proportion of low-carbon modes of travel such as public transport, walking and cycling fail to play their full role in alleviating traffic congestion.

3.3. Structure Optimization

Building energy saving renovation: The work of building energy conservation in Shenzhen has achieved certain results, but the potential of energy conservation market is still huge [6]. The construction industry in Shenzhen has a big problem in the selection of materials, at the same time, the construction area is rising in a straight-line increase of not less than 10%. Many construction projects in the selection of building materials, often only consider the economic benefits and ignore the environmental benefits. However, many construction projects often only consider economic benefits and ignore environmental benefits when choosing building materials. For example, some highly polluting and energy-consuming materials are used in large quantities in buildings, increasing the pressure on carbon emissions. In the architectural design and construction stage, some architectural designs are not reasonable enough, and do not fully take into account natural ventilation, lighting and other energy-saving designs, resulting in large energy consumption during the use of buildings. In addition, in the construction process of some buildings, there are problems such as waste of materials and pollution of the environment, which increases the pressure of carbon emissions.

4. Measures to Promote the Development of Low-carbon Development

4.1. Reduce the Use of Fossil Fuels while Promoting Green Energy Utilization

In order to achieve "carbon peak and carbon neutrality", China emphasizes the need to promote the transformation and upgrading of traditional industries and the optimization of energy structure, and promote the construction of renewable energy to replace the dominant position of coal-fired power generation. The green transformation of the traditional thermal power industry mainly involves upgrading and transforming existing coal-fired units, as well as promoting the construction of new energy fields such as hydropower, wind power, and photovoltaic power generation. One extremely important aspect of promoting the development of low-carbon technology is to respond to national policies and promote the construction of a new energy base. In the planning, construction, and operation of the base, city will deepen the substantive cooperation between new energy and thermal power and promote the optimization of the combination of coal and new energy [7]. At the same time, the development of emerging industries also requires a large amount of capital supply. Shenzhen has also issued some Green bond to promote the transformation of enterprises and reduce emissions. In order to meet and meet the issuance conditions of Green bond, enterprises will inevitably choose transformation and upgrading to control their pollutant emissions [8].

4.2. Improving Traffic Emissions by Controlling Vehicle Operation and Affecting Urban Air Environment

Regarding the allocation of transportation resources, it is necessary to finely allocate road resources among various modes of transportation and cooperate with reasonable traffic management and control measures. By dividing the right of way reasonably, mixed traffic flow can be avoided, allowing pedestrians, motor vehicles, and non motor vehicles to flow smoothly, and improving traffic operation efficiency. Minimize the intersection area as much as possible, set up a left turn waiting area, and clarify the right of way for people and vehicles. By adopting advanced traffic control means and information technology, such as driving route guidance, parking management and information release, traffic flow control and other measures, urban traffic information can be obtained, processed and released in a timely manner. The commonly used methods for dividing road rights currently include setting up physical isolation facilities and setting up one-way traffic [9].

Regarding solving the problem of traffic emissions, traffic control can be used to limit the flow and composition of motor vehicles in the characteristic areas during peak hours. Encourage the use of the public transport system by means of tolls and prices such as road maintenance fees, vehicle purchase taxes and mileage taxes, fuel consumption and pollution emission taxes, parking fees, etc. Manage and control parking lots in busy areas, such as controlling parking time and number of parking spaces, to maximize vehicle parking and minimize interference with road traffic. The roadside parking fee policy adopted has implemented a high fee management method for roadside parking in key areas, vigorously promoting public transportation travel.

4.3. Reducing Organic Pollutant Emissions by Improving Industrial Facilities

Reducing industrial source emissions can be achieved by promoting the substitution of low volatile raw and auxiliary materials, which is the primary way to achieve the reduction of unorganized organic pollutants. Improve the collection rate of waste gas related to organic pollutant processes, follow the principle of full collection of receivables, and try to convert unorganized into organized as much as possible. To improve the treatment rate of end-of-life facilities and achieve synergistic efficiency in pollution reduction and carbon reduction, the first step is to improve the operational standardization of existing treatment facilities and regularly replace ineffective purification materials based on actual treatment efficiency.

To effectively reduce the unorganized emissions of VOCs from industrial sources, it is recommended to increase the waste gas collection rate and concentration of VOCs related processes, and simultaneously improve the standardization of the operation of treatment facilities and the rationality of process design [10].

5. Conclusion

Against the backdrop of the country's vigorous promotion of low-carbon industries, Shenzhen actively responds to environmental challenges, from controlling haze to achieving carbon peak and carbon neutrality. As one of the first batch of low-carbon pilot cities in China, a pilot city for carbon Emissions trading, and a demonstration area for innovation in the sustainable development agenda, Shenzhen has made remarkable achievements in energy conservation, emission reduction, zero carbon construction, and has initially formed a low-carbon development model with Shenzhen characteristics. In order to promote the operation and promotion of low-carbon economy, under the background of domestic green Low-carbon economy transformation and industrial structure adjustment, city should vigorously promote emerging green industries and reduce resource consumption and gas emissions caused by fossil energy. At the same time, refined traffic design will be the focus of the new round of traffic quality improvement work, and it is also a key focus that needs to be paid attention to in the management of traffic congestion in large cities. Under the premise of minimizing engineering construction, improving the traffic capacity of roads and intersections through refined design is of great significance for improving urban traffic congestion and urban quality, and is also an important part of promoting green travel. To effectively reduce the unorganized emissions of organic pollutants from industrial sources while improving environmental benefits, it is recommended to increase the waste gas collection rate and concentration, and simultaneously improve the standardization of the operation of treatment facilities and the rationality of process design, in order to achieve low energy consumption reduction. And in order to ensure low-carbon operation, cities also need to vigorously promote the operation of Green bond to provide sufficient funds for low-carbon construction. Over the years of construction and operation, Shenzhen's low-carbon and new energy technologies in various industries have been rapidly developing, and a complete system has been established. Shenzhen is the beginning of the national development of low-carbon, which has had a huge impact on the popularization and development of low-carbon throughout the country. The series of developments in Shenzhen's reform and opening up fully reflect the development process of China's reform and opening up. By showcasing Shenzhen's low-carbon technology, we aim to promote national follow-up on green technology. In recent years, it has gradually been implemented in various industries, bringing a brand new quality of life to the people. In future development, various industries should actively improve low-carbon technologies and establish a better foundation for the high popularization of low-carbon technology.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

References

[1] Yu Hongyuan. Low Carbon Economy: A Common Development Direction for Human. Society, Green Leaf, 2009, (1).

[2] Li Chun. Main Experience of Building a "Low Carbon Society" in Japan. Engineering Machinery, 2009, (12).

[3] Sheng Wen. Research on Accelerating the Reform of the Electricity Market to Adapt to Carbon Neutrality Goals. Economics, 2021, 4(2): 15-18.

[4] Ge Guoyao. Vigorously develop clean energy to achieve sustainable economic and social development. Guangdong Science and Technology, 2008.

[5] Bao Yin. Role ofintelligent traffic guidance “microcirculation” in urban traffic. Traffic & transportation, 2021, 37(4): 71-74.

[6] Yang Wenxia. Improving the quality of economic growth and energy constraints. Energy Saving Technology, 2002, (4).

[7] Chai Mei, Luo Yonghao, Monday Gong, et al. Flexible and Smart Thermal Power Supporting Shanghai's Urban Energy Transformation and Development. Shanghai Energy Conservation, 2021, (4): 326-330.

[8] Dong Mengyuan. Analysis of the Path of Green Bonds Assisting Shenzhen's Energy Transformation and Upgrading under the "Carbon Peak, Carbon Neutrality" Strategy. Green Accounting, 2021, (12): 4.

[9] Cheng Shuang, Xia Jia, Zhu Mingkun. Practice of Improving Road Traffic Congestion Based on Refined Traffic Design: A Case Study of Bao'an District, Shenzhen. Transportation and Transportation, 2015, (A02): 5.

[10] Cheng Yijun, Huang Junlin, Qiu Xiangyang, et al. The Status Quo and Control Measures of Unorganized Emissions of VOCs from Typical Industrial Sources in Shenzhen. Environmental Impact Assessment, 2023, 45(1): 49-56.