

Planning Analysis of Low-carbon Ecological Community Based on “Healthy City” Concept

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Abstract: With the sustained population growth and increasing consumption of energy resources in cities, leading to a series of problems such as global climate change, urban environment deterioration, and weakening of human body functions. “Health” and “ecology” have become the consensus of the international community. Community is the most basic unit in the city. Planning a low-carbon ecological community in the city plays a significant role in promoting urban green development. Firstly, this paper studies the basic characteristics and function subjects of low-carbon ecological communities and based on the current international experience in the construction of low-carbon city communities, the enlightenment of foreign low-carbon ecological communities in the development of Chinese urban construction is discussed. Finally, the paper puts forward the basic strategy of developing low-carbon ecological community construction.

1. Introduction

Due to the endless demand for non-renewable resources in the development of modern industrial civilization, human beings are confronted with such ecological problems as energy shortage, environmental deterioration, and climate warming. Community is the main place where people live, produce and live, and the cornerstone of healthy ecological city. Therefore, in order to ensure the efficient connection between the communities and the ecological cities and between the communities and the green buildings, people need to change the traditional urban development mode in the urban development construction [1].

2. Basic Characteristics and Function Body of Low-carbon Ecological Communities

Development of “low-carbon economy” and “low-carbon city” concept. In 2003, Britain released the concept of “low-carbon economy” [2] in “Our Energy Future, creating a low-carbon Economy” in “UK Government 2003”, and then caused the trend of transition from world to low-carbon economy. The urban low carbon community can be understood as the extension of the concept of the space structure domain in constructing low carbon city, but also the practice of the new idea of urban

community development or low carbon concept in the most basic community unit [3]. In the construction process of urban low-carbon community, it is necessary to expand the construction perspective of ecological community with low-carbon concept, which mainly has the following five main bodies and three characteristics:

Government agencies, the public, developers, professionals and low-carbon technology are the main body of the low carbon ecological community. These five parts play an important role in the construction of low carbon ecological community. In addition to the five main bodies playing their roles, low-carbon communities in cities also have the following three characteristics. First, naturalness. it is necessary to realize the efficient use of energy in the community [3], and reasonably control light, heat, soil, water, sound, atmosphere and other elements to ensure the overall ecological landscape in the community and meet the survival needs of human beings and all kinds of organisms; Second, economic efficiency. Economic feasibility analysis and evaluation should be carried out. By carrying out the economic rules of low carbon community operation, the daily energy consumption of low carbon community can be accurately calculated to realize the internal economic balance of low carbon community; Third, sociality. Low carbon ecological community is one of the most basic components of low carbon city. The community should create a good low carbon living atmosphere, so that all members in the community can recognize the living habits and ecological environment value system within the low carbon community.

3. International Experience in Community Building in Low-carbon City

3.1. Construction and Development Trend of International Low-carbon Ecological Community

According to the construction scale of low carbon ecological communities, it can be divided into four types: rural ecological community, urban green belt area, urban renewal project, and ecological town [4].

In the study of the development trend of international low-carbon communities, it is found that industrial, commercial and residential areas in traditional European cities tend to show mutual supporting operation mode, and these areas are organically integrated into public spaces dominated by urban streets [5]. City administrators effectively combine various functional areas, for example, reasonably allocating commercial facilities, hospitals or schools, and other public facilities in residential areas, and providing corresponding park green space and outdoor activities space between the functional areas to provide the best living environment for the surrounding residents. The idea of humanized urban development lasted to the 1990s in Europe and America until the western scholars represented by Hillman putting forward the compact city development theory, which believes that to save resources and reduce environmental pollution in the city, a compact development mode is needed in the development of the city, and the mixed use of land is emphasized. Therefore, in the development of urban low carbon ecological community, Europe and America and other major countries mainly adhere to the natural principle and reduce the damage to the ecological environment caused by the construction of urban community based on preserving the terrain, river, and vegetation of the original base.

3.2. International Low-carbon Ecological Community Practice Case

This study focuses on the low carbon urban communities that have formed mature systems in the world, through studying their low carbon characteristics, classifying and summarizing the main low carbon measures (Table 1). Table 1 shows that different cities take regional low carbon measures according to their own characteristics, but there is no lack of the same strategic features: taking “low-carbon” as the core purpose, applying low carbon technology application to energy manufacturing

innovation, layout pattern of green buildings, and green transportation travel, to complete the planning and design of low carbon community.

Table 1: Strategic planning of typical low-carbon communities

Country	Community name	Low-carbon features	The main low-carbon measures
England	Bedding ton	Zero energy consumption	Renewable energy Environmental greening Low-carbon building Green transportation
England	BedZed Ecological Village		
Denmark	Beder Low-carbon Community	Design of public housing and utilization of renewable energy	Renewable energy
Germany	Vauban district	Walking-oriented Carless Community	Green Transportation Establishing Low-carbon Life Concept Technological innovation
Germany	Freiburg Solar-power Community	Solar power supply	Renewable energy
The United Arab Emirates	Masdar Zero-carbon City	“Zero” Waste “Zero” vehicles	Government policy Technological innovation
Sweden	Eco-town, HammarbySjöstad, Stockholm	Environmental protection and energy conservation	Low-carbon energy-saving technology

4. Basic Strategy of Planning and Construction based on Low-carbon Ecology Community

In the development of low-carbon ecological community in china, there are some problems that the government lacks the support of relevant supporting measures, the public low-carbon lifestyle consciousness is weak, and the developers are too pursuing short-term benefits [6].

Most developers in China pursue the maximization of short-term economic benefits in community development. This is mainly due to the long construction and development cycle of low-carbon ecological community and the relatively large cost in the early stage, resulting in the low investment return amount of developers in the construction of low-carbon ecological community; in addition, the low-carbon living consciousness of the domestic public in the construction of low-carbon ecological community is relatively weak, and is not used to the lifestyle brought about by low-carbon economy. [7] Therefore, China needs to improve the construction framework and strategy of low-carbon community. According to the current problems faced by low-carbon community development in our country, this study puts forward the development strategy according to the characteristics and needs of our country (Figure 1).

4.1. Re-development of Land Use Layout and Space form Construction

In the planning and construction of low-carbon ecological community, regional landscape culture, biological characteristics, microclimate, and geographical conditions should be studied [6]. Based on maintaining the self-discipline level and stability of low-carbon ecological community, the spatial relationship between urban low-carbon ecological community and other functional areas should be handled well [6]. For example, when carrying out the construction of low-carbon ecological community in heavy industrial city, it is necessary to carry out researches on the direction, landform, pollution degree, and other important factors of the city. The location of low-carbon ecological community should be settled in the upper air outlet area of the city, and be kept the corresponding safe distance with the industrial area of the city, to avoid the low-carbon ecological community from

being affected by the atmospheric, noise, or wastewater pollution brought by industrial development during operation [8]. At the same time, in the construction of spatial form low-carbon ecological community, it is necessary to meet the “ecosystem stability” in the ecological community, which requires designers to combine the living space inside the ecological community with office space, outdoor activity place, park green space and other infrastructures organically [9]. Forming a mixed function network in the fixed functional space, thus constructing a relatively complete regional ecosystem to meet the diverse activities and multi-level demands of the residents in the ecosystem.

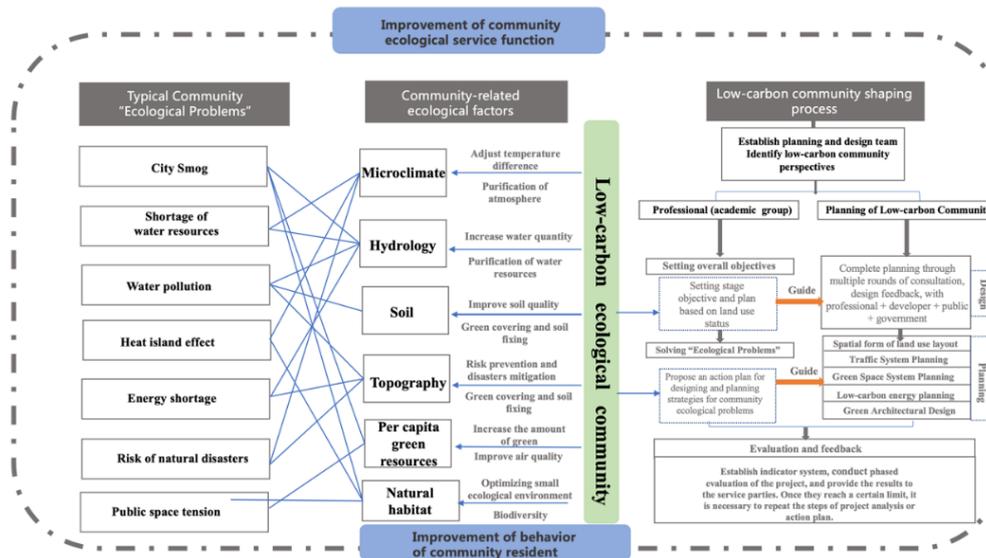


Figure 1: A framework for building low-carbon communities based on important ecological factors

4.2. Planning and Transformation of Transportation System within the Community

In the planning and construction of low-carbon ecological community, the original transportation system in the community shall be planned and transformed [10]. The low-carbon ecological community shall vigorously advocate “green transportation system” during operation, which is, giving priority to bicycle travel, banning the use of household cars, and strengthening the input of public transportation and other means of transportation [11]. For example, during the construction of ecological community, community administrators in Hangzhou West Lake District of China built a special bicycle driving road in the community, and assembled the bicycle road with a grid length of 400~600 meters, especially for bicycle travel in the community, to improve the travel speed of bicycles and reduce the chance of bicycle accidents during driving. Meanwhile, for example, Europe and Netherlands have built perfect bicycle route in many cities of the country, and combined bicycle lane with bus line to give bicycle priority in road driving. In addition, the country has combined bicycle lanes with residential areas of public facilities, even with bicycle lanes around school libraries, but motor vehicle lanes are distributed only outside the community, which is a design that significantly increases bicycle usage in the country.

4.3. Planning and Transformation of Low-carbon Energy in the Community

In natural ecological communities, it is necessary to strengthen the utilization of new energy and adopt clean technologies to strengthen the ecosystem of green buildings in low carbon communities and create high-quality living places for residents [12]. For example, low-carbon ecological community can advocate the use of solar energy during construction and apply solar energy to the buildings inside the low-carbon community to provide hot water, lighting, and power generation. For

example, Dezhou City of Shandong Province of China became a member of the world solar city organization in 2004, which is dedicated to the application of solar energy resources in the development of the city. At present, solar energy resources are widely used in landmark buildings such as Changhe Park, Dongfeng East Road, and Future City. In addition, the city's administrators have proposed a "million roof plan", which is expected to install solar water heaters and solar panels for residential quarters in the city by 2020, thus ensuring sustainable economic development in low-carbon areas.

5. Conclusion and Prospect

At present, our country is a big country of carbon dioxide emission in the world. According to relevant investigation and research, the amount of carbon dioxide emitted by our country accounts for about 1/6 of the total carbon dioxide emission in the world. In 2007, China became the largest carbon dioxide emission country in the world. Although our society and economy have been transformed and developed rapidly in this process, the extensive urban development mode makes our country suffer the rejection and attack of many developed countries in international public opinion. Therefore, in the future construction planning of urban low-carbon community in China, the basic principles of ecology will be taken as guidance to construct a harmonious and beautiful atmosphere between human being and nature in low-carbon community. With the help of modern ecological technology, the spatial environment inside and outside the urban low-carbon community is organized and designed. Based on reducing the use of land resources and energy in urban low-carbon communities, a harmonious, comfortable, healthy, and natural human living environment will be created.

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