

## REVIEW ARTICLE

## RESEARCH ON THE CONSTRUCTION AND DEVELOPMENT OF ECOLOGICAL CITY IN YIYANG HIGH-TECH ZONE UNDER THE BACKGROUND OF SMART CITY

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## ARTICLE DETAILS

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## ABSTRACT

In 2017, Yiyang City joined hands with “Huawei” to jointly promote the construction of a new smart city. With the gradual advancement of project construction, it respectively won “2017 China Smart City Innovation Award”, “2017 China Smart City Demonstration City Award”, “Chinese Government Information Management Innovation Award”, “2018 China Urban Governance Intelligent Excellence Award”, “2019 China Leading Smart City Award”, “2021 China’s Leading Smart City” and other titles. However, in the process of development, urban intelligence and ecology have not developed synchronously, and the advantages of high-tech intelligence have not been fully exerted in terms of ecological environment, green building, resources and carbon emissions, and green transportation. This paper combines the concept of smart city and ecological city, benchmarks the evaluation standards of green urban areas, and combines the current situation and planning results of Yiyang High-tech Zone to study the main problems in the current situation, so as to provide an effective development path for the construction of ecological city in Yiyang High-tech Zone.

## KEYWORDS

Eco-City, Smart City, Evaluation Criteria

## 1. RESEARCH BACKGROUND

In 2017, Yiyang joined hands with well-known enterprises such as Huawei and China Telecom Hunan to jointly promote the construction of a new smart city with the goal of “good governance, benefiting the people, and prospering the industry”. In November 2017, the People’s Government of Yiyang City, together with Huawei and Hunan City University, established the “Hunan New Smart City Research Institute” to provide comprehensive and systematic solutions and talent support for the construction of new smart cities in Yiyang, Hunan and even the whole country. As the project construction has been promoted and launched, a series of characteristics and achievements have been demonstrated. They have won the “2017 China Smart City Innovation Award”, “2017 China Smart City Demonstration City Award”, “China Government Informatization Management Innovation Award”, “2018 China Urban Governance Wisdom Excellence Award”, “China Leading Smart City Award” in 2019, “China Leading Smart City” in 2021 and other titles.

Yiyang High tech Industrial Development Zone, formerly known as Hunan Yiyang Chaoyang Economic Development Zone, was upgraded to the National High tech Industrial Development Zone in 2011 with the approval of the State Council. The High tech Zone enjoys a favorable location and convenient transportation. It is only an hour’s drive from Huanghua International Airport and only 70 kilometers from Beijing

Zhuhai Expressway and Beijing Guangzhou Railway. In 2020, it won the National Advanced District for Digital Agriculture Rural Development. In the “13th Five Year Plan” for Economic and Social Development of Yiyang National High tech Industrial Development Zone 2016-2020, it is clearly proposed to “cultivate and strengthen the cloud computing industry”, and to further promote the construction of “National High tech Industrial Base Yiyang Information Industrial Park” with the goal of building a “cloud computing valley”. On December 18, 2018, the Furong Cloud Data Center located in Yiyang High tech Zone officially started operation, and the creation of a smart city has improved more favorable conditions. At the same time, Yiyang High tech Zone is close to the mountain and beside the water, with typical Huxiang landform and landscape characteristics. Zishan Lake Scenic Area, Zishan Lake International Golf Club, Olympic Park, Lijing Yayuan Noble Residential Area and the Zishan Lake Theme Park to be built by investment promotion have formed a unique regional natural ecological landscape.

In the context of smart city development, Yiyang City has endowed the high-tech zone with the connotation of combining intelligent and high-tech industries, but in the current development process, the following problems still arise: the construction and operation of smart cities are blind, relevant theoretical research lacks depth, urban intelligence and ecology have not developed synchronously, the advantages of high-tech intelligence have not been fully exerted in terms of land layout,

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green buildings, resources and carbon emissions, green transportation, etc., and the introduction of relevant policies is relatively lagging behind. Based on the evaluation criteria of eco-urban areas, this paper benchmarks the planning results and provides an effective development path for the creation of green and smart industrial parks.

## 2. A REVIEW OF THE RESEARCH STATUS AT HOME AND ABROAD

Smart city refers to the use of various information technologies or innovative ideas to integrate the components and services of a city to improve the efficiency of resource utilization, optimize urban management and services, and improve the quality of life of citizens (Liu, 2012). With the development of cities and the progress of informatization, industrial science and technology, information technology, cloud computing, (mobile) Internet, intelligent hardware, big data and other information technologies have brought new intelligence and possibilities to the city (Lv, 2013). As an advanced stage of urban informatization development, smart city construction is of great significance to implement the five major development concepts of innovation, coordination, green, openness and sharing, make the city "more scientific, more efficient in management and better in life", accelerate the integration of the four modernizations, and achieve the goals of stable growth, structural adjustment, strong innovation, and promotion of transformation (Chen et al., 2014; Wang, 2016).

As far as the current domestic research results are concerned, there are still few theoretical studies on the development of eco-urban areas in the context of smart cities, and the research results mostly focus on the application level of building energy saving, community governance, urban design and so on (Wan and He, 2017). Among the foreign research results, such as the smart grid in Madrid in 2011, the smart transportation in Madrid, the smart building in Ruhrmülheim in Germany, and the smart urban management in Vienna in 2013, etc., all use the high-tech means of smart city to achieve the goal of efficient urban operation, energy saving and emission reduction, which provides a certain theoretical basis for the research of eco-urban development strategy of this topic (Shen, 2018). In the Eco-Urban study, Richard Register, O. Yanitsky, P.F. Many domestic and foreign scholars represented by Downton, Roseland, Moughtin J. C., William M Marsh, Matthew Carmona), Ma Shijun, Wang Rusong, Huang Guangyu, Wang Jianguo and others have made remarkable achievements in eco-city theory and practical research, laying a solid theoretical foundation for the research of this topic (Cui and Yang, 2018; Yang et al., 2018; Ma et al., 2018). In recent years, there have been many general studies on ecological city construction, for example, the concept of "urban double improvement" was put forward in the Summary of Experts' Opinions at the 2017 Annual Meeting of the Urban Ecological Planning Academic Committee of the China Urban Planning Society (Yan, 2021; Hilbert and Lopez, 2011; Batty, 2012).

## 3. TECHNOLOGY ROADMAP

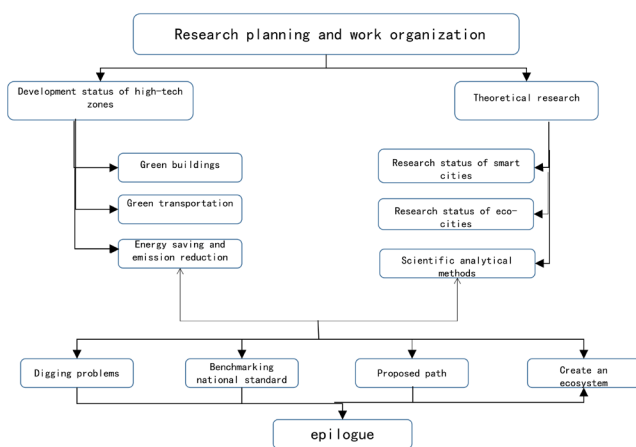


Figure 1: Technical Roadmap

## 4. INTERPRETATION OF THE CURRENT SITUATION

I combine the smart city with the Evaluation Standard for Green

Ecological Urban Area (GB/T51255-2017), comprehensively evaluate the planning achievements of the high-tech zone from eight categories of indicators, including land use, green buildings, resources and carbon emissions, green transportation, information management, industry and economy, and human environment, and study and sort out the construction and development status of the high-tech zone, The main problems in the current development process of the high-tech zone are summarized as follows.

### 4.1 Low Land Utilization Rate

Comparing the current situation of existing land use and the current situation of planned land, there are currently many undeveloped and utilized land and idle land, the phenomenon of urban villages is serious, and land pollution is obvious. At the same time, residential land, public management and public service facility land, and commercial service industry facility land account for less than 60% of the total land use in urban areas, and in the evaluation system of 10 points for land use in the Standards, land use needs to account for more than 60% to reach the standard of 7 points, of which the proportion of land for public management and public service facilities and commercial service facilities is too small.

### 4.2 Lagging Green Building Construction

Taking the theoretical research on smart city development strategy in the literature review at home and abroad, combined with the Standards, all new civil buildings should meet the green building one-star and above standard, of which the proportion of construction area that meets the green building two-star and above standard should not be less than 30%. The proportion of newly built large-scale public buildings (offices, shopping malls, hospitals, hotels) that meet the green building two-star standard or above shall not be less than 50% of the total area of newly built large-scale public buildings. At present, during the construction of the high-tech zone, the upper plan does not explicitly stipulate that all civil buildings should meet the requirements of more than two stars for green buildings, and most public buildings in public buildings do not meet the above requirements except for important public service facilities such as Yiyang Citizen Cultural Center and Yiyang Citizen Service Center. At the same time, there are no special requirements for the evaluation system and construction standards of intelligent buildings.

### 4.3 Lack of Green Transportation Planning

According to the requirements of the Standards, urban transportation planning should put forward guiding measures and overall control indicators to reduce traffic carbon emissions and improve green transportation, and at the planning and design stage, special transportation plans such as walking, bicycles, public transportation, and intelligent transportation in the urban area or implementation should be formulated. Up to now, the upper plan of Yiyang High-tech Zone has not planned the overall control index for reducing transportation carbon emissions, and has not established a relatively independent and complete walking, bicycle and intelligent transportation system on a large scale. At the same time, the degree of intelligence in the process of traffic management is not high, and it is impossible to effectively improve the efficiency of traffic operation and the processing time of traffic accidents.

### 4.4 Low Efficiency of Energy Comprehensive Utilization

At present, there is no detailed and reasonable carbon emission calculation and analysis list in the existing planning plan of the high-tech zone, and although there are phased emission reduction targets and implementation plans, there is no specific implementation path. At the same time, there is no large number of statistics on the distribution and availability of renewable energy in urban areas, and the energy consumption of new buildings has not been evaluated on a large scale, and the proportion of high-efficiency equipment such as road lighting, landscape lighting, traffic lights, water supply and drainage related equipment has not reached 80%.

## 5. SOLUTION AND PATH RESEARCH

### 5.1 Improve Land Utilization

Use GIS and land spatial planning data, make full use of the current large and concentrated undeveloped land, make overall planning of idle land, and increase the proportion of land used for public management and public service facilities and commercial service facilities. Expand the protection and utilization of landscape and pastoral lakes, implement big data monitoring and management, and strictly control violations and illegal construction.

### 5.2 Preparation of Technical Guidelines for Green Buildings

According to the climatic conditions of the high-tech zone, combined with intelligent building management, the overall green building technical guidelines and various green building applicable technology application guidelines are compiled. New buildings fully implement the one-star and above standards in the current national standard "Green Building Evaluation Standards" GB/SHINT50378, of which 30% of two-star and above standard buildings are added, and the proportion of green buildings in public buildings is increased. At the same time, prepare a special planning plan for green buildings, clarify the target positioning, main tasks and safeguard measures for the development of green buildings in urban areas, implement specific green building layout plans, and review regional overall planning, detailed control planning and special planning for green buildings. The public buildings invested by the government should reach the evaluation standard of green building of two stars or above by 100%.

### 5.3 Prioritize Green Transportation

Implement intelligent traffic management, comprehensively promote the establishment of a transportation system that prioritizes green transportation in Yiyang High-tech Zone, and make the green traffic travel rate reach more than 65%. The urban area has formed a complete public transportation system, with 100% coverage of 500m of bus stops, bus lanes along the main corridors of ground public transportation, bicycle lanes in suitable areas, etc., and effective management measures. Increase surface and underground parking spaces, encourage the use of new energy vehicles, and increase the construction of supporting facilities for the use of new energy vehicles.

### 5.4 Establish an Intelligent Network for Energy Distribution

The actual situation of the city where the project is located, such as the climate characteristics, energy structure, conventional energy supply and utilization status, and renewable energy resource status, should be fully understood, an independent intelligent network of energy distribution should be established, and the problem of insufficient energy supply during peak hours should be solved according to the energy consumption laws of electricity, gas, and renewable energy in big data. Combined with the virtual simulation of digital city, formulate a reasonable comprehensive energy utilization plan, clarify the scope and period, objectives, planning content, planning route and planning basis of energy planning, improve energy efficiency, reduce energy consumption and carbon emissions in urban areas, and improve the utilization rate of renewable energy.

## 6. SUMMARY AND OUTLOOK

The development background of smart city in Yiyang City gives the high-tech zone the connotation of combining intelligent and high-tech industries. Based on the current situation of smart city construction, combined with the "Evaluation Standards for Green Eco-urban Areas" (GB/T51255-2017) in terms of land layout, green buildings, resources and carbon emissions, and green transportation, I found that there are four problems in four aspects, such as low land utilization, lagging green building construction, lack of green transportation planning, and low comprehensive energy utilization efficiency, and put forward the problems of improving land utilization, compiling green building technical guidelines, giving priority to green transportation, and Establish solutions such as intelligent energy distribution networks

to provide effective development paths for the creation of green smart industrial parks. However, as a more scientific and objective quantitative analysis method, although the Standard itself can be used as an effective evaluation method, the comments on some detailed rules are not detailed, such as the lack of effective evaluation rules for the evaluation standards of resources and carbon emissions, therefore, in the process of project implementation, a variety of big data evaluation methods should be used for quantitative analysis to reduce quantitative errors and planning errors caused by subjective judgment.

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