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Current Situation and Countermeasures of Smart City Construction

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***Abstract*—Smart city construction, which is based on advanced information and communication technologies such as Internet of Things, Internet, big data and cloud computing, is an effective approach to deal with the current urban development problems. After the analysis of foreign smart cities, it is found that the construction of foreign smart cities has a long-term planning and operational balance. Based on the city, the development has its own emphasis, implementing the "people-oriented" concept of development, with the characteristics such that all the people participate in cooperation. It believes that the construction and development of China's smart cities should focus on top-level design, establish a comprehensive and coordinated system and mechanism, scientifically improve the legal and regulatory system of network information security, and provide guarantee for the independent innovation and development of information technology industry.**

Keywords—smart city; construction status; development countermeasures

I. INTRODUCTION

For a long time, China's extensive urban development model has brought a series of difficult social problems, including the following aspects. The first is the environmental problems brought about by the explosion of urban population. The second is the problem of excessive consumption of resources and energy caused by the traditional economic development mode. The third is the unscientific problems of urban operation and management.

A. Challenges Faced by the Human Settlement

In 1950, the proportion of urban population in the European Union was slightly over 50%. By 2010, it had risen to 75%. In the next 40 years, it is expected to increase to 85% [1], [2], [3]. The explosion of population has brought tremendous pressure [4] to the urban environment. Environmental pollution has a great impact on urban economic development. It is estimated by the World Bank that the health costs and productivity losses caused by pollution are equivalent to 1-5% of the country's GDP.

B. Short Supply of Resources and Energy

It is predicted by the experts that, at the current rate of consumption, oil and natural gas will be exhausted in less than half a century, coal will be exhausted in one or two centuries, and the energy situation faced by mankind is becoming increasingly severe. In addition, the non-renewability of energy and the low utilization rate of energy make the energy crisis serious day by day. The problem of high energy consumption in China is particularly prominent. The energy consumption per unit GDP is three times higher than the world average level, four times higher than that in Europe and America, eight times higher than that in Japan and even 40% [4] higher than that in India.

C. Pressure of City Operation and Management

Traffic congestion is serious in large and medium-sized cities in China, for whcih the main reasons are as follows: The number of motor vehicles has increased sharply, and the capacity of the road itself is insufficient; the existing traffic system management and control functions, information collection functions, traffic flow prediction functions and traffic guidance functions are difficult to meet the practical requirements. The unbalanced medical resources and poor circulation of medical history highlight the medical problems. Food safety incidents occur frequently because of inadequate supervision of food testing and inadequate monitoring of production and circulation links. There are difficulties in information sharing among the meteorological, water conservancy, transportation and urban management departments, resulting in waste of resources and inaccurate decision-making [5], [6].

"Developing Smart Cities" has been included into the work report of the government of China, which has aroused great concern from all walks of life. With the steady progress of new-type urbanization, a series of problems such as resources and environment, industrial structure, people's livelihood security, government services and information security have become increasingly prominent. The construction of smart city provides the new ways to solve the problems of urban development in China and realize the sustainable development of cities. From the promulgation of relevant national policies to the establishment of smart city pilot projects, from the establishment of relevant research institutions to the construction of the standard system of smart city construction, the construction and research work of smart cities in China is being carried out in an all-round way.

II. CURRENT SITUATION AND EXPERIENCE OF FOREIGN SMART CITIES

A. Smart Vienna

The smart cities construction of the Vienna Government is carried out [7] based on the Smart Vienna Plan. The plan

focuses on energy efficiency and climate protection, including three parts: the 2050 long-term plan, the 2020 medium-term plan and the 2012-2015 short-term plan. It mainly involves five aspects: overall management of energy system, efficient production and supply technology, smart pipeline network and thermal energy supply, low-energy interactive architecture and environmental protection transportation system.

B. Smart New York

The construction of Smart New York mainly follows the New York City Master Plan, including land, air, water, energy and transportation. By 2030, Smart New York will be a more convenient, healthy, beautiful and equal city. The New York Government is in charge of the implementation of urban planning. And the office for long-term planning and sustainable development is responsible for specific matters. The experts from the environmental, business, community and legal fields form the advisory committee who provides the comprehensive support and assistance for the implementation of the plan. At the same time, the New York Government is studying the economic form and social situation of New York City jointly with Columbia University, New York University, City University of New York and other academic institutions. Besides, the New York government has consulted more than 1,000 citizens so that Smart New York can better serve its residents. In the master plan, New York has added many short-term action plans, which are operational and can make the overall plan practical but not a castle in the air.

C. Smart Singapore

Since the 1980s, Singapore has launched a series of strategic plans at the national level, including 1981-1985 National Computer Program, 1986-1991 National IT Program, 1992-1999 IT2000 Program, 2000-2003 Infocomm Program and 2003-2006 Internetwork Singapore. By 2006, Singapore had launched a 10-year “Smart Country 2015” (iN2015) plan, trying hard to build Singapore into a smart country and a global city driven by the information and communications industry. iN2015 mainly includes four modules: super-high-speed and intelligent communication infrastructure construction; transformation of major economic fields, government and society; building a globally competitive telecommunications industry and enhancing the communication technology capabilities of ordinary practitioners. The specific contents include: 90% of home-use broadband network; 100% computer coverage in families with school-age children; 55,000 new information and communication employment opportunities and 25,000 subsidiary employment opportunities; the output value of the information and communication industry has doubled to 26 billion Singapore dollars; the export revenue of the information and communication industry has reached 60 billion Singapore dollars, a three-fold increase by the current level.

In conclusion, the construction and development of foreign smart cities have provided valuable experience to the construction of China's smart cities, which can be summarized as follows.

1) The balance between long-term planning and operability: Smart city construction abroad has an advanced long-term planning concept, focusing on the next 30, 50 years in most cases, such as Vienna's 2050 long-term plan and the United States 2030 plan. And in order not to make such a construction goal for decades become an unrealizable castle in the air, these cities have formulated the short-term concrete and operable action plans accordingly. By layering and refining the target system, the seemingly " majestic" goals will become practical and simple.

2) Based on the characteristics of the city, the development has its own emphasis: Vienna government proposed the "Smart Vienna" project based on the EU SET plan, focusing on energy efficiency and climate protection. The construction of New York's Smart City focuses on balancing the economic, social and environmental aspects to promote the sustainability and comprehensive development of the city. And Singapore government attaches great importance to the development of information industry and strives to promote the rapid development of economy society by building the smart city.

3) Implementing the "people-oriented" concept of development. Vienna government attaches great importance to the life experience of every urban resident in the process of building a smart city. In its planning projects and action plans, every aspect of the daily life of the residents are taken into account, including housing community, office work, entertainment and recreation, transportation, urban safety and so on. It is considered truly from the actual needs of citizens. In New York's “Connected City" action plan, an important part is to popularize broadband services to low-income households, while its high-speed broadband development plan is to speed up all New Yorkers' access to the Internet.

4) Participation by all people and cooperation with each other: New York's urban planning was compiled from the bottom up with the participation of the public. In the process of compiling the plan, the New York Municipal Government has formulated a detailed public participation plan according to law. And the community people, experts and scholars were invited to give their opinions. The specific forms include interviews, questionnaires, public hearings, civic consultation, media discussions, community lectures and group discussions and summaries of community planning. After repeated discussion and consultation, an action plan as acceptable to all parties as possible was finally reached.

III. DEVELOPMENT COUNTERMEASURES OF CHINA'S SMART CITY CONSTRUCTION

A. The Top-level Design Level

Smart city construction is a comprehensive complex giant system with various applications, various elements, interaction and continuous evolution. In order to make every construction step and content closely linked and organically coordinated, avoid a localized and one-sided design, there must be a scientific method to drive the effective operation of this complex giant system, as well as a top-level design plan

responsible for the overall operation of the city. Some scholars have proposed that the top-level design of smart cities should be implemented from the two aspects of policy planning and technical implementation[8].

1) Top-level design in policy planning: The subject of the design is the local government. The formulation of the overall plan for the construction of a smart city should not covet everything, copy everything, or seek only one aspect. It is needed to consider the overall strategy of the city's development, an scientifically invest the limited resources into the problems that need to be solved urgently. Adhering to the people-oriented concept, it is necessary to put the basic needs of the people first, take the intelligent application of key areas as a breakthrough, and provide residents with more efficient, convenient and low-cost social services. The government should make a good overall planning of urban and rural development layout, and scientifically link the planning of smart city construction with the overall planning of national economic and social development, urban and rural planning, regional planning, main functional area planning, related industry development planning and related special planning.

2) Top-level design in technical implementation: The government should focus on the information security issues involved in the process of technology implementation, which is mainly to do well the two key tasks of "hardware infrastructure security" and "software system security". Hardware infrastructure includes smart city construction sensors, data centers, network facilities and so on. "Safety of hardware infrastructure" needs to monitor the whole process of infrastructure construction. At the stage of procurement of related equipment, a scientific purchasing record system should be established. And the stability and safety of related technical products are strictly identified. During the construction stage of infrastructure such as network and data center, the reliability rating of the participating bidding enterprises should be evaluated. Software system refers to digital platform system and basic database, etc. "Software system security" is to ensure the security of network information after these systems are put into operation. It is necessary to establish and improve the monitoring and prevention system against network intrusion. For preventing all kinds of network espionage agencies from stealing information from the public and enterprise information in China, a set of scientific and sound security monitoring and emergency response mechanism should be established to enable all government departments to monitor, coordinate and respond them effectively.

B. System Mechanism Level

The smart city construction involves a wide range of aspects, including smart transportation, smart medical treatment, smart government, smart education, smart community and so on. Therefore, it is necessary to establish a comprehensive and coordinated system mechanism. It should be considered from two aspects, one is the coordination mechanism of various departments'construction tasks, and the other is the information sharing mechanism of various departments.

1) Coordinating mechanism of various departments' construction tasks: At first, the leading department of the construction of smart cities in China was the information department. However, the Ministry of Housing and Urban-Rural Development has carried out the pilot work of the National Smart City, which makes the urban planning and construction department leads the planning and construction of "Smart City". The competent department of information leads the construction of smart cities [8], which can fully and effectively integrate emerging information and communication technologies, and make scientific use of existing information management resources. But the disadvantage is that it is difficult to combine the application of informatization with the specific business of urban planning and construction. The advantages and disadvantages of the urban planning and construction departments leading the construction of smart cities are just opposite of the above situation. For the complex system engineering such as smart city construction, no single department can undertake the whole construction task. It is urgent to build a comprehensive coordination mechanism that can effectively coordinate the business of each department.

2) Information sharing mechanism in each department: The core of smart city construction is the application of new generation information technology such as big data, Internet of Things and cloud computing. And the basis of realizing big data is to open, exchange, share and integrate the information of each departments and agencies. During the process of information construction in our country, the phenomenon of information barrier between departments is particularly prominent, resulting that the degree of sharing of data and information is not high, and the relevance between information is separated. Therefore, it is necessary to promote the establishment of trans-department information sharing mechanism and accelerate the sharing and updating of information. Each department should plan the database system in a unified way. Each competent department should provide free access to information databases for the departments in need. And the sharing departments should make rational use of information resources in accordance with the authorization stipulation.

C. Legal Construction Level

In the age of Internet in China, the laws and regulations are not perfect enough. There are a lot of "debts" in the legal construction. And many problems caused by the security of information network are in a state of no suitable legislation. Smart city construction is based on the Internet, added with advanced information technology such as Internet of Things, cloud computing, etc. Under such circumstance, the information security problems will increase sharply, and the information security situation is extremely complex. Therefore, in the age of intelligence, a scientific and perfect legal system

is more important for the orderly development of the whole society.

D. Industrial Development Level

The first industrial revolution gave birth to some emerging industries in a few countries such as Britain, and greatly promoted its urbanization process. The emerging industries brought about by the second industrial revolution made the rapid improvement[8] of the urbanization level of most developed countries and some developing countries rise rapidly. The new generation of information technology is the major feature of the third industrial revolution, which also provides a basis for the construction of smart cities. And smart city construction will bring huge domestic demand market. If we seize this favorable opportunity, we can actively promote the process of new urbanization in China.

IV. CONCLUSION

For a long time, China's extensive urban development model has brought a series of difficult social problems. The construction of smart city provides a new way to solve the problems of urban development in China and realize the sustainable development of cities. This paper sorts and summarizes the development experience of smart cities in the developed countries, and it is found that the characteristics of smart city construction in the developed countries can be summarized as follows: For the balance between long-term planning and operability, based on the characteristics of the city, the development has its own emphasis, implementing the "people-oriented" concept of development. All the people participate in cooperation. We conclude that the top-level design of China's smart city development should be done from two aspects of policy planning and technical implementation. It is necessary to establish coordination mechanisms for tasks and information sharing mechanisms among each department. The government should scientifically improve the system of laws and regulations, and take the construction of smart cities as an opportunity to vigorously develop the smart industries.

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