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Establishment of Evaluation Index for the Sustainable Development Capability of Regional Economy

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Abstract Combining the basic theory of regional economics and economics of development, the sustainable development capability of regional economy is expounded; the meaning of sustainable development, the connotation of the sustainable development of regional economy and the specific qualitative of the developmental capability of regional economy are introduced. Various factors that affect the sustainable development of regional economy, such as the sustainable capability of resources, innovation ability and institutional capability, are analyzed at length. On the basis, the evaluation index system of sustainable development capability of regional economy, so as to provide directions for regional economy from the long-term perspective.

Key words Regional economy, Sustainable development, Evaluation index, China

The traditional developmental theory, which is featured by simple pursuit of economic growth, has brought rapid economic growth for human social economy in the recent several centuries. However, it only takes the economic index as the standard to weigh the social development and it ignores the distribution of wealth, environment and some other crucial elements, especially the negative impact on environment caused by economic growth. Currently, the penalties caused by the deterioration of environment have attracted more and more attentions, the traditional developmental theory is abandoned gradually and the sustainable development is accepted by more and more people. Although in the early 21st century, our government has issued the China Agenda 21 to guide the national sustainable development, from the actual situation, the phenomenon of one-sided pursuit of GDP growth still exists. Governments from many areas still can not clearly know how to evaluate local places' capability of sustainable development, so they often make mistakes when making decisions. From the idea and strategic demand of sustainable development, the paper established the evaluation index system of regional sustainable development economy on the guidance of economics for development, regional economics and systematic theory and the basis of the comprehensive analysis on the factors influencing the sustainable development of regional economy, so as to provide reference for government at all levels to implement regional economic policies, carry out the plan of sustainable development, evaluate and adjust the developmental momentum of regional economic development and dynamically evaluate the sustainable developmental capability of regional economy.

1 Summarization of the sustainable development capability of regional economy

1.1 The connotation of sustainable development After the World Commission on Environment and Development (WECD) putting forward the model of sustainable development in 1980s, the sustainable development has increasingly become a hot topic both in the theoretical and practical circle. But, just as Herman E. Daly said, "sustainable development is a word liked by everybody, but no one knows its connotation" ^[1]. "At present, the widely accepted and approved meaning is the definition given in the *Our Future* issued by the WECD in 1987. It says that sustainable development is the development that can satisfy the demand of the contemporary people without threatening the demand of future generations" ^[2]. From the definition, it can be seen that sustainable development idea advocates: "natural resources, air, water source and land quality are the common heritage of human. The pursuit of short-term economy at the expenses of damaging environment and natural resources may bring punishment to themselves as well as the future generations" ^[3]. Therefore, sustainable development concerns the profits of the whole human society and it pursues the long-term sustainable development capability of human society.

1.2 The connotation of sustainable development of regional economy The sustainable development of regional economy is the sustainable development of a certain area guided by the idea of sustainable development and it also demands to coordinate the relations among population, resources, environment and development. The sustainable development of regional economy emphasizes that under the restriction of existing ecological environment to realize the continuous economic growth by effectively using the advantages of the region. In the growth process, the consumption on renewable resources is lower than the total volume of the regenerated renewable resources. The use of non-renewable resources

should adopt high-effective technology to improve the efficiency of resource use. At the same time, the wastes produced by human activities in the district are limited strictly within the absorption capability of the environment. The coordinated development of population, resources and environment should be realized.

1.3 The specific quantitative of the sustainable development capability of regional economy The sustainable development capability refers to the capability of a country or an area to develop sustainable development. According to *China Agenda 21*, the sustainable development capability of a country "depends on the capability of its government and people to a large extent and its economic, resource, ecological and environmental situation". According to the opinion, domestic scholars use the following function to abstractly describe the sustainable development capability of a country or an area^[4]:

$$SD(t) = N(t) + C(t) + I(t)$$

In the function, $SD(t)$ stands for the sustainable development capability of a country or an area. $N(t)$, $C(t)$ and $I(t)$ represent the diversity and stock of resources, innovation capability and system capability of development respectively. Further, the diversity of resources and stock of resources includes the carrying capacity of the whole system, the change degree of natural system (It can be weighted by the non-sustainable development status of natural system disturbed by human activities); and the capability of self-recovery and self-maintenance of natural system after being disturbed. The innovation capability of develop includes the basic quality of people (it can be measured by the number of people who has accepted education and degree of education accepted); the overall technology innovation capability of a country and the technology content of economic activities. The system capability refers to various formal and informal systematic arrangements that can promote the implementation of sustainable development.

2 Major factors that affect the sustainable development capability of regional economy

According to the modern economics of development, the economic development of a country or an area depends on its productivity, but labor productivity depends on the five elements covering natural resources, physical capital, human capital, technical knowledge and system. Due to the major attention is paid to the sustainable development capability, in the process of inspecting the above function of sustainable development, the natural resources are definitely the resource section that determines the sustainable development capability, that is the $N(t)$ in the function of sustainable development capability. Human capital and technical knowledge are also related to the innovation capability of a country or an area, so they can be included in $C(t)$ of the function of sustainable development capability. As for the system, obviously, it belongs to $I(t)$ of the function of sustainable development capability. Therefore, the major factors that affect the sustainable development capability are natural resources, human capital, technical knowledge and system. In order to parallel to the above function of sustainable development capability, the factors integrate into three categories:

the sustainable capability of resources, innovation capability and system capability.

2.1 The sustainable development capability of resources

The natural materials without man-made process are called natural resources. According to the renewable and non-renewable features of resources, natural resources can be divided into renewable resources and non-renewable resources. Among natural resources, the renewable natural resources refer to the resources that can maintain and even increase their stock through natural power under the premise of intelligent use, including forest, air and water, etc. However, if the resources can not be intelligently used and the consumption speed has surpassed the renewable speed, the renewability of renewable resources will be damaged, and they will change into non-renewable resources. The non-renewable resources refers to the resources that can not use natural power to maintain their stock, e. g. coal, oil and metal, etc. The non-renewable resources can be further divided into the recyclable non-renewable resources like copper and iron; and non-recyclable non-renewable resources like oil, coal and natural gas. Obviously, non-renewable resources belong to depletable resources, and the renewable resources can not be properly used, they will change into depletable resources. Hence, in order to maintain the sustainable development capability of a country or an area, the sustainability of resources should be maintain in the first place, that is to say, maintaining the diversity and stock of resources or even increasing them.

2.2 Innovation capability Innovation is the source of new technology, and the engine for the development of human society. All in all, the contribution made by innovation the social development is realized through technology. So the innovation capability of a country or an area is reflected by its technical capability. Generally speaking, the innovation capability of a country or an area is composed by the level of production equipment, quality of personnel, capacity of getting information and organization capability. The strength and breadth of a country or an area on the four aspects determine the level of its technology, as well as the development level of the country or the area. So, in order to promote the economic development of the area, every country and area should input more capital on science and technology activities to produce and popularize science and technology. Meanwhile, the enhancement of technical capability relies on the improvement of human capital. Human capital refers to "workers get knowledge and skills through education, training and experience", and human capital "includes the rudimentary education at early period, primary school education, middle school education, university education and skill accumulated in the vocational training of grown-up labors"^[5]. As for a country or an area, the strength of its human capital is jointly determined by the quantity and quality of human capital. From the perspective of the practice of each country, improving the quality of population in the county and promoting the production and popularization of technology is the lynchpin for keeping the sustainable development capability.

2.3 Institutional capability In essence, institution is the

rule for social gaming. It is "created by man to form all the restrictions among human interaction" [6]. From the perspective of content, institution can be divided into formal content and informal content. Generally, laws and regulations belong to formal institution. Informal institution refers to the customs and practice, *etc.*. Formal institutions or informal institution, all provide principles for human activities to reduce the uncertainty of human activities, through restricting people's choices, to improve the efficiency of production and exchange. Theory and practice all express that institution has great impact on the economic performance of a country or an area. The long-term economic performance difference can be explained by using institution difference. The low institution capability of a country or an area will result in the instability of system. And then, people in the country or area can not get the stable expectation. In this case, people's rational choice will consider the current interests

rather than the long-term interests and the sustainable development of economy can not be realized. Therefore, the sustainable development capability of a country depends on the institution capability of it.

3 The establishment of evaluation index system of sustainable development capability of regional economy

The evaluation index system of sustainable development capability of regional economy is established according to the above mentioned factors influencing the sustainable development capability of regional economy, the general principles of establishing index system and the index choosing method of some scholars [7] (Table 1).

Table 1 The evaluation index system of sustainable development capability of regional economy

First-grade index	Second-grade index	Third-grade index	Fourth-grade index
Sustainable development capability of regional economy	Sustainable capability of resources	Water	Total amount Use efficiency Variation degree of resource
		Forests	Total amount Use efficiency Variation degree of resource
		Land	Total amount Use efficiency Variation degree of resource
		Air	Total amount Use efficiency variation degree of resource
		Geographic resources of the very area	Total amount Use efficiency variation degree of resource
		Mineral resources	Total amount Use efficiency The production of substitutes
	Innovation capability	Technical capability	The contribution rate made by technology to economic growth
			The number of patent owned by per ten thousand people
			Transference ratio of technical results
			The number of people out of ten thousand people who apply the patent
			The proportion of R & D expenses to GDP
	Innovation capability	Technical capability	The proportion of technical industries to the whole industry
			Total population
			Average life expectancy
			Employment rate
			Growth rate of population
		Human capital	Percentage of children who enter school
			Average length of education
			The proportion of technical personnel to the total population
			Training rate of new employees
			Retraining rate of experienced employees
	Institutional capability	Formal institution	The time space of the retraining for experienced employees
			The proportion of educational expenses to GDP
			The ratio of inflow and outflow technical personnel
			The moral personality and metal quality of employees
			The perfection degree of laws and regulations
		Informal institution	Crime rate
			Implementation rate of the decisions of court
			The stable implementation rate of governmental policies
			The reasonable procedures of customs
			The evaluation direction of custom
			People's attention to custom and practice

be rooted out, so that the bogus products can be eliminated.

3.3 Actively expanding the employment space of modern agriculture As the primary industry, agriculture has the economic, social and ecological functions. Among them, the major social function is to supply jobs for the labor forces, to obtain agricultural products to maintain life through agricultural production, and to reserve and transfer labor forces for the secondary and tertiary industries. Modern agriculture has relatively low employment cost, large contribution and significant comparative advantage, compared with secondary and tertiary industries. Development of modern agriculture needs to increase the employment numbers of agricultural labor forces in a variety of forms, at different levels and through different channels in order to expand the employment space. Firstly, industrial chain of agriculture can be extended and job opportunity is increased by industrialization management. Secondly, through the adjustment of agricultural industrial structure, labor-intensive agriculture can be developed in order to increase the demand for labor forces. Thirdly, through developing high-yield, high-quality and high-efficient agriculture, the demand for agricultural extension workers, agricultural researchers, and farm workers is enhanced.

3.4 Protecting ecological environment by modern agriculture Agricultural production is the combination of the reproduction of nature and society, which has a very close connection with the natural environment. On the one hand, agricultural production affects the natural environment. On the other hand, changes of natural environment also influence the agricultural production. Primitive agriculture and traditional agriculture are necessarily beneficial to the protection of the ecological environment. Slash-and-burn cultivation, deterioration of grasslands, and water and soil loss are examples that traditional agriculture damages the protection of ecological environment. Modern agriculture should change the passive improvement of ecological environment and resources protection in the past into active exploration of the sustainable development of agriculture, and

should actively promote the protection of ecological environment and the improvement of environment quality. Development of modern agriculture in Henan Province should, on the one hand, actively promote the no-tillage, returning straws into field, transgenic crops, precision agriculture, methane and other technologies, which can directly protect the ecological environment. On the other hand, through the development of agriculture, the agricultural land occupied in the past can be used for ecological protection, which indirectly promotes the improvement of ecological environment. Besides, governments can construct the modern animal husbandry, reduce the damage of livestock grazing and over grazing on vegetation by realizing intensive feeding, realize the separation of humans from animals finally, and improve the living conditions of rural residents.

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4 Conclusions

It deserves noting if the research studies sustainable development of regional economy from long-term perspective, so it ignores the impacts of short-term economy and social factors on regional economic development. Meanwhile, when establishing the evaluation index system of sustainable development capability of regional economy, the research just takes the major factors into consideration and ignores the specific weight of each index. Therefore, in the process of applying the evaluation system, the weight of each index should be marked and the actual situation of each area should be considered to comprehensively evaluate the sustainable development capability of regional economy.

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