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The exploration for environmental economy model of international city-taking chongqing as an example

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ABSTRACT

This paper has summarized the experience of planning, constructing, managing and developing Chongqing city on the basis of comparing and analyzing the product economy model and environmental economic model of city development, and made in-depth discussion for the selection basis and connotation of environmental economic model in developing Chongqing into an international city. And this paper has measured the ecological footprint of Chongqing through using ecological footprint model, evaluated the sustainable development ability of Chongqing through applying development capacity formula, and analyzed the coordination of industrial structure and ecological environment through adopting harmony index of industry - ecology.

KEYWORDS

Environmental economic model; Product economy model; Chongqing.

INTRODUCTION

Chongqing is the only municipality directly under the central government in central and western regions of our country and the largest industrial towns in southwest of China, China has actively striven for providing powerful policy support for Chongqing's economy development since direct governing, so as to maintain its rapid economic growth. However, such a high growth has paid out a great deal of ecological environment[1]. At present, Chongqing is still in the dual process of accelerating industrialization and urbanization, how to realize rapid economic growth and sustainable development of ecological environment and economy at the same time is a key problem for the development of Chongqing in the future.

Environmental economic model takes the advantage of city's location and environment as the premise condition. Chongqing is in the traffic crossroad of water, land and air, whose transportation condition is superior; and it takes vast inland areas as hinterland, its attractive radiation is of wide range; the climate is warm and humid with beautiful scenery landscape and good condition of land use. Most of the cities with above conditions would develop into senior central places of larger size, which is the tie and bridge contacting whole area with the outside world. The shape of the urban construction environment is not only the need of developing its economy, but also is the objective requirement for the overall takeoff of vast hinterland economy[2]. Environmental economic model regards the city as the greatest products and takes the city's own image as the brand to attract investors and consumers to invest in factories, business and industries, travel, shopping, and even settle down, so as to increase the income of the city. Economic development way of environment model is: the urban planning, construction, management of the third industry development, environmental optimization and development of the second industry. For the cities which have developed with environmental model are more comprehensive central cities in region mostly, it not only has the developed third industry, superior investment environment and pleasant living environment, but also enjoys fist products in market, and the city fame is far greater than the popularity of a certain industry or product.

THE COMPARISON BETWEEN PRODUCT ECONOMY MODE AND ENVIRONMENT ECONOMY MODE

Urban development train of thought and pattern mainly has two categories: one is to start from attracting the investment with industrial projects, the income will be obtained through producing the best products and outputting them abroad, by which to promote urban infrastructure construction and economic development; second, the city management is taken as a breakthrough, and the city is taken as the largest product for urban planning, design, construction and management, so as to build the city's best investment environment and the most pleasant living environment, the investment of domestic and foreign merchants will be attracted by the fame and brand of city, visitors at home and abroad will also be drawn to sightsee, visit and go shopping, thus the investment and increased profits will be striven for the city, which finally would promote the comprehensive development of society and economy[3]. We call the first model as product economy model, the latter model is called environmental economic model. Two kinds of urban development mode have following differences:

(1) Advantages of the two are different: product economy model takes the advantage of market demand and supply conditions as the premise. Only there must be the market demand, the product mode could be adopted. If there is no consumer demand, no matter how many better products are produced, they will not be sold out. The value of products is not possible, potential advantage also can not be transformed into real value, which also will not be able to earn income for the city.

(2) The development approach of the two are different: economic development approach of product model is as follows: producing certain products, related production department helps to develop the third industry, city planning, construction and management would be implemented[4]. For the cities which have developed from adopting the product model are resource-based industrial cities or specialized

industrial cities, or comprehensive industrial city mostly, the fame of products are often greater than cities' well-knownness.

(3) Different applicable objects: the product economy mode has characteristics of less investment, quick effect and weak power; environmental economic model has the disadvantages of big investment and slow effect, but its aftereffect is very strong. Therefore, the product model is suitable for the cities which are in the bud or early growth. At this moment, city's economic foundation is weak, the level of industrial structure is lower, its development is the overriding task, cities do not have enough economic strength to perform a large scale construction of infrastructure and environment, and the economic benefits must be obtained though launching and outputting projects as soon as possible. On the contrary, environmental model is more suitable for the cities which are in the middle and later periods of growth or striding forward mature period.

(4) The behaviour subjects of the two are different: the behaviour subject of product economy model is the entrepreneur. The behavior subject of environmental economy model is the municipal government. The government's main function is to build a convenient and easy environment for economic development, including city's hardware and soft environment, namely the city management[5]. Product operators are entrepreneurs, urban operators are municipal government. Whether a good development direction could be chosen for the city and the city could be in better planning, construction, management shall be deemed to be an important yardstick of government achievement.

(5) The multiplier effect of the two are different: the product economy mode occurs mainly in the field of certain industry, its affected scope is limited, the multiplier effect is smaller, the formed cities have stronger productive function and weak function of central place. In the environmental economic mode, urban construction is the first change, such as urban environmental construction, infrastructure construction and the development of the real estate industry, a best city environment should be first built, then investment will be attracted, the products will be produced, which would finally lead to the development of relevant industries.

THE ANALYSIS FOR THE SUSTAINABLE DEVELOPMENT CAPACITY OF CHONGQING

The sustainable development capacity of chongqing

Sustainable development ability of Chongqing could be calculated through applying formula of development ability Ulanowicz, namely the development ability is equal to the product of per capita ecological footprint and diversity index of ecological footprint, as shown in type (1):

$$DC=ef\times H=ef\times\left(-\sum P_i \ln p_i\right) \quad (1)$$

In the type, DC is the development ability, ef is the per capita ecological footprint, H is the diversity index, which represents the numerical value of various land types in ecological footprint by which to evaluate the stability of economic ecosystem[6]. P_i is the proportion of i types of land in total ecological footprint, which is the degree of opulence; $\ln p_i$ is the distribution status of i types of land in total ecological footprint, namely the degree of equality. According to type (1) and ecological footprint data throughout the years in Chongqing obtained through above parts, the diversity and development capacity index of Chongqing's ecological footprint could be obtained (see Figure1). We could see from Figure 1 that, the diversity index of Chongqing's ecological footprint has risen a little, ecological footprint of cultivated land is basically in balance, while diversity index has decreased day by day; the ecological footprint and diversity index of woodland, grassland, water area, construction land, land for fossil fuels have increased a lot. We see from the empirical structure that, as the increasing of per capita ecological footprint and diversity index, especially the construction land and land for fossil fuels have enhanced the ecological economic development capacity of Chongqing.

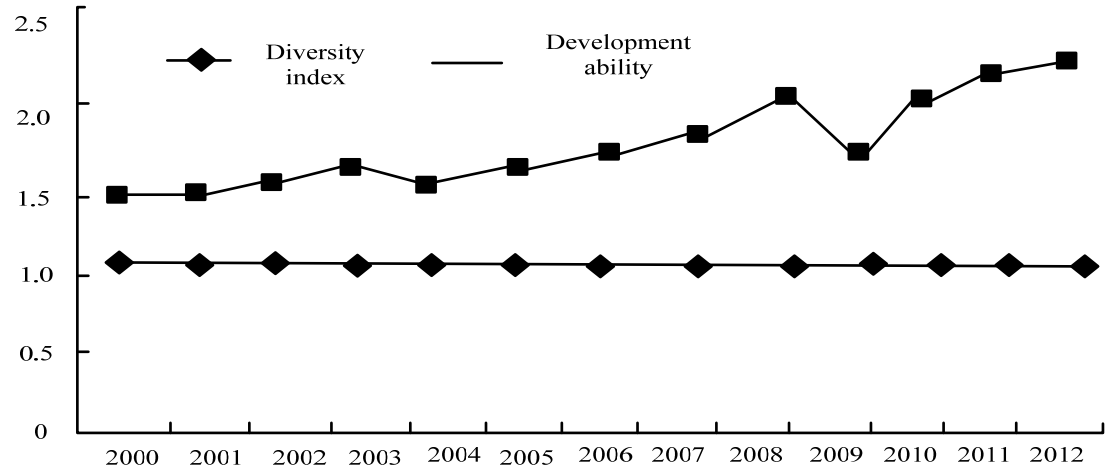

Figure 1 : The diversity index and development capability index of ecological footprint in Chongqing

Ecological harmony index

In order to further describe the relationship between the industrial structure and ecological environment in Chongqing, this article has represented the coupling degree between industry structure and ecological environment of Chongqing through establishing the harmony index of industry – ecology[7]. The harmony index of industry - ecology represents the industrial structure benefit of unit ecological capacity (bearing), namely the comparative ratio of the labor productivity and per capita ecological carrying capacity, which is used to describe the harmonious and sustainable development state of industrial structure in the process of merging with ecological environment, it is the fundamental guarantee for the healthy development of ecological economic system. Calculation formula of industry - ecological harmony index is shown below:

$$IEHI = \frac{ISB}{ec} = \frac{X_1 / X_2}{ec} = \frac{y_1 / l_1}{y_2 / l_2} \times \frac{1}{ec} \quad (2)$$

In the type, IEHI is the harmony index of industry – ecology, ec is the per capita ecological carrying capacity, ISB is the industrial structure benefit, which is denoted with the ratio between comparative labor productivity X_1 in the first industry and comparative labor productivity X_2 in the second and third industry. Among them, the comparative labor productivity is also called the relative national income, which equals to the relative weight of industrial labor divided by that of industrial national income, y_2 and l_1 represent the proportion of national income and labor force in the first industry respectively, y_2 and l_2 represent the proportion of national income and labor force in the second and third industry respectively.

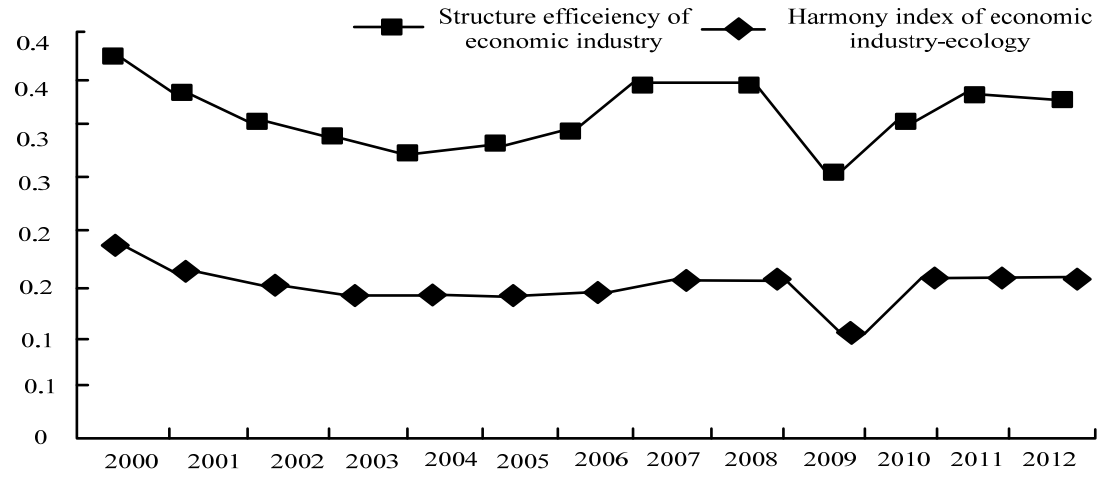

Figure 2 : The economic industrial structure efficiency and harmony index of industry - ecology in Chongqing

THE SELECTION BASIS OF ENVIRONMENTAL ECONOMIC MODEL IN DEVELOPING CHONGQING INTO INTERNATIONAL CITY

Chongqing has taken the idea of shaping the best environment in urban construction and stimulating the economic development with the best environment, the city is considered as the largest state-owned assets and the most important products for management, thus this pivot will be shaped through urban environment, so as to lever economic development and make great achievements, which has also received the recognition of the world[8]. Theoretically, the basis of Chongqing's selecting environmental economic model mainly includes the following:

(1) Industrial advantage of abundant foundation: Chongqing is the largest industrial city in southwest of Sichuan province and one of the large industrial base as well in China. Chongqing's industrial fixed assets (excluding the newly merged Yongchuan region, the same below) accounts for one 5th of Sichuan province, and it accounts about one 7th of the southwest region, gross industrial output value accounts for a quarter of Sichuan province, and one 5th of southwest region. Chongqing's industrial categories are relatively complete industrial categories with better supporting conditions on the spot or in the vicinity.

(2) Transportation advantage: Chonqing stands at the junction of the Yangtze river and Jialing river, its cruising range accounts for one tenth of the total length of the inland river navigation, connecting more than ninety counties and cities, ranking the first in the nation. There existing three trunk railways, namely Chengdu-Chongqing, XiangYu and Sichuang, as well as six main foreign highways including Chengdu- Chongqing, Han yu, Sichuan, Chongqing south, Sichuan, Sichuan- Hunan and YuChang. In addition to that there are dozens of aviation routes.

(3) Superiority of science and technology, information: Chongqing has one hundred and eighty-nine scientific research institutions, 12 colleges and universities, one of the only two institutes for scientific and technological information is also in Chongqing. Natural scientific and technical personnel are more than seventy thousand in the city, the proportion of the industrial engineering technical personnel in the total number of employees is higher than the average level of about 15 central cities in China, and even higher than that of Tianjin, Wuhan, Guangzhou, Dalian and other more economically developed city.

THE CONNOTATION OF ENVIRONMENTAL ECONOMY PATTERN IN DEVELOPING CHONGQING INTO INTERNATIONAL CITY

City planning, construction and management include detailed and complicated content, which has involved many fields and influenced broadly. It not only serves for the production and residents life of city, but also shapes the investment environment and constructs living environment; in addition it is in itself a huge industry, belonging to the category of the third industry (excluding construction), which is one of the important source of urban economic growth[9]. The connotation of environmental economic model in Chongqing's development mainly includes the following aspects:

(1) Basic idea of establishing the environmental economic model: the development of economy benefits from environment, and environment modeling depends on management of urban, while urban management is the result of correct development idea. Chongqing's municipal government has reached a consensus in all aspects including good city planning, construction, management, etc as the government's primary functions.

(2) Set the long-term goal of urban development, Chongqing's municipal government has been constantly adjusting the long-term goal of urban development according to the international and domestic economic situation, the domestic urban contrast, resource conditions and economic base of Chongqing. Target positioning with high starting point and continuous rising has provided strong impetus to Chongqing's economic and social development, great changes have taken place in cities as well.

(3) Formulate overall urban planning and special planning: first of all, urban construction guideline of "pursuing the "best" not biggest" is determined, the measures of controlling the urban population scale, improving population quality; controlling the scale of infrastructure and enhancing the construction level

are implemented, the method of through adjusting the industrial structure to improve corporate efficiency are applied, so as to relieve the contradictions of urban water shortage and lack of land, avoid the mistake of being susceptible to the "inflation" disease in constructing megacities and giant cities at home and abroad; second, urban reform is taken as an opportunity to adjust industrial structure and city layout; third, the design of city characteristic and shape is given priority, thus helps to form a unique style of the city; fourth, consciousness for the prime is built up, the level of planning, design and construction is enhanced; fifth, the management and regulating control is strengthened, so as to ensure the implementation of the overall urban planning design.

(4) More efforts should be put into comprehensive environmental control of urban infrastructure construction and environmental control strength, so as to improve the living environment, construct safe, beautiful and healthy residential district[10], increase the residents' living space, thus city's per capita living space would be increased to 9 square meters; the living environment should be constantly improved to achieve quality and service, thus a complete set of residential area and service would be implemented in high quality; unique style of leisure square would be constructed, so as to improve urban cultural taste and connotation; by planting grass, scrabbling house, dismantling walls, managing road street, engineering activities and so on, the level of urban greening, landscaping, lighting will be enhanced constantly.

(5) Multi-channel investment and financing mechanism should be established; financing mechanism of multi-channel and multi-level would be set up under the condition of market economy, foreign capital should be actively used, so as to make up the lack of urban construction funds; paid use shall be implemented on the use of municipal utilities infrastructure, the capital recovery will be sped up and the principle of direct benefit and reasonable burden would be implemented, thus by which to mobilize the enthusiasm for investment subjects of municipal, district, county and enterprises, which helps to form good atmosphere of "people's city should be built by people".

(6) Strengthen the urban management, improve the management level: the first is to straighten out city's management system and strengthen the management of city functions. The second is to strengthen urban legislation, law enforcement and supervision work of city management; the third is to attach great importance to enhance citizen's civilized quality. The consciousness of citizen's garden, international mentality, modern and civilization consciousness should be cultivated, the level of citizens' public morals, the enthusiasm of urban residents' planning, construction, management participation should be enhanced; good social fashion of "people's city people's love, love city like home" would be established.

(7) Developing industry group of urban construction; the city planning, construction and management will be taken as basic and leading industry, the industry clusters covered by city's environmental economy should be implemented with chain development and go along the road of industrialization development, which has formed large industrial system including architecture, design, planning, landscape, public utilities, building materials production, decoration, post and telecommunications, communications, transportation, warehousing, real estate and other departments.

CONCLUSION

Under the background that ecological environment has become the restricting factors of regional economic sustainable development; the development mode of high energy consumption has no longer adapted to the development needs. Look from the stage and trend of economic development, Chongqing also cannot span heavy industry development stage, industrial development still depend much on energy, such as coal, electricity and other factors which need to be purchased from outside, if the sustainable development of industrial economy is able to be implemented within the 12th five-year period, the optimization and upgrading of industrial structure is a must. Based on this, this paper puts forward the following suggestions: (1) creating the city of national environmental protection model is taken as an opportunity, circular economy is taken as the model, energy conservation and emissions reduction is regarded as the breakthrough point, backward production capacity would be eliminated, so as to promote the development of industrial structure toward the diversification, lightweight, and solidly

promote transformation and upgrading of the traditional process, strive to create high-end, high quality, newly industrial cluster; industry and service industry would go simultaneously, emerging industries and traditional industries would improve together. (2) The main functional area is considered as the division basis, aided by different resources, environmental bearing capacity in the county to build ecological industry and guide the formation of industrial structure based on its own resources endowment, promote to form the low carbon mode of production and green consumption mode, solidly strengthen the natural basis of harmony relationship between man and nature, build an ecological barrier for the security. Through continuously transforming industrial structure to be optimum, high and light, "silly, big, black, coarse" image of the old industrial base will be completely improved, by vigorously developing low pollution industries such as electronics, information, logistics, the quality and level of economic development would also be gradually improved. (3) The basic role of market and government guiding will be organically combined, so as to clear the property right relations of ecological resources protection, the economy will be developed through using various forms of ecological compensation mechanism, thus protect ecological resources, improve the ecological output in unit area of forest, afforestation and wetland. (4) The intensive use of land resources saving must be promoted constantly. The diversity index of ecological footprint shall be improved. The stability of ecological economic system should be enhanced continuously.

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