Discussion on Low-carbon urban planning technologies and strategies of mountain towns of western Hubei based on Urban Ecology

—Take in Enshi Autonomous Prefecture and Shennongjia Forest Zone for examples

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Abstract—This paper analyzed the characteristics of carbon sources and carbon sinks of Western Hubei urban, combined with the features of low-carbon city, and revered to the law of urbanization underdevelopment mountainous town of western Hubei. We combined low-carbon technology urban planning with the theory of urban ecology and tried to increase income and decrease expenditure, and strengthened self-repairing function of urban ecosystem by the follows: Town planning policy guidance and support, Rational distribution of urban spatial structure, Construction of Urban infrastructure and Energy-saving building. From all aspects to control, reduce energy consumption and carbon emissions. In order to ensure their stability and sustainability, the virtuous circle of ecology, economy and society, protect the city healthy and sustainable progress.

Keywords—Urban Ecology; Resources and environment carrying capacity; Low-carbon city; Urban spatial structure; Urban transportation

I. INTRODUCTION

The Declaration on the Human Environment pointed out that the of human social and economic improved continuously under the force of progress in technology. On the one hand, the development of scientific and technology transformed and used the earth’s resources, on the other hand also caused incalculable harm to the global environment. It is human’s responsibility to protect and improve the environment. Development of economy must consider cautiously the consequence to environment. Basing on it, what has been an important content of the twelfth five-year-plan is healthful and sustainable development of urbanization.

II. DISCUSSION ON CONNOTATION OF LOW-CARBON CITY AND PLANNING TECHNOLOGY BASED ON URBAN ECOLOGY PERSPECTIVE

Cities generated with the development of human civilization, developed with the improvement of technology, prospered with the prosperity of economic activities, and deepened with the inheritance of culture. Cities are advanced shape of human settlements life, human’s trade and gathering center, transport center of technology and production, information communication and propagation center and also shaped human’s way of life and production. Because of the development of modern technology, the function of city has been enriched, besides, the quality of human life has been elevated. While, the duality of modern technology make city production and life activities destructive. Urban pollution problems, traffic problems, safety issues, harmony problems have been important barriers of sustainable urban development.

A. Connotation of Low-carbon city

Urban ecology pointed out that city is human material, spiritual environment and wealth which result from human creative harbor process and have higher value. Besides, city is vector spaces of social activities which are in accordance with human beings need and also is one of human lifestyle that is progressiveness and rational. What’s more, city is a complex ecosystem which contains ecology, economy and society. Human beings are the predominant in the system[1]. Low-carbon city advocate actually recycling economy development mode. It start from regional economic, layout of industrial pattern, regional planning, urban planning and other aspects, then, build a sustainable, harmonious urban complex ecosystem gradually. The core content of low-carbon city is to eliminate impacts on urban ecosystem which are produced by human, push actively urban natural ecosystem, economic ecosystem and social ecosystems of coordinate, complementary and sustainable progress forward. The connotation of low-carbon city based on urban ecology:

1) We are living the same earth. The earth provide supplies for human’s surviving. It will affect the ecological environment at some extent when human make use of technology to improve their production and life. From the perspective of humanity, low-carbon city mean to construct the same global village, to keep it healthy and sustainable vitality. Hence, it is imperative to advocate low-carbon production and life from the entire earth to a small village.
Urban construction should practice circulating production and saving modes from the perspective of macro-level which stand for humanity, meson level which stand for countries, micro-level which stand for regions and towns.

2) The coordination in entirety of urban complex ecosystem. Human survive relying on nature. People’s various of life activities need all kinds of necessary resources which are provided by urban natural system. While, inadequate life style would damage natural system. Urban economic activities are based on natural resources, but restricted by the reserve and form of natural resources. Urban social activities are not only symbol of city’s quality, but also exemplification of citizen life. Urban social system which is for its natural system, economic system is not only creator, but also bearer. In sum, keeping the integral harmonious of urban complex ecosystem is the chief goal of low-carbon city construction.

3) “decreasing source and increasing carbon sink”, elevating anti-interference of urban complex ecosystem. Urban economic activities and social activities damage continuously its natural system. Human beings exploit and damage nature incessantly, which has makes natural system can’t self-healing. So, natural ecosystem need human intervention in order to complete itself and reinforce its function of self-adaptation and self-repair. We should adjust layout of regional industrial conformation, optimize industrial chain combine characteristics of region natural ecosystem and ,which may decrease the damage to natural ecosystem from production link .we also should advocate saving life style, elevate citizen’s ethics conscious, which may control the consumption and pollution to natural environment from life link.

4) Town group means to optimize regional town spatial pattern, compete town green transportation system, push town architectures ecological technology forward, and explain low-carbon city from urban planning perspective. The urban scale is on the basis of resources and environment carrying capacity. The town goup is led of resources features and circulating economy. Thus, we should advocate mixed transportation which combine rail traffic with public transit system and walking mall. We should also advance to research and use of architectures ecological technology. Then, we could control urban carbon source and promote construction of low-carbon city from various of perspective and channels.

B. Planning Technology of Low-carbon City Based on Urban Ecolog

Urban ecology define that city is a human-centered ecological - economic - social complex ecosystem. This special ecosystem contains three contents which are natural ecosystem, economic system, social ecosystem. Three parts combine, influence and restrain each other[1]

Urban planning is both a means of national macro-control and spatial structure of future development of cities. It also is a tool about policy formation and implantation. It gets a strong character of public policy. It could be said that urban planning is a technological, professional and prospective public policy[2].

Low-carbon city planning technology mainly reflect:

1) suitable urban scale and rational layout of city group spatial conformation. The purpose of low-carbon urban planning is to elevate and improve city’s character and life quality. Firstly, endless expansion of the city has brought traffic congestion, environment pollution, resource shortages, unsafe of cities. With the help of digital technology, urban planning restrain the scale of the city through the calculation of city resource and environment carrying capacity, then push the city to develop healthily. Secondly, with the formation of city group in region ,low-carbon city planning technology has combined the advantages of resources and environment ,and also combined the layout of city group spatial structure which is mainly of circular economy. Thus, it could promote construction and development of low-carbon city.

2) The green traffic sparse mode of various ways coexistence. According to statistics, urban transportation carbon source occupied a considerable quantity in all of the urban carbon source . Backbone cable of high-speed transportation occupied large areas of the city’s green space, and separated urban natural ecosystem, meanwhile, changed people’s life style. Based on this, mixed layout of urban land use planning played a role in reducing transport carbon. Both layout of combination workplace with living in a certain area and coexistence of walking mall are helpful to reduce city traffic volume at some extent. Establishment of urban group rail traffic, Improvement of the city's public transport system, and combine of urban transportation management could reduce and control traffic volume, and could also reduce city’s traffic carbon source.

3) Ecological technology of urban planning. Urban ecological structure planning which its research object is resources and environment is a kind of anti-planning process. That combines land conservation planning and land use planning. Regarding city's health, safety, and sustainable development as the goal, urban ecological structure planning include land use planning about protective land and out of protective land in urban development. It could conserve carbon sink and reduce carbon source at some extent. In addition, it is modern technology which is used to reform and take advantage of existing buildings, and It could reduce carbon source in process of buildings construction effectively. Green architecture technology could control carbon source in building energy conservation .The carbon source produced in buildings use.

III. TECHNOLOGY AND STRATEGY OF LOW-CARBON TOWN IN MOUNTAINOUS WESTERN HUBEI BASED ON URBAN ECOSYSTEM PROSPECTIVE

At traditional sense ,western Hubei generally refer to the Longitudinal Qinling Mountains in western Hubei Province.
This article has taken Enshi and ShenNongjia for examples, discussed technology and strategy of low-carbon town in mountainous western Hubei. Mountainous western Hubei is restricted by its geographical location and natural conditions. Its social development and economy development fall behind relatively, and its urbanization level is low. This location is low utilization of land resources, ecologically fragile sensitive, low level of industrial structure, and extensive use of resources. With western migration of eastern industries and support of the western development policy, the economy development and urbanization construction are facing opportunities and threats. What has been experts’ and scholars’ research topic is how to advance urbanization construction scientifically, rationally, and suitably.

A. Characteristics of Carbon Sources and Carbon Sinks in Development of Mountainous Western Hubei (Shennongjia, Enshi)

Enshi locate in interchange of Hunan, Hubei, Chongqing province. In its territory, it has towering and steep mountains, complicated terrain, and has always been a coveted strategic location. In addition, Enshi is also the birthplace of the ancient Bachu culture. It gets unique cultural superiority and mountains and canyons landscape resources, is a good place to travel. Due to natural conditions which contain poor transport, social and economic backwardness, especially low level of industrialization, land scarcity, the obvious contradiction between people and land, ecological vulnerability, and agricultural production is difficult to form scale effect. As Shanghai and Chongqing railway, and Yichang and Wanzhou railway have opened, economy development and urbanization construction of Enshi would open a new chapter. According to analysis carbon sources and carbon sinks of Enshi, we have known carbon sources come from mainly extensive industries such as building materials, thermal power, mine exploitation, etc, and also come from land use change which result from urban development, urban waste, city transportation, construction of infrastructure and buildings construction activities, carbon emission from life. Carbon sinks mainly rely on mountainous green in towns, forests and artificial green. Because of the high forest cover, its carbon sinks volume is very enormous.

Shennongjia locate in the western border of Hubei Province, adjacent to Wushan County of Chongqing City, near the Three Gorges and close to Mount Wudang. It is accounted for 85% of forest land in its territory, and one of concentration of plant and animal species in China. Meanwhile, Shennongjia gets a rich tourist attractions, is a famous summer resort for leisure in China. The population of Shennongjia is sparse, its urbanization level is relatively low. The carbon sources and carbon sinks features of Shennongjia reflect mainly in land use change of urban expansion, town construction, traffic between towns and extensive mine. Its carbon sinks volume also is very enormous.

B. Low-carbon Technology Strategy of Urban Planning

According to analyze carbon sources and carbon sinks characteristics in mountainous western Hubei (Shennongjia, Enshi), we have generalized strategy of low-carbon urban planning mainly reflect:

1) Adjusting and optimizing industrial structure, planning recycling industry chain. The industry of mountainous western Hubei is mainly electric power, building materials, mining, etc which are high energy consumption and carbon emissions industry. Besides, the production techniques and technologies are backward. The use of resources and the impact on the environment have reflected the features of extensive economy. What’s more, agriculture cultivation is also extensive, and it don’t form recycling industry chain between industries. Thus, the first carbon emission and the second carbon emission have not been controlled effectively. In urban planning, the adjustment of industrial structure should be based on the principle of resources and environment priority, take recycling industry chain as the link, aim at the first industry and secondary industry in order to be concise apartly, optimize efficient low-power of industrial clusters. Finally, it could improve the decreasing source and increasing carbon sink in production processes, meanwhile, increase economic output.

2) Scientifically rigorous land use planning. This region face the pressure of economic development and urban extension. Urban land use planning is based on the whole urban agglomeration space layout, premeditate urban green pattern in functional sub-region, so as to reduce carbon sources of urban transportation and guarantee urban carbon sinks volume.

3) It may take rail transport for the skeleton, then promote urban agglomeration expand outward in a radial way. It may also take public transport for guidance, so as to divert traffic in towns. It may take walking mall for advocacy, then lead low-carbon access mode in community, and construct urban transportation network. Promoting vigorously the eco-technology in construction of urban infrastructure and buildings construction. Eco-technology which takes the economic and ecological benefits for the dual purpose is a kind of high-tech, and regards harmonious development between man and nature as the value-oriented. Through multi-level use of resources, it can make materials from one form change into another form, which could be used circularly in industrial systems and then complete products in a minimization way. Thus, eco-technology is high efficiency, high output but low-pollution. Urban construction is also a high energy consumption, and high carbon emissions industry. We may take advantage of eco-technology and energy saving technology to reform and reuse existing buildings, so as to decrease energy and resources consumption which produce in building destruction and construction, and environment pollution. In the process of town construction, we could reduce rationally energy consumption and resources profligacy produced in construction through planning and designing. We could also use green architecture technology to control carbon sources during construction, meanwhile, guide
residents to live low-carbon life. Then, decrease energy consumption and reduce the carbon sources volume.

IV. CONCLUSIONS

The method which integrate the concept of low carbon into urban planning and construction, nowadays, is the first choice of reacting to climate warming. In the future, the method is also the first choice. According to analysis the features of development of mountainous western Hubei, and discuss the low-carbon technology and strategy of urban planning. The author think low-carbon city construction should take the town master planning and urban regulatory plan for the two levels of co-ordination, begin to plan from policy guidance, regional cooperation, urban itself, and increase carbon sinks in various ways, so as to realize a full range of top-down low-carbon city, construct a healthy, sustainable and complex urban ecosystem which contains ecology, economy and society.

REFERENCES


