The Provincial Calculation Model of Output Value and Growth Rate of Energy-saving and Environmental Protection Industry Combined with GDP

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Abstract. Energy conservation and environmental protection industry refers to the industry that provides technology, equipment and service support to save resources and energy, develop circular economy and protect the ecological environment. At present, there are no conclusions and differences between industries and academia on the scope and boundaries of the energy conservation and environmental protection industry, and government departments at all levels also have misplacement of responsibilities and multi-cross phenomena in the management of the industry, resulting in the difficulty of effectively implementing planning measures and government decrees and regulations for the development of the energy conservation and environmental protection industry, and the situation of decentralized investment and low-level repetitive construction within the industry for a long time. It is difficult to form effective synergy. The Provincial Calculation Model of Output Value and Growth Rate of Energy-saving and Environmental Protection Industry, which is the most important reference index of environmental protection production, but in the actual calculation, due to the existence of broad data statistics, the calculation of this index is inaccurate. Therefore, an accurate Provincial Calculation Model is needed. So we proposed The Provincial Calculation Model of Output Value and Growth Rate of Energy-saving and Environmental Protection Industry Combined with GDP model. Relevant data can be reversely deduced from GDP. Based on this, this paper applies the Output Value and Growth Rate of Energy-saving and Environmental Protection Industry data of Hubei Province. The accuracy of the model is verified.

Keywords: Provincial Calculation Model, Growth Rate, Energy-saving and Environmental Protection Industry.

1   Introduction

Energy-saving and environmental protection industries refer to sectors that provide technology, equipment, and service support to conserve resources and energy, devel

op a circular economy, and safeguard the ecological environment [1]. Unlike general economic industries, the energy conservation and environmental protection industry has the characteristics of strong public goods (requiring guidance and support from policies and regulations), [2] wide coverage (spanning secondary and tertiary industries), and long investment return cycles. Currently, various industries and academia lack conclusive opinions on the scope and boundaries of the energy conservation and environmental protection industry, leading to differences in opinion. Government departments [3] at all levels also have misplaced responsibilities and multiple overlaps in the management of the industry, resulting in the introduction of planning measures for the development of the energy conservation and environmental protection industry. Additionally, it is difficult to effectively implement government orders and regulations [4], and the industry has long been in a state of dispersed investment and low-level duplication of construction, making it difficult to achieve effective synergy. The Provincial Calculation Model [5] of Output Value and Growth Rate of Energy-saving and Environmental Protection Industry serves as the most important reference indicator for environmentally friendly production. However, in actual calculations, the measurement of this indicator is inaccurate due to extensive data statistics [6]. Therefore, an accurate Provincial Calculation Model is needed. We propose the Provincial Calculation Model of Output Value and Growth Rate of Energy-saving and Environmental Protection Industry Combined with GDP model. Relevant data can be inferred through GDP. Based on this, this paper applies the Output Value and Growth Rate of Energy-saving and Environmental Protection Industry data of Hubei Province. The accuracy of the model is verified.

2   Methods

2.1   Description of classified statistics on energy conservation and environmental protection industries

It is estimated that the reasonable annual growth rate of energy conservation and environmental protection industry in Hubei Province from 2023 to 2025 is 10%-15%, and the expected output value is 6354-731.4 billion yuan by 2025. The three-year action plan proposes an average annual growth rate of 15%, with an output value of 730 billion yuan by 2025 (of which 120 billion yuan for green ship manufacturing).

According to the Guidance Catalogue of Key Products and Services for Strategic Emerging Industries (2016 edition) [7], energy conservation and environmental protection industries include three major industries: energy conservation, environmental protection and resource recycling. As shown in Table.1, in the "Statistical Classification of Energy Saving, Environmental Protection and Clean Industries (2021) [8]" released by the National Bureau of Statistics in 2021, energy saving and environmental protection industries include four major areas: high efficiency and energy saving industries, advanced environmental protection industries [9], resource recycling industries, green transportation vehicles [10] and vessels and equipment manufacturing industries.

Table 1. Comparison of classified changes in energy conservation and environmental protection industries

Statistical Classification of Energy Saving, Environmental Protection and Cleaning Industries (2021)			Classification of Strategic Emerging Industries (2018)		Catalog of Key Products and Services for Strategic Emerging Industries (2016)	
Energy conservation and environmental protection industry	Green transportation vehicles and equipment manufacturing industry	Manufacturing of key components for energy saving and environmental protection of new energy vehicles	5, new energy automobile industry (including 5.1 new energy vehicle manufacturing; 5.2 Manufacturing of new energy vehicle devices and accessories; 5.3 Manufacturing of new energy vehicle-related facilities; 5.4 New energy Vehicle-related services)	5.2 Manufacturing of new energy vehicle devices and accessories	5. New energy automobile industry (including 5.1 new energy automobile products; 5.2 Charging, power changing and hydrogenation facilities; 5.3 Production Test equipment)	5.1 New energy vehicle products
		Manufacturing of charging, changing, hydrogenating and gas filling facilities		5.3 Manufacturing of new energy vehicle-related facilities		5.2 Charging, power exchange and hydrogenation facilities
		Green ship-building	Not included		Not included	

Green transportation vehicles and equipment manufacturing industry including ① new energy vehicles energy-saving and environmental protection key parts manufacturing; ② Manufacturing of charging, power changing, hydrogenation and gas filling facilities; (3) Green ship manufacturing and other three contents, because the two data (1) and (2) were included in the "new energy automobile industry" before 2018, there is no single statistical data for the time being, and this time it is not included.

$$x = [\, (z + y + G)\, S + M] \times R \tag{1}$$

Where x is the output value of the energy-saving and environmental protection industry calculated this time, z is energy-saving, y is the environmental protection, G is the resource recycling industry, S is the basic data, M is the green ship manufacturing basic data and R is the growth rate of the energy-saving and environmental protection industry.

2.2   Basic data

The output value of energy-saving and environmental protection enterprises in 2019-2021 provided by the Bureau of Statistics is shown in the following table.

Table 2. The number and output value of energy-saving and environmental protection enterprises in 2019-2021

Year	Number of energy-saving and environmental protection enterprises (number)	Total output value of energy-saving and environmental protection enterprises (100 million yuan)
2019	482	1297
2020	501	1283
2021	585	1758

Note: Energy-saving and environmental protection enterprises refer to enterprises with annual main business income of 20 million yuan and above. The above data do not include green transportation vehicles and equipment manufacturing industry data.

As shown in Table.2, the average annual growth rate of the number of energy-saving and environmental protection enterprises in 2019-2021 is 16.4%, and the average annual growth rate of the total output value of energy-saving and environmental protection enterprises in 2019-2021 is 15.4%. Affected by the epidemic, the number of energy-saving and environmental protection enterprises in 2020 fell by 1% compared with 2019, and the total output value of energy-saving and environmental protection enterprises in 2020 fell by 3%. In 2021, the number of energy-saving and environmental protection enterprises increased by 16.77% year-on-year, and the total output value of energy-saving and environmental protection enterprises increased by 37.02%.

The 2019-2021 green ship manufacturing output value provided by the Bureau of Statistics is 10.16% in 2019-2021, 10.84% in 2020, and 9.47% in 2021.

3   Experiment

According to the Three-year Action Plan of Hubei Province to Accelerate the Promotion of energy conservation and environmental protection Industry Chain (2022-2024) (draft for comments) [11], the total output value data of energy conservation and environmental protection industry in Hubei Province is shown in the following table.

Table 3. Total output value of energy conservation and environmental protection industry in Hubei Province in some years

Year	Total output value of energy conservation and environmental protection industry (100 million yuan)	Among them: Energy saving	Among them: Environmental protection	Among them: resource recycling	Hubei GDP(100 million yuan)
2013	1500	450	250	800	25378
2019	3300	1000	800	1500	45429
2020	3200	/	/	/	43004

(1) Average annual growth rate

As shown in Table.3, from 2013 to 2019, the average annual growth rate of output value of energy-saving and environmental protection industry was 14%, of which the average annual growth rate of output value of energy-saving field was 14%, the average annual growth rate of output value of environmental protection field was 21%, and the average annual growth rate of output value of resource recycling field was 11%.

(2) Proportion of GDP

In 2013, 2019 and 2020, the output value of energy conservation and environmental protection industries accounted for 5.91%, 7.26% and 7.44% of GDP respectively, and the average annual output value of energy conservation and environmental protection industries accounted for 7.03% of GDP.

Assuming a constant GDP share, reverse the growth rate. In Hubei Province, the output value of energy conservation and environmental protection industry will account for 7.44% of GDP in 2020. Statistics show that the total scale of the national energy conservation and environmental protection industry in 2020 will reach about 7 trillion yuan, accounting for about 6.8% of GDP, and the GDP growth rate of Hubei Province is slightly higher than the national average, so it is reasonable for the output value of energy conservation and environmental protection industry to account for more than 7% of GDP.

As shown in Figure.1, since the output value data of energy conservation and environmental protection industry in Hubei Province in 2021 and 2022 have not been released, assuming that the proportion of output value of energy conservation and environmental protection industry in GDP remains unchanged from 2020 to 2022, the total output value of energy conservation and environmental protection industry in the current year = the GDP of Hubei Province in the current year × the proportion of output value of energy conservation and environmental protection industry in GDP, the relevant data for provisional estimation is shown in the following figure:
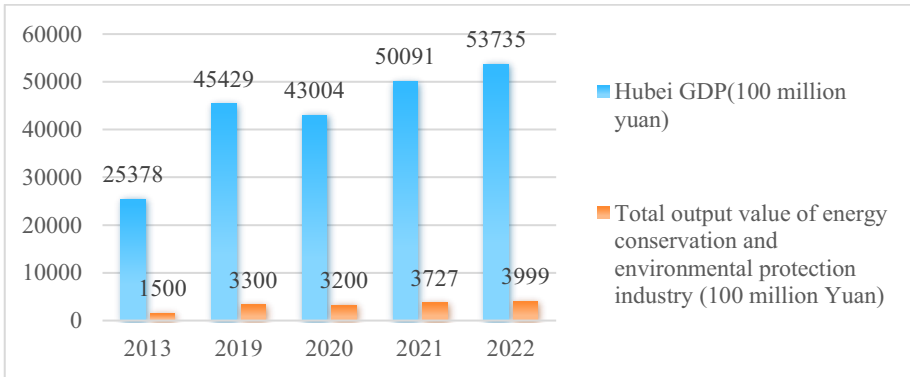
Fig. 1. Estimation of energy conservation and environmental protection growth rate in 2021-2022.

4   Conclusion

The Provincial Calculation Model of Output Value and Growth Rate of Energy-saving and Environmental Protection Industry Combined with GDP model is proposed. Relevant data can be reversely deduced from GDP. Based on this, this paper applies the Output Value and Growth Rate of Energy-saving and Environmental Protection Industry data of Hubei Province. The accuracy of the model is verified.

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