Ecological economic city construction based on interactive relationship between urbanization and ecological environment

—Taking Daqing City of Heilongjiang Province as an example

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Abstract—The harmonious development between urbanization and ecological environment is important part of new urbanization. Urbanization is a major symbol of human civilization progress and economic and social development. It is the only way of backward agricultural country changing to a modern industrial nation, and it is a historical stage of the world in the process of modernization process. Ecological economic city is an ecological system which has economic characteristics, is a place that human and other organisms on earth are interdependent in this particular range, meanwhile, exchanging material and energy with the environment continuously, forms a composite system that is dynamic economic-social-ecological comprehensive development. During the time of accelerating the urbanization, attention should also be paid to its relationship with the ecological environment. Taking Daqing City of Heilongjiang Province as an example and basing on the definition of ecologically economic city connotation as well as target model, this paper puts forward the ecologically economic city construction strategy from five aspects：implementation of industrial ecology;to strengthen the construction of infrastructure; reasonable urban planning; Cultivate social culture and Strengthen policy control.

Keywords-urbanization; ecological environment; harmonious interactions; recycle economy;eco-economic city

I. INTRODUCTION

The so-called urbanization is refers to the rural population moving into towns and secondary and tertiary industries constantly to towns aggregation. So that the number of towns increased and the urban scale expand, urban civilization history is widely spread. At present, China is in a stage of rapid development of urbanization. The rapid rise of urban agglomerations and metropolitan circle, large and medium-sized city and small town's system preliminary formation, urban residents living and working environment have been significantly improved. However, with the rapid development of urbanization, the urbanization of stress effects on the ecological environment has become increasingly prominent. Therefore, to construct the ecological and livable city with the coordinated development of economy, society and environment is an inevitable choice for the future development of urbanization in China, and is also an effective way to alleviate the ecological pressure, realize the city and the sustainable development of economy.

The Daqing city of Heilongjiang province is relying on oil resources city, and it is currently in a stage of rapid industrialization, urbanization and internationalization development. Resources and energy demand has increased year by year, and the ecological environment pressure is

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increasing. Therefore, starting from the relationship between urbanization and ecological environment interaction, to study construction of the ecological and economic in Daqing City, not only has practical significance for the future of regional development and planning, but also has important reference and inspiration for the sustainable development of other towns in china.

II. THE CONCEPT OF ECO-ECONOMIC CITY AND THE TARGET MODEL

Ecological economic city is an ecological system which has economic characteristics, is a place that human and other organisms on earth are interdependent in this particular range, meanwhile, exchanging material and energy with the environment continuously, forms a composite system that is dynamic economic-social-ecological comprehensive development. The construction of ecological economic city is based on the theory system of economic, social, ecological coexistence, strengthen and optimize internal circulation system, improve the rate of exchange and utilization rate of substance and energy, realize the resource and energy conservation and efficiency. In addition, it is based on the harmonious unification about building the positive cycle of city and ecological environment, people and the living space, realizing the sustainable development of the city. These principles are accord with the essence of circular economy, so they strengthen the role of circular economy in construction of eco economic city.

The circular economy which is a target model of building ecological economic city is also regarded as the core concept of ecological economic city. Circular economy refers to put the linear traditional dependence of consumption growth into a cycle of relying on the ecological resources to the development of economic in the system of human, natural resources and science and technology as well as in the whole process of resources, production, product consumption and waste. Circular economy follow the principle of "reduction, reuse, recycle" (also known as the "3R principle"), its essence is the ecological economy which is characterized by a kind of the matter closed circulation. It achieved the transform between the traditional "resources product waste" to "resources products renewable resources" and it can solve the contradiction between the unlimited demand and the limited resources fundamentally, so as to realize the sustainable development of the economy development and the ecological environment, is the ideal model for the construction of the ecological and economic city .

III. EVALUATION OF THE CURRENT SITUATION FOR ECOLOGICAL AND ECONOMIC CITY CONSTRUCTION OF DAQING CITY OF HEILONGJIANG PROVINCE

Daqing economy has reached more than 10% growth rate since 2004 for ten consecutive years. Rapid economic growth has brought the rapid growth of resources and energy consumption; furthermore, with the acceleration of urbanization, growing population also brings the resources and energy consumption, which brought great challenges to the eco city construction. Now evaluating city environment by Ecological Footprint Model to understand the present situation of Daqing city clearly.

A. The main idea of Ecological Footprint Model

The model of ecological footprint is a method to measure the degree of regional sustainable development in twentieth Century at the beginning of the 90's proposed by the Canadian ecologist Willian E.Rees. The main idea is to transform the humanity demand of natural resources and energy consumption (the ecological footprint demand) and the resources and environmental services (ecological carrying capacity) that human supplied into common comparative regional area. Through calculating and comparing the ecological footprint demand and ecological carrying capacity, determine whether there is excessive use of human to a regional resource utilization.

B. Calculation of Ecological Footprint

Calculation of ecological footprint is divided into the following three steps:

（1）The calculation of the per capita ecological footprint

$$ef = r_j a_i = \frac{1}{N}\sum_{i=1}^{n} r_j \left(\frac{C_i}{P_i}\right)$$

ef : Per capita ecological footprint area

r_j : Corresponding to the equilibrium factor of various land using types. Its role is to enable the different type's biological productive land to transformation with the same ecological productive area. $j = 1,2,3,4,5,6$. Balancing factors are translated using the results of FAO: arable land, building land for 2.8, woodland, fossil energy land for 1.1, grassland for 0.5 and water land for 0.2.

a_i : Commuted per capita ecological footprint component of the i-cnsumption items $i = 1,2....n$

N : Population

C_i : Per capita annual consumption of the i-consumption items. $i = 1,2....n$

P_i : The annual average productivity of the land corresponding biological production item i–consumption consumer items. $i = 1,2....n$

（2）The calculation of the per capita ecological carrying capacity

$$ec = \Sigma(a_j r_j y_j)$$

ec : The ecological capacity per capita

a_j : The per capita ecological productive area. $j = 1,2,3,4,5,6$

r_j : The equilibrium factor of various land types.

y_j : Yield factor of various land types. The results yield factor are translated using the results of FAO: The arable land and building land for 1.66, grassland for 0.19,

woodland and fossil energy land for 0.91, water land for 1.00.

（3）The Calculation of ecological surplus or deficit

Ecological surplus (deficit) = per capita ecological footprint- the ecological capacity per capita

On the calculation results is less than zero is called ecological surplus, shows that economic and social development of the region is within the maximum of natural ecosystems. On the calculation results is more than zero is called ecological surplus ecological deficit, indicates that the area of human load exceeds the capacity of its ecological. The regional ecological environment is in unsustainable development state.

Based on the ecological footprint model, select the production of various types of land as calculated on the Daqing City in 2012, on the basis of major products(calculation slightly).Through the calculation and the summary，we can get ecological footprint data of Daqing. As shown in Table 1

TABLE I. TABLE. 1 ECOLOGICAL FOOTPRINT CALCULATION OF DAQING IN 2012

Biological productive land	Balancing factor	Yield factor	ecological capacity per capita hm^2	Percapita ecological footprint hm^2
arable land	2.8	1.66	0.7720	2.3943
woodland	1.1	0.91	0.0867	0.0008
rangeland	0.5	0.19	0.0232	1.0383
water land	0.2	1.00	0.0208	0.2693
building land	2.8	1.66	0.1260	0.1470
fossil energy land	1.1	0.91	0	1.7826
Total			1.0287	5.6323
Deduction of 12%			0.9053	

Attention: According to the World Commission on environment and development suggestions, the bearing capacity of foundation should be in a balanced ecological carrying capacity ecological city eventually deduct 12% of the area, the area used as a bio diversity conservation area.

Per capita ecological footprint- the ecological capacity per capita=5.6323-0.9053=4.7207

The calculation results show that the ecological deficit of Daqing city is 4.7270. Daqing is ecologically unsustainable. This situation is mainly due to the consumption of resources of economic growth pattern and the excessive exploitation of natural resources exploitation. Therefore, how to protect the living standards of the people, reduce the ecological footprint demand and accelerate the construction of eco economic city. This is the current urgent problem for Daqing.

IV. THE CORRESPONDING COUNTERMEASURES

A. lementation of industrial ecology

As Daqing City, an important production base for petroleum and petrochemical products in China, and its industrial and economic development has been the main driver of the development of urbanization, so the industrial ecology ecological and economic construction as the primary measure of the city. Industry has been the leading industry of Daqing urban development. So eco-industrial must be developed in Daqing city. It through eco-industrial park, building ecological industrial chain, to promote economic growth mode from extensive to intensive, changing from high-carbon economy to a low carbon economy.

Agriculture as highly intensive ecological city economic development model, the ecology of the operation is the future direction of the development of modern agriculture. Daqing have five districts and four counties, two of the four county area and production areas are agricultural, ecological environment is more favorable agricultural development should be based on its own resources, in water, fertilizer, and energy-saving drugs under the principle, to develop aquaculture and green food production characteristics, making it an important green and characteristics of China's northern agricultural production and processing bases. Accelerate the development of agricultural circular economy, the development of green production technology, utilization of energy, and to promote the use of harmless or less harmful new processes, new technologies, lower raw material and energy consumption.

Eco-tourism is a new growth point of ecology economic, Daqing has wetlands,geothermal, grasslands, lakes, and other eco-tourism resources. Therefore, to rely on these tourism resources, appropriate development and protection, forming the regional eco-development advantage, promote the development of other local industries.

B. To strengthen the construction of infrastructure

In recent years, with the development of urbanization, heating, water supply, waste water treatment and other living facilities of Daqing cannot meet the growing needs of the urban population and the productive infrastructure and environmental infrastructure evident in an unbalanced state, which inadequate supply of seed to strengthen the role of the stress of urban ecological environment, weakening the town's services, thereby affecting the coordinated development of urbanization and region. Strengthening the construction of infrastructure, guided by the government and under the principle of regulated by the market, meantime, planning the construction of domestic infrastructure each part of regional on the whole, such as sewage treatment, garbage disposal, central heating, clean air, living infrastructure and so on, which can play an integral role and promote urbanization development coordinately and orderly.

C. Reasonable urban planning

Reasonable and scientific town planning can reduces the impact on ecological environment from disorder of the

development of Urbanization. Therefore, urban planning should be revised and improved scientifically and reasonably. On the basis of making full use of urban population, natural and economic conditions information and according to the principle of urban land ecological suitability, through reasonable layout of residential areas and adjustment of industrial layout which can avoid the degeneration of ecological environment due to improper use of land. In addition, the heavy polluting industrial enterprises should be moved away from residential areas and urban centre and be away from the water source and environment fragile area, and shall be under the direction of the city wind. The standards of threshold which the enterprises enter the satellite cities should be controlled strictly. We cannot focus on the immediate interests only while ignore long-term interests.

D. Cultivate social culture

People as urban designers, builders and managers, their behavior on the town to protect the ecosystem plays a vital role.At present, although the public's environmental awareness has been greatly improved, but because of the economic and social environment, people are not yet integrated into the environmental awareness into everyday lives. Foster good ecological culture, and its purpose is to change people's values, rooted in the environmental awareness of people's hearts, and transformed into conscious action.Therefore, to strengthen the promotion and popularization of environmental knowledge, in particular to strengthen the leadership cadres and workers of enterprises and institutions at all levels of awareness of resource conservation and environmental awareness, promote green travel, green consumption concept, creating conservation, low-carbon, green , environmentally friendly eco-cultural atmosphere.In addition to disclosure the construction of the ecological environment and protection of the situation information .

E. Strengthen policy control

Policy is mandatory and effectiveness compared with the moral constraint, and impact on the process of urbanization and the construction and protection of ecological environment in varying degrees.And reasonable policy can effectively compensate for the deficiencies of market regulation, thereby promoting optimal allocation of resources.Policy formulation, monitoring and implementation requires an city environmentally friendly organization as the safeguard which is efficient and have contributions.The environmental Coordinated organization should take constraint and containment, develop appropriate programs of action to solve the uncoordinated behavior and phenomena of urbanization and environment, which include the promotion of eco-city construction, building the rule of law system of urban environmental resources, establish a comprehensive urban environmental improvement and urban environment improvement examination system, the implementation of environmental objectives Mayor responsibility and so on.

REFERENCES

[1]Lv C.The Coordinated Development of Urbanization and Ecological Environment in Shandong Province.Chongqing Society[J],2013,(1):82-87.

[2]Man Q.Changchun Urbanization and Coordinated Development of Ecological Environment.A Master thesis of Northeast Normal University[D],2007.5

[3]Song Weibo. Eco-city construction based on urbanization and ecological environment interaction mechanism. Ecological and economic[J],2006,(10):53-56.

[4]Wang Zhi.Coordinated Development of Urbanization and Ecological Environment—Case of Tianjin City.A Master's degree thesis of Nankai University[D],2009.3

[5]Song Lei.A research about Coupled relationship between urbanization and ecological environment in Hubei Province.Huazhong Agricultural University, master's degree thesis[D],2007.5

[6]Yang Gui Gen.The choice of path about Construction of ecological and economic in Chizhou city .Economic Research Guide[J],2007,(11):154-157

[7]Ren Man Li,Jiao Shi Xing.Ecological and Economic coordination Development in Henan Province Based on Ecological Footprint Theory. Agricultural economy[J],2007,(11):36-38.

[8]Wang Ping ,Wang Xin Jun.Ecological Economic City : An ideal model for urban development. Academic exchanges[J],2011, (1):90-93.

[9]A Buyantuyev, J Wu.Urbanization diversifies land surface phenology in arid environments: Interactions among vegetation, climatic variation, and land use pattern in the Phoenix metropolitan region, USA[J].Landscape and Urban Planning,2012（5）:78-83

[10]EM Cook, SJ Hall, KL Larson .Residential landscapes as social-ecological systems:a synthesis of multi-scalar interactions between people and their home environment[J].Urban Ecosystems,2012（6）:99-103