Research on City Center Area System Identification and Environmental Renewal Strategy under the Background of Smart Cities

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Abstract. In this paper, combining the development of the times and the construction of smart cities, the various identification elements of the city center area system were collated and extracted while combing the morphological characteristics of the central area of the city. Moreover, after combining these identification elements, the problems to be solved in the construction environment of the modern urban center area were analyzed. Through the analysis of the content of smart city construction and integration with the organic renewal of the urban center area, a strategic discussion has been proposed, aiming at maximizing the rejuvenation of the environmental vitality of the urban center area while adapting to modern urban environmental management.

1 Introduction

At the end of the 20th century, the concept of Smart Cities was first introduced and quickly spread throughout the world. At the same time, the rise of information technology has enabled the concept of smart cities to be operational. In China, the studies on smart city projects and investment are rising. This concept has been accepted by more and more city managers, but the combination of smart city construction and organic renewal still has a long way to go.

2 System Identification in the Central Area of the City and Problems

According to the evolution process of the city's overall structure, the central area of the city is a comprehensive concept and is the central location of the city's public buildings and the tertiary industry. It provides urban and urban areas with facilities and services for economic, political, cultural and social activities, and is different from other parts of the city in terms of its constituent systems.[1] The identification of the city center area system can be divided into the following three aspects.

2.1 System Identification

2.1.1 Economic Identification Elements

The city center area plays an irreplaceable position in the economic development of the city, including many economic and trade institutions. The identification elements of the city center area economy include not only the main industries, business models, and economic benefits, but also include the mental outlook of the employees in the economic activities, the market conditions in the center area, the infrastructure in the center area, the construction status of the service facilities, etc. For example, everyone thinks that people on Wall Street live at a fast pace, even if they run to the company during business hours, which are the information that the economic identification elements in the city center system convey to people.

2.1.2 Cultural Identification Elements

The cultural identification of the city center area includes all cultural activities, urban security, social classes, and the social status of various people in the central area of the city. In addition, the cultural level of residents in the central area, the service standards of the service industry, the professional ethics of the practitioners, the standard of living of the citizens, living environments, and public relations are also categories of cultural

2.1.3 Landscape Identification Elements

There are generally two elements of landscape recognition in the central area of the city. The first is the

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basic landscape elements, that is, the space scales, functions, and topographic features of buildings and structures that people intuitively feel. The second is a variety of visual decorations, such as architectural facades, text signage, promotional slogans, and green landscapes.

2.2 Problems in the Central Area of the City

2.2.1 Traffic Congestion & Poor Accessibility

With the continuous development of the auto industry, the number of private cars has been increasing. With the ever-increasing number of traffic problems, the central urban area has become area with the most serious and concentrated problem.

From the comparison of absolute quantity, the growth rate of urban roads in China is generally lower than the number of urban motor vehicles. Confronted with more and more traffic problems centered on the urban center, there is little effect to resolve conflicts through the widening of roads. So, solving the parking problem is already imminent.

2.2.2 Intensified Commercial Facilities and Complex Industrial Structure

The industrial clustering and continuity of operation in the city center area has won the favor of the majority of operators, making the city center district present a different style of business. These different industries have enriched the use of the city center area, but at the same time they also bring many hidden dangers, such as mutual interference, vicious competition, private construction and random construction, which have greatly reduced the degree of coupling between industries in prime locations in cities and have, to some extent, constrained the development of the central area or even the entire city.

2.2.3 Serious Environmental Pollution & Poor Visual Conductivity

In pursuit of maximizing land use, most cities are building mega-buildings in urban centers. These buildings are generous in height and scale. These encirclements of large buildings have led to many canyons and thin strip of sky streets in the central area. Such regional streets lack public space and shared landscapes, high static wind frequencies, and stable air flow, which leads to less diffusion of pollutants. In addition, the outdated facilities, the hardening of the ground, and serious waterlogging in the city areas not only bring serious environmental pollution, but also affect the residents' physical and mental health.

3 Environmental Renewal Strategy

In order to achieve sustainable urban development, the construction of smart cities has become an irreversible historical trend in the development of urbanization in the world today.With reference to foreign experience and the concept of smart city construction in China, the following points are proposed regarding the strategy of environmental renewal in the central area.

3.1 Organic Evacuation & Utilization of 3S Technology to Promote Multi-Center Derivation

3.1.1 Technology of 3S

Smart cities often intersect with regional development concepts such as digital cities, technology cities, ecological cities, and low-carbon cities. The essence of a smart city is to use advanced information technology to achieve smart city-style management and operation, so as to create a better life for people in the city and promote the harmony and sustainable growth of the city. [2]

3S is the abbreviation of Remote Sensing, Global Position System (GPS) and Geographic Information System (GIS). 3S is a general term for modern information technology that collects, processes, manages, analyzes, expresses, disseminates, and applies spatial information through the combination of space technology, sensor technology, satellite positioning and navigation technology and computer technology and communication technology, as well as highly integrated multidisciplinary.

3S is a commonly used technical method in the construction of smart cities. 3S technology can be used to digitize building height, building density, urban texture and street space, and quantitatively analyze the data to form a mathematical model.[3] Then the model can be superimposed on the central area to realize scientific and rational evacuation. The intensity that affects city development is appropriately transformed into dispersion.

3.1.2 Intelligent Evacuation

If the functions of the city center are different, the organization of the city center is different. The traditional city center is often integrated with business, finance, culture, and office, and it is only a single-core center. GIS, RS and GPS can effectively acquire data and analyze data with the development of 3S technology, so that the complex and diverse data in the central area of the city can be integrated and the accuracy of image data interpretation can be improved, making the decision-making and design process more scientific and standardized. (as shown in Figure 1)

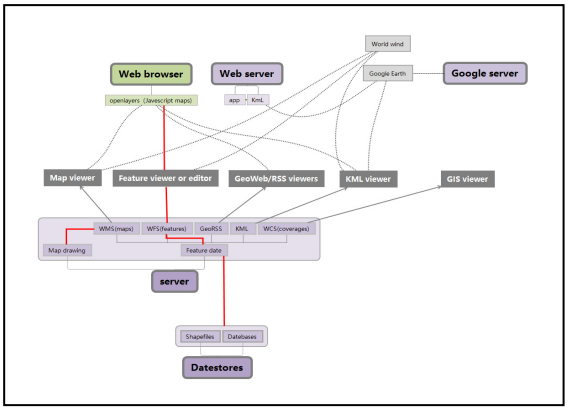

Figure 1. The Work model of GIS.

Urban planners can use these data to organically disperse central facilities such as administrative management, business services, and cultural and recreational facilities within the larger central area or in the central area of the new district, so as to reduce the burden on the original central area while also stimulating the development of other areas of the city. [4] Or they divide the facilities into functional areas, separate them and place them in different locations, and then set up an auxiliary traffic priority network and walking system, which can greatly improve the accessibility of the central area of the city.

3.2 Multivariate Driving & Building Compound LID System

3.2.1 The Dynamic of Growing Cities

The mature city center area presents a strong three-dimensional trend, which manifests itself in high utilization of various spaces. This kind of three-dimensionalization is manifested in several aspects such as “digging down” (that is, the use of underground space), “stretching upwards” (that is, the development of high-rise buildings) and the spatial integration associated. The above space driving underground space, and underground space supplying ground space have become the exploration of the realization of a smart central area.

Through the establishment of an underground integrated pipe gallery in the central area of the city, and the integrated layered multi-channel space integrating wire cables, municipal pipelines, and sewage discharge into one, more floor space will be released to relieve traffic pressure and reduce the interference of municipal maintenance on the environment in the central area. (as shown in Figure 2)

Figure 2. The Work model of underground integrated pipe gallery.

3.2.2 The Application of LID

Low Impact Development (LID) is a stormwater management and non-point source pollution treatment technology developed in the late 1990s, which aims to achieve control of runoff and pollution from heavy rainfall through decentralized and small-scale source control, making the development area as close as possible to the natural hydrological cycle.

The key to achieving the ecological technology system of urban rainwater collection and utilization lies in in-situ collection, natural purification, and the nearest use or remedy of groundwater. In the LID system, a number of links are added to monitor data, and the water circulation in the central area is adjusted, creating a smart water network. [5] (as shown in Figure 3)

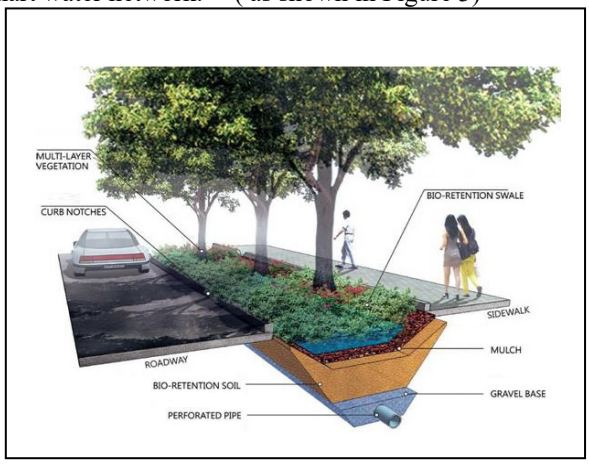

Figure 3. The system of LID

3.3 Green Advance & Use BIM to Assist City Construction Renewal

3.3.1 A Green Revolution

From the courtyard to the streets or buildings to the plants, the central area of the city serves as the starting point for the development of the city, where cultural heritage accumulates here. The construction of a smart city includes the construction of smart buildings. How to make buildings become smart is an important part of the renewal of buildings in the center.

Green building refers to the maximum conservation of resources during the entire life cycle of a building, including energy saving, land saving, water saving, and material saving, which aims to protect the environment and reduce pollution, and provide people with healthy, comfortable and efficient use of space. It is a building that is in harmony with nature. Green building technology focuses on low consumption, high efficiency, economy, environmental protection, integration and optimization. It is the sharing of interests between man and nature or the present and the future. It is a means of sustainable development.

3.2.2 The Useful of BIM

It is not difficult to build a new green building, but transforming an old non-green building is indeed an interdisciplinary, cross-stage comprehensive design process. The BIM model is precisely adapted to this demand. It can restore quantitatively and qualitatively the state of the target reconstructed buildings in the central area of the city, stripping them out of the complex physical environment, and achieving the coordinated design and data concentration of various types of work on a single data platform. At the same time, it incorporates 4D information through software such as Navisworks, so that cross-phase management and design can be completely added to the information model. [6、7]

BIM technology subverts the traditional model of building renewal. In the renewal process of non-green to green in the central area, it can build a complete three-dimensional model of virtual building engineering and use digital technology to provide a complete and actual project information database, where contains geometry, physics, and topology information. [8] Through completing database information, technical support can be provided for better renewal of old buildings in the central area.

4 Conclusion

Linking green urban development, energy efficiency improvement, and environmental climate protection to realize the integration and development between the smart city framework and green city construction has always been the aim of contemporary urban planning and environmental managers.

A good city construction environment is the basis for people's colorful city life. We hope that the research on the identification system of city centers and the renewal of strategic thinking can comply with the construction of smart cities, to a certain extent, and solve a series of problems in the architecture, environment and culture of the central city. Perfecting the recognition of the central area system can also provide ideas for the renewal and development of other parts of the city, so that the central area of the city can also be smart.

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