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ИССЛЕДОВАНИЕ РЕГИОНАЛЬНОГО ЗЕЛЁНОГО РАЗВИТИЯ В КИТАЕ

Аннотация. Зеленое экономическое развитие стало основной тенденцией развития во всем мире. Китай находится в критическом периоде зеленой трансформации. Некоторые регионы Китая уже имеют хорошую базу для развития зеленой экономики. Преимущественное развитие зеленой экономики в некоторых регионах может послужить примером для Китая.

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A STUDY OF REGIONAL GREEN DEVELOPMENT IN CHINA

Abstract. Green economic development has become a mainstream development trend worldwide. China is in a critical period of green transformation. Some regions of China already have a good basis for green economy development. The advantageous green economy development in certain regions will serve as a model in China.

Introduction. Energy security and environmental protection are global issues since the beginning of industrial civilisation and are huge challenges for mankind. After the reform and opening up, China has rapidly developed for more than 40 years and it has become one of the largest economies. It has a complete industrial system and is at the peak of its industrial development. Along with intense industrialisation, China has to confront the growing pressure on its resources and environment while enjoying the dividends brought by industrial activities. In order to balance ecological functions and economic benefits, and to relieve the pressure on over-consumption of resources and the environment, China must explore a green economy development path in accordance with its market regulations. Nevertheless,

there is an imbalance among regions in China in terms of resource endowment, fiscal subsidies, social development, and many other aspects. This has resulted in a differentiated green development nationwide. Therefore, it is necessary to study the differences in the green economy development status across China and to explore the green economy transition path that for each region. [1]

Methodology. In order to study the differentiated green economy development status by region in China, a comprehensive evaluation index system is constructed. And with the entropy weight method, the green economic development index by region in China is calculated. [2] The indicators are shown in table 1.

Table 1 - Green economy development indicators

Dimension	Indicator
Ecological environment	Forest coverage rate
	Energy self-sufficiency
	Water supply per capita
	Chemical oxygen demand emissions per capita
	Sulphur dioxide emissions per capita
	Solid waste generation per capita
	Research funding of industrial enterprises
	Proportion of employees in the fields of education, science, culture and health
	Number of patents granted per capita
Economic development	Share of tertiary sector
	Investment in high technology industries as a proportion of GRP
	Investment in environmental pollution management as a proportion of GRP
	Energy consumption per unit of GRP
	Water consumption per unit of GRP
	Electricity consumption per unit of GRP
	Growth rate of gross regional product per capita
	Growth rate of industrial output in tertiary sector
	Elasticity coefficient of energy consumption
Social harmony	Comprehensive utilization rate of industrial solid waste
	Sewage treatment rate
	Share of clean energy
	Growth rate of expenditure on energy conservation and environmental protection
	Share of expenditure on science and technology
	Growth rate of fixed asset investment in tertiary industry
	Level of urbanization
	Household disposable income
	Engel coefficient

Based on the above indicators, the entropy weight method was introduced to quantify the green economic development status of each region in China. Firstly, the raw data need to be processed for the purpose of eliminating the effects of inter-indicator dimensionality.

For positive indicators:

$$X_{ij} = \frac{x_{ij} - x_{min}}{x_{max} - x_{min}}$$

For negative indicators:

$$X_{ij} = \frac{x_{max} - x_{ij}}{x_{max} - x_{min}}$$

where, X_{ij} – normalized value of indicator x_{ij}; x_{ij} – reference value of indicator j in region i; x_{min} – the minimum value of certain indicator among basic data; x_{max} – the maximum value of certain indicator among basic data.

The green economy development index is calculated with the following formula. [3]

$$p_{ij} = \frac{X_{ij}}{\sum_{j=1}^{n} X_{ij}}$$

where, p_{ij} – proportion of indicator j in region i.

$$e_j = -(\frac{1}{\ln n}) \sum_{i=1}^{n} p_{ij} \ln (p_{ij}), \ \ 0 \le e_j \le 1$$

where, e_j – entropy for indicator j.

$$\lambda_j = 1 - e_j$$

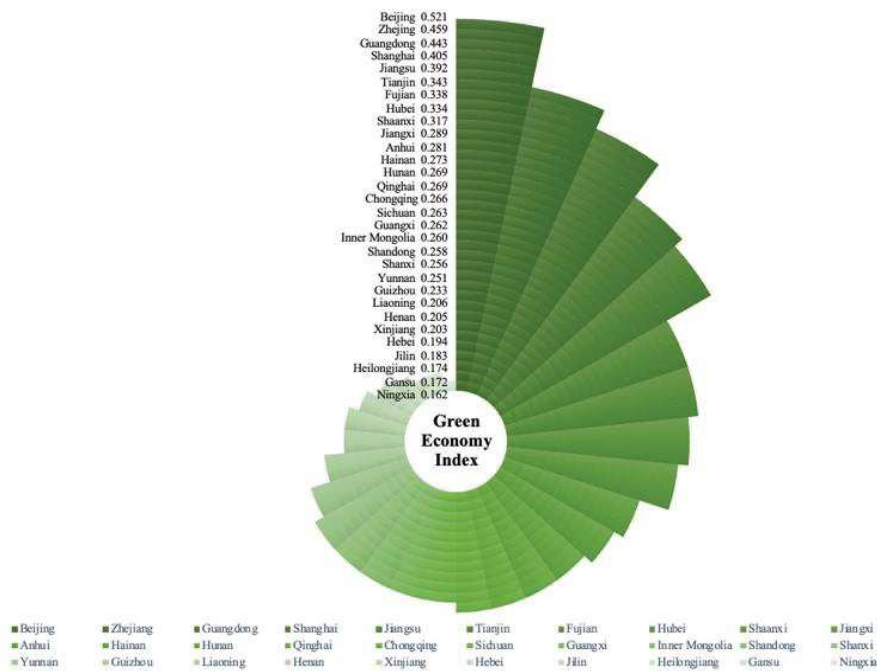where, λ_j – coefficient of variation of indicator j.

$$w_j = \frac{\lambda_j}{\sum_{j=1}^{m} \lambda_j} = \frac{1 - e_j}{\sum_{j=1}^{m}(1 - e_j)}$$

where, w_j – weight for each indicator.

$$u_i = \sum_{j=1}^{m} w_j * X_{ij}$$

where, u_i – green economy development index in region i.

Analysis. Based on the relevant data for 2019, along with the entropy weight method the green economy development index by region in China was calculated, as shown in Figure 1.

Fig. 1 - Green economy development index by region in China

According to the graph, it can be learned that the green economy development is generally not high in all regions of China and varies greatly across regions. Most of the regions with a relatively high green economic development index (higher than 0.3) are the core regions of China's three major economic circles. They mostly already have a highly developed economy and a complete social base. As important regions in the economic sphere, in addition to their advantageous geography and climate, they are at the forefront of many aspects such as industrial transformation, fiscal subsidies, talent aggregation and social infrastructure, guided by multiple national strategic objectives. These factors have resulted remarkable strengths in these regions. The impressive green economy development indexes of these regions illustrate their exemplary performance in the green economy transition in China. Besides, the major resource-based regions in China, Shaanxi, Inner Mongolia, Shanxi, are not far behind in their green economy development index across the country, despite their relatively lagging social and economic development and their industrial structure caught in a locked-in situation where they rely mainly on the secondary sector. This has further demonstrated the vast differences among regions in China when it comes to energy endowments. It also underlines the prominent and crucial role of energy endowments in the comprehensive evaluation of green economy development.

Conclusion. As green economy development has become a mainstream development trend in countries around the world, China is also in a critical period of green transformation. In order to know the basis of the

current green economy development by region in China, 27 indicators are selected for creating a comprehensive evaluation index system on green economy development. Along with the entropy weight method, the green economy development status by region in China was calculated. The results show that the green economy development level in China is generally low and that there are significant differences among regions. Some of the important regions belonging to the major economic spheres of China perform better in green economy development. In addition, the major traditional resource-based regions in China do not lag behind other regions in terms of their comprehensive green economy development score, despite the fact that they have difficulties in many aspects. This demonstrates the vast differences in energy endowments among regions in China.

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ВОЗОБНОВЛЯЕМЫЕ ИСТОЧНИКИ ЭНЕРГИИ: ВЕТРОВЫЕ РЕСУРСЫ

Аннотация. Возрастающий интерес к возобновляемым источникам энергии ставит не только технологические и технические задачи, но и вопросы