

# Economic evaluation method based on multi objective fuzzy and system dynamics

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**Abstract.** Developing green economy is an important measure to save resources, and build an environment-friendly society. Therefore, the exploration of developing green economy is studied and researched. Firstly, the paper briefly analyzed the contemporary international background, and pointed out the inevitability of developing green economy in china. Moreover, it analyzed the subjective and objective conditions on developing green economy. Finally, the new exploration of developing green economy can be summarized as follows: obeying the laws of nature, biosphere, economy and society.

**Key words.** China, Green economy, Subjective and objective conditions, Exploration.

## 1. Introduction

In 21st century world economic development, Green economy development is the inevitable trend. Under the traditional economic development model, social development and economic prosperity are always use, then waster natural resource at the cost of destructing natural environment, and eventually they result in unsustainable development among economic development, ecological environment and natural resources[1].

Green economic model is that maintaining the operation of economic system in bearing capacity of human in ecology, resources and environment systems. It realizes the sustainable growth of economy, and also ensures the ecology, resources and environment sustainable.

In the framework of sustainable development, china has been committed to develop green economy for more than 20 years. China needs to carry on the new exploration for developing green economy.

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As the largest developing country, economic development and ecological environment of china plays a decisive impact on the world, and they suffer from international pressure from America and Japan and other major developed countries. Therefore, our country attaches great importance to develop green economy[2, 3]. Green developing, building a resource-conserving and environment-friendly society is put forward clearly by national 12th five-year plan. The future development of our country is realized by developing green economy, promoting structural adjustment and changing the pattern of economic development.

Therefore, the connotation of green economy is analyzed firstly, and the background of green economic development is expound, finally the guideline of developing green economy is analyzed.

## 2. Connotation and form of green economy

### 2.1. Connotation

Green economy is an emerging economies in the sustainable development theory. Domestic economics made different interpretations for green economy from different perspectives. However, at present, definition of the connotation of green economy has not been unified in domestic economy. According to spirit from experts, scholars and government, connotation of green economy are including: green economy is a new economic development mode, based on based on resources and environment protection as the premise, high-tech development as the means, to achieve the unity of the economic, ecological and social benefits as the goal, to social, economic and environmental coordinated development way for growth, which does not harm the environment in the process of production, circulation, distribution and consumption[4-6].

Therefore, green economy is a new form of economic development. According to the current economic development model and the target of resources and environment protection, green economy content can be summarized as two subjects:

(1) Green economy is characterized by low consumption, low pollution, and low emission

Through the recycling of resources in society production into the least natural resources, waste gas is discharged into the environment, the harm to environment, or at least minimize damage, namely with minimal resource consumption and environmental costs to achieve social, economic system and efficient, harmonious, material virtuous cycle, to achieve environmental and economic win-win purpose, so as to realize the sustainable development of the society[7, 8].

(2)Goal of Green economy is pursuit innovation and maximize efficiency

Green economy should follow the principle of innovation, the use of theory, technology, system innovation for economic growth to provide the necessary technical and economic and social conditions. Green economy seek to maximize efficiency, it calls for economic growth to maintain a non-reduction, including resources and environment of natural capital, total capital stock, which can keep from natural resources and ecological environment under the premise of sustainable use and protection, to

maximize the benefits of growth.

## **2.2. Form**

According to the connotation of the green economy, the basic form of green economy is classified into three forms:

(1) Green economy is developed in circular economy and low carbon economy development mode

Advocate of green economy is a kind of based on material recycling economy development model, demand that the economic activities organized into a “resources - products - renewable resources” feedback process, all matter and energy in the ongoing economic cycle to get reasonable and lasting use; To give full consideration to the natural ecosystem in the process of production of the bearing capacity, the whole process of material transformation strategic, comprehensive and preventive measures.

(2) Green economy is a new and high technology industries economic form

To develop green economy needs the green development of the whole society transformation, and transformation in green development needs through the development of emerging industry, the use of new and high technology to upgrade traditional industries, such as measures to promote.

Green economy is an important support technology by high and new technology intensive industry economy, the key support of new energy, energy conservation, environmental protection, new materials, biological medicine, biological breeding, information, electric vehicles and key technology research for modern service industry in areas such as the core, and system integration, will continue to promote the information technology, intelligent network, biotechnology and other high-tech popularization and application in the field of traditional industries, make the strategic emerging industry as the dominant force in economic and social development at the same time, the green economy is a kind of low carbon economic development model.

Request vigorously promotes low-carbon development, to accelerate the development of clean energy, improve energy utilization efficiency, promotes low-carbon technology research and development and industrialization, with the transformation of green development, building energy saving low line of comprehensive utilization of resources and recycling system.

(3) Green economy is a coordinated ecological economy between economy development and ecological protection

Green economy requires economic and social development should not be at the expense of the environmental pollution, resource destruction, harmony between man and nature is the eternal theme of development. It demands within the scope of the ecosystem carrying capacity, using the principle of ecological economics and system engineering method to change the way of production and consumption, all can make use of the resource potential of mining, some developed economy, ecology and efficient industry, reasonable construction system, the harmony of the society culture and ecological landscape health, comfortable environment, finally realizes the economic effect benefit, ecological benefit and social benefit of high degree of

unity[9, 10].

### 3. Background of green economy

Although our country economy develops with high speed, economic development form is single, and existing low land utilization, high energy consumption, and insufficient investment in science and technology problem.

#### 3.1. Extensive land use

With the high-speed development of China's economic and social, the urbanization level increased significantly, the effect was obvious in urban construction. At the same time, the phenomenon of extensive, inefficient use of land resources in a certain extent is existing[11]. Table 1 shows land GDP of our country and eastern developed areas in China.

Average land GDP of whole country is far lower than developed eastern region, and the average land GDP of shanghai in 2009 is 65.9 times than national average GDP. The shows that efficiency of land-use are generally low. From this level, the rise of average land GDP of developed eastern region is low than national average GDP. From 2005 to 2009, the national average GDP increase by 89.47%. And Average land GDP of Beijing, Shanghai and Guangzhou developed city increase by 74.22%,62.65% and 77.34% respectively. This shows that the whole country constantly attaches great importance to the intensive utilization of land resources.

Table 1. Land GDP of our country and eastern developed areas in China

region	2005	2006	2007	2008	2009
Beijing	0.425	0.495	0.600	0.677	0.741
Shanghai	1.459	1.668	1.971	2.219	2.373
Guangzhou	0.693	0.818	0.960	1.115	1.229
nationwide	0.019	0.023	0.028	0.033	0.036

In addition, if compared with foreign developed cities or regions, the extensive utilization of land in our country is more apparent. From the GDP of global main city in 2005, average land GDP of Tokyo is 5.48 billion/km<sup>2</sup>, and average land GDP of New York is 9.06 billion/km<sup>2</sup>, average land GDP of London is 3.50 billion/km<sup>2</sup>. Average land GDP of those cities is far more than the current level of eastern developed cities.

By shown in figure 1, from the growth rate of urban population with country area, the rising trend of urban area from 2006 to 2010 is linear, and the density of urban population is "U" type. This reflects the urban construction in China are expanding fast, and population of the city agglomeration ability is relatively slow, characterized by extensive use of land resources.

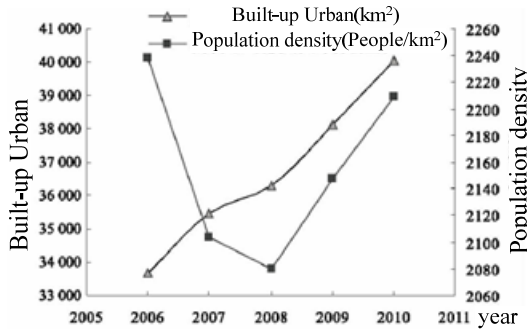


Fig. 1. Variety of built-up urban and population density

### 3.2. High energy consumption of the production mode

Energy consumption illustrates the utilization and protection of energy, and it both reflects the level of intensive production and protection of resources and environment. In 2009 the national average energy consumption per unit GDP is 1. 321 tce/ten thousand yuan, and national average energy consumption per unit GDP of Beijing, Shanghai and Guangzhou are 0. 606, 0. 727 and 0. 651 tce/ten thousand yuan, respectively. The national energy consumption level is much higher than the eastern developed areas[12].

According to targets of the ecological city construction from existing research, unit GDP energy consumption is less than or equal to 0. 9 tce/ten thousand yuan. It shows that our country is still in the high energy consumption of production mode.

As shown as Figure 2, per unit GDP energy consumption of whole country and eastern developed area tend to be declining, and this reflects the achievements in energy conservation and emissions reduction in recent years, but still need to further promote the efficient of energy.

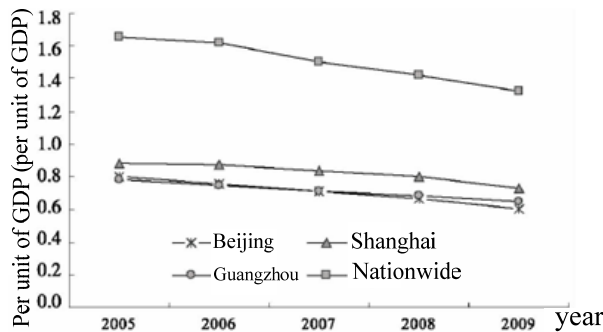


Fig. 2. Per unit of GDP in Nationwide, Beijing, Shanghai and Guangzhou

### 3.3. Lack of technological innovation

Advanced science and technology is the key of upgrading industrial structure, circular economy and green investment. If there is no advanced technology input, economic and environmental benefits seeking from green investment will be fundamentally hard to achieve. Investment in science and technology to a certain extent determines the technical innovation ability, has important influence on development of green economy.

According to science and technology input reflecting by share of budget for R&D in GDP, the national average is far less than Beijing, Shanghai developed areas. The share of national average in 2015 is 1.70%, and the share of Beijing and Shanghai is as much as 5.50% and 2.81%, respectively. The total R&D of both Beijing and Shanghai accounted for the country's 13.3%, by shown in table 2.

This reflects the investment in science and technology of the country's general level is still very low, investment in science and technology are mainly concentrated in some developed regions and cities. Still need to continue to increase investment in science and technology in our country, especially in the central and western regions of investment in science and technology, promoting technological innovation.

Table 2. R&D and peoples of Nationwide, Beijing, Shanghai and Guangzhou in 2015

region	R&D(million)	R&D/GNP(%)	(R&D) people(people)
Beijing	58 021 068	1.70	3 183 687
Shanghai	6 686 351	5.50	252 676
nationwide	4 233 774	2.81	170 512

## 4. General idea of green economy development

On the basis of the above analysis, to effectively develop the green economy must follow objective law of green economic development. Objective laws of green economic development is not only in in the economic system, more in natural, economic, social, ecological circle of large system, and there are both mutually dependent relationship between them, there is a progressive logic relationship. Therefore, We need a broad view of thinking based on the objective laws to scientifically build new explore the overall train of thought to the development of China's green economy.

### 4.1. Keep, maintain and repair of the earth natural circle

Natural circle is including sunshine circle of the earth's surface, atmosphere, hydrosphere, rock, soil. Sunshine circle has three aspects: the function of the human, namely, brought cold and hot air on the earth, ocean currents, monsoon, moisture, rain and snow weather phenomenon. Through photosynthesis, carbon dioxide and oxygen to the earth, through buried fossil fuels such as oil, coal, natural gas stored solar energy. Atmosphere from the earth's surface to a few tens of kilometers to an altitude of nearly one thousand km is covered with a variety of gas, C, H, O and

N elements such as is necessary for the creatures on earth, ozone layer protection ground creatures from a variety of the dangers of cosmic rays and prevent the surface temperature of heated change and excessive moisture be lost. Hydrosphere is composed of various kinds of water body of the earth's surface, including 97% of the water of the sea, less than 1% of the fresh water, about 2% of the ice, is also a survival necessity of creatures on earth. Rock - soil circle refers to the sum of rock and soil of the earth's surface, the rock in the ore is an important industrial raw material, and the soil is the basis of terrestrial plants to grow.

The excessive use of natural resources has made human biosphere relies for survival and reproduction of varying degrees of destruction of circle, brought by human activities and form all kinds of natural disasters, and threaten the continued survival and reproduction of the biosphere, so must keep, maintain and repair the natural circle of the earth. Covering, an organic content of the contemporary world development green economy is to reverse the traditional economic development mode excessive exploitation of natural resources and the wanton destruction of natural circle the various economic behavior, to preserve, maintain and repair the earth's natural circle and virtuous circle and orderly development.

#### ***4.2. Keep, maintain and repair of biosphere on earth***

On the basis of natural circle, life, life is mutually dependent and connections between various species of the chain relationship to form the biosphere. Natural circle is an objective basis to the survival of the biosphere, it is because the biosphere and the frequent exchange between natural circle with material, energy and information in order to make the biosphere of species to maintain its own survival, not only that, internal between different species and the biosphere is a substance, energy and information exchange frequently, which constitutes a huge biosphere system.

In the world today maintain sustained economic development of the premise is to avoid natural circle and biosphere sustained damage, and change the traditional mode of economic development and building a green economy development mode is to reduce and avoid economic development to the destruction of the biosphere. Therefore, development of green economy second organic content of the general idea is to make sure to keep the earth biosphere, maintenance, and repair.

#### ***4.3. Economic circle of the human society of circulation flow***

On the basis of natural circle and biosphere, humans engage in various economic activities. Human economic activity there is division of labor and exchange multi-farious relations, constitute the economic circle. Circle economic history shows that economic circle and the nature, the biosphere, there is a close material, energy and information between the communication and exchange, the mutual relationship between each other, depend on each other, any one party the break of original balance will endanger the balance of the other party.

Economic history, especially since the industrial revolution of industrialization and urbanization process, has shown that economic circle has hit natural circle and

the balance of the biosphere itself and the nature and all kinds of disaster in biology, these disasters in turn impact on economic circle own balance and circulation.

In view of this, we think, it is necessary to reconstruct economic system, in order to reduce economic circle in various economic activities on the natural circle and the impact of the biosphere and damage, so as to maintain their natural circle, biosphere and economic circle and the balance between each other and circulation. Therefore, developing green economy overall train of thought of organic content three should be to ensure that the cycle of economic circle.

#### ***4.4. Circulation flow among social circle in nature circle, biosphere and Economic circle***

Based on the natural circle, biosphere, economic circle, human engaged various social activities. All kinds of social activities are interconnected and interdependent relationship between and social circle. Social circle depends on economic circle, because the normal operation of the economic circle for the society provide the necessary material conditions, at the same time, social circle also through economic circle of the media and the formation of natural circle, biosphere indirect interdependent relationship

By go up, can only follow the natural social circle, biosphere and the requirements of the development of economy and development, in turn, social circle can through own rational development influence natural circle, the balance of biosphere and economic circle and circulation. Therefore, development of green economy overall mentality four should be created and the nature of organic content mutually adapt to social and economic circle, biosphere and effectively promote the above four circles and circular flow between each other.

## **5. Conclusion**

Exploration of developing green economy in china is a theoretical subject, moreover, a practical action. Therefore, the background of developing green economy is analyzed, and the state-of-the-art of green economy development is pointed out, then deficiencies are also pointed out. Finally , in balance between nature, biosphere, economy and society mode, the general idea of exploration of the development of green economy is summarized.

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