Construction and Application Effect Evaluation of Enterprise Green Accounting System under the Double Carbon Targets

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Abstract: This paper studies the construction of green accounting system and its application effect evaluation under the background of "double-carbon" goal.Firstly, the paper reviews the research status of green accounting theory and "double-carbon" strategy of enterprises at home and abroad, defines the connotation and characteristics of green accounting system under the goal of "double-carbon," and then puts forward the construction path of green accounting system of enterprises, including green accounting system, management system and information disclosure system; At the same time, it has constructed an indicator system covering environmental performance, economic performance, social benefit and management efficiency, and conducted case empirical analysis using analytic hierarchy process and fuzzy comprehensive evaluation method, which proves the practical value of green accounting system construction and provides reference for enterprises to promote the implementation of "double-carbon" target.

Key words: dual-carbon target; green accounting system; application effect evaluation; index system; empirical analysis

Introduction

With global climate change becoming more and more serious in the recent past, the development path with low-carbon transition as the core has become the consensus of all countries in the world.In September of 2020, China clearly put forward the "double-carbon" strategy, i.e. to achieve carbon peak by 2030, and carbon neutralization by 2060.The proposal of this strategy not only reflects China's determination to deal with climate change as a responsible big country, but also is an inevitable choice for China's high-quality and sustainable economic and social development.In this context, all walks of life are actively exploring the effective path to achieve the "double-carbon" goal, among which enterprises, as the main body to achieve the coordinated development of economy and environment, are particularly critical to their green transformation.Enterprise is not only the basic unit of economic activity, but also an important source of carbon emission.According to relevant statistics, the energy consumption of the enterprise sector accounts for more than 70% of the total energy consumption of the whole country, and the

carbon emission also exceeds 60% of the total national amount.Whether enterprises can achieve green and low-carbon transformation directly affects the smooth realization of China's "double-carbon" goal.

1 Literature review

1.1 Research status of green accounting theory at home and abroad

Green accounting theory originated from the rise of environmental protection movement in western countries in 1970s.At first, green accounting was only regarded as the extension and supplement of traditional financial accounting, mainly focusing on the cost accounting and disclosure of environmental resource consumption and ecological environment damage in enterprise operation activities.Then green accounting gradually developed into an independent branch of accounting theory, foreign scholars to the research gradually in-depth, formed to environmental cost accounting, environmental liability recognition, environmental performance evaluation as the core of the theoretical system [1].In recent ten years, with the global climate change problem, the research of enterprise carbon accounting has been gradually rising, and the research content of green accounting has been further extended to the fields of carbon emission accounting, carbon asset management and so on.Since the introduction of the concept of green accounting at the beginning of the 21st century in domestic academia, relevant research has developed rapidly, but it is still in the initial stage as a whole. Most of the research focuses on the discussion of the basic concept of green accounting, environmental cost accounting method and green performance evaluation index system, and a systematic framework system of enterprise green accounting has not yet been formed, especially the in-depth research on enterprise carbon emission responsibility and green accounting practice under the "double-carbon" strategy [2].

1.2 Research progress of enterprise green accounting system under the background of double carbon targets

In recent years, with China's "double-carbon" goal, the research of enterprise green accounting has got into a new stage.Domestic and foreign scholars have focused on the systematic research on carbon emission accounting methods and environmental cost accounting around the "double-carbon" goal [3].In terms of carbon emission accounting, the international carbon accounting method system with GHG Protocol as the core has been gradually formed, while the domestic carbon emission accounting practice is actively promoted based on ISO 14064 standard.At present, the construction of green accounting system of enterprises in China is still facing many problems, including the lack of unified green accounting standards, insufficient disclosure of environmental information, irregular accounting of environmental costs within enterprises, etc., which leads to the difficulty of objectively measuring the environmental performance of enterprises and can not effectively guide the practice of enterprise green transformation.It is urgent to conduct in-depth research from the theoretical and practical levels to establish an effective green accounting system suitable for the characteristics of Chinese enterprises, so as to promote enterprises to better serve the

realization of the national "double-carbon" strategic objectives [4].

2 Double carbon target and the definition of enterprise green accounting system

2.1 Connotation and requirements of dual-carbon target

"Double carbon" target refers to China's clear carbon peak and carbon neutralization strategy.Specifically,"carbon peak" refers to the country's carbon dioxide emissions reaching an all-time high by 2030, after which the emissions will gradually decrease, and "carbon neutral" refers to the realization of net zero greenhouse gas emissions by 2060.The realization of the "double-carbon" goal has put forward clear requirements for enterprises, which need to strictly control carbon emissions in all links of production and operation, actively carry out technological innovation, and promote the transformation of energy structure towards clean and low-carbon direction.At the same time, enterprises need to scientifically measure and manage their own carbon emissions, and actively disclose relevant information to respond to the expectations of the government, society and investors to fulfill their environmental responsibilities.

2.2 The connotation and characteristics of enterprise green accounting system

Enterprise green accounting system is a kind of management system which is based on traditional financial accounting, integrates the concept of ecological environment protection, systematically identifies, calculates and reports the impact and cost of enterprises on the environment in their production and operation activities.Its core lies in realizing the unity of economic benefit and ecological benefit of enterprises by means of environmental cost accounting, carbon emission accounting and environmental performance evaluation.Green accounting system has the characteristics of comprehensiveness, standardization and dynamics, and its main components include environmental cost accounting, environmental liability recognition, carbon emission measurement and reporting, green audit and information disclosure system, etc.

2.3 Principles of enterprise green accounting system construction under the background of double carbon

Under the context of the "dual-carbon" goal, enterprises should adhere to the principles of green development, sustainability and systematicness in building green accounting system.The principle of green development requires that enterprises must pay attention to environmental protection in their business activities and realize the coordination and unification of economic and ecological benefits; the principle of sustainability emphasizes that enterprises should take long-term interests into consideration in the construction of green accounting system to ensure that economic growth does not sacrifice environment; the principle of systematicness emphasizes that enterprises should pay attention to integrity and coordination in the process of building green accounting system, comprehensively cover all links of enterprise operation, and ensure the effectiveness and integrity of system construction [5].

3 The construction path of enterprise green accounting system

3.1 The construction of green account system in enterprises

Under the context of the "dual-carbon" goal, the construction of green accounting system for enterprises first needs to clarify the identification and accounting methods of environmental costs.The identification of environmental costs should be based on the comprehensive analysis of the impact of business activities on the ecological environment, the cost of pollution control, ecological restoration costs, carbon emission reduction costs included in the scope of enterprise cost accounting, the life cycle costing, activity-based costing or process costing and other suitable methods for measurement and confirmation.At the same time, the enterprise shall establish a scientific and reasonable carbon emission calculation and accounting system, accurately calculate the direct emission, indirect emission and supply chain emission of the enterprise in strict accordance with the national and international carbon emission standards and methods (such as ISO 14064 or greenhouse gas accounting system), and clearly define the responsibility boundary.For enterprises in the carbon trading mechanism of carbon assets and carbon liabilities, enterprises should establish a special accounting method, clear carbon quotas and carbon credit confirmation, measurement and reporting process, to ensure that the carbon assets and liabilities of the information is accurate and transparent.

3.2 Design of green accounting management system in enterprises

The effective operation of enterprise green accounting system requires a complete set of management system.Green budget management system shall be established, green development concept shall be integrated into the whole process of enterprise budget preparation, and special budget management shall be carried out for projects involving environmental protection, energy conservation and emission reduction.Enterprises need to establish an environmental performance appraisal mechanism oriented by the "double-carbon" goal, incorporate environmental performance indicators into the enterprise's overall performance management system, and closely integrate with incentive mechanisms such as compensation and promotion of managers and employees, so as to promote the effective implementation of corporate green responsibility.Enterprises should build a sound green audit and internal control system, to ensure the authenticity and reliability of green accounting information, through internal audit and supervision and regular assessment of corporate environmental responsibility performance, timely detection and correct the problems existing in the green management, to ensure the sustainable development of green business.

3.3 Construction of enterprise green accounting information disclosure system

The disclosure of green accounting information is an important way for enterprises to fulfill their social responsibilities and respond to the concerns of stakeholders.Under the "double-carbon" background, the disclosure of green accounting information of enterprises shall adhere to the principles of authenticity, integrity, comparability and timeliness, and specify the

disclosure standards and contents, including key information such as carbon emissions, environmental costs and benefits, carbon assets and liabilities, environmental performance evaluation results, etc.Enterprises shall adopt multi-channel and three-dimensional disclosure methods, including annual environmental report, corporate website, social responsibility report and relevant platforms, so as to ensure the convenience and effectiveness of stakeholders in obtaining information, enhance the transparency and credibility of enterprises in the eyes of the public and investors, and promote the continuous improvement of corporate green image.

4 Evaluation index and method of application effect of enterprise green accounting system

4.1 Construction of the evaluation index system of enterprise green accounting effect

In the context of the "dual-carbon" goal, the practical application effect of the green accounting system established by the enterprise needs to be objectively evaluated through a set of perfect and systematic index system.In terms of environmental performance index design, it shall include the total carbon emission and emission reduction rate of the enterprise, the reduction proportion of energy consumption per unit product, the recycling rate of wastes, the reduction of resource consumption, etc., so as to fully reflect the efforts of the enterprise in reducing environmental load and carbon emission.In the design of economic performance indicators, the indicators should cover the input and output of green technology innovation, the proportion of sales revenue of green products of enterprises, the cost saving and profit growth brought about by the implementation of green measures, so as to measure the actual contribution of green transformation to the economic benefits of enterprises.Thirdly, in the design of social benefit indicators, attention should be paid to the improvement of social image after the implementation of the green development strategy of the enterprise, the satisfaction of stakeholders on the fulfillment of the green responsibility of the enterprise, and the transparency and influence of the enterprise's active disclosure of environmental information, so as to fully show the responsibility performance of the enterprise at the social level.Management efficiency index design is also essential, the index system should include the implementation of enterprise environmental management system, the timeliness and accuracy of green accounting information disclosure, the coverage rate and effect of enterprise green audit, the improvement of environmental awareness and ability of internal management personnel, etc., reflecting the internal management level and operation efficiency of enterprise green accounting system.

Table 1 Evaluation Index System of Enterprise Green Accounting Effect

Indicator dimension	Specific indicators
environmental performance	Total carbon emissions and emission reduction rate; reduction rate of energy consumption per unit product; recycling rate of waste; reduction rate of resource consumption
economic performance	Input-output ratio of green technology innovation; proportion of sales revenue of green products; cost savings and profit growth brought about by green transformation
social benefits	Improvement of corporate social image; stakeholder satisfaction; transparency and influence of environmental information disclosure
management efficiency	Implementation of environmental management system; timeliness and accuracy of green accounting information disclosure; green audit coverage and effect; improvement of environmental awareness

and ability of management personnel

It can be clearly seen from Table 1 that the application effect evaluation index system of enterprise green accounting system covers a wide and comprehensive range, covering not only the ecological and environmental protection achievements of enterprises, but also the economic growth and social benefits, as well as the management efficiency within the enterprise.The index system can effectively help enterprises, the government and the public to evaluate the actual effect of the construction and implementation of the green accounting system in enterprises more comprehensively, and provide scientific basis for enterprises to further promote the green transformation.

4.2 The choice of evaluation method of enterprise green accounting effect

After the establishment of the evaluation index system of enterprise green accounting effect is completed, it is necessary to further select suitable methods for quantitative comprehensive evaluation.Among them, the fuzzy comprehensive evaluation method is widely used in the field of enterprise green performance evaluation because of its objective evaluation process and can effectively deal with multi-factor and multi-level complex problems.the method comprehensively analyze and judges that index of different dimensions by establishing a fuzzy evaluation matrix, and is particularly suitable for evaluating the index which are difficult to be accurately quantified, such as enterprise environmental performance, social benefits and the like.Analytic Hierarchy Process (AHP) is also widely used in the evaluation of green accounting effect, the method through the establishment of multi-level evaluation structure and with the help of experts in the form of scoring to determine the weight of different evaluation indicators, with a clear logic and strong operability.AHP can reasonably determine the importance of indicators to ensure the scientific evaluation results.Entropy weight method is also one of the commonly used methods of current effect evaluation, its outstanding advantage is that it can effectively reduce the subjective interference of human factors in the evaluation process, and more objectively determine the index weight.The entropy weight method uses the information entropy of the index data to determine the weight, which is suitable for the situation with sufficient data.Combining the above methods or adding the gray comprehensive evaluation method, DEA method and other methods to carry out comprehensive evaluation can further improve the robustness and comprehensiveness of the evaluation results, and provide more accurate scientific basis for enterprise decision-making.

5 Case analysis and empirical study

5.1 Enterprise case selection and introduction

In order to deeply analyze the actual effect of the construction of enterprise green accounting system, this study selects a large manufacturing enterprise in China (hereinafter referred to as "Enterprise A ") as a typical case for analysis.Enterprise A is one of the leading enterprises in the domestic industry. In recent years, it has actively responded to the national "double-carbon" strategy, made great investment in green development, and initially established a relatively complete green accounting system.Enterprise A now has nearly ten

thousand employees, with an annual operating income of more than 10 billion yuan. Its business involves high-end equipment manufacturing, R & D and application of new energy technology, etc.Since 2020, the enterprise has established an environmental cost accounting system, carried out carbon emission accounting and green information disclosure, accumulated rich data and experience, and provided sufficient case materials for this study.

5.2 Analysis on the application effect of green accounting system in case enterprises

In this study, the use of the previous building of corporate green accounting effectiveness evaluation index system (see Table 1), combined with the Analytic Hierarchy Process (AHP) and fuzzy comprehensive evaluation method, the implementation of the green accounting system for Enterprise A after the effect of empirical assessment.

Table 2 Comparative analysis of key performance indicators before and after the implementation of green accounting system of Enterprise A (2020 - 2023)

Indicator type	Specific indicators	Pre-implementation (2020)	After implementation (2023)	Increase (%)
environmental performance	Total carbon emissions (10,000 tons)	120.6	96.5	20.0 %
environmental performance	Energy consumption per unit product (ton standard coal/10,000 yuan output value)	0.56	0.43	23.2 %
economic performance	Proportion of green product revenue (%)	12.8	28.5	15.7 %

Table 2 can be clearly seen that after the implementation of the green accounting system, the environmental performance and economic performance of Enterprise A have been significantly improved, in which the total amount of carbon emissions decreased significantly, the energy consumption per unit of product decreased significantly, and the proportion of green product revenue increased significantly, indicating that the implementation of the green accounting system has a positive effect on the green transformation and economic efficiency of Enterprise A.

Further for enterprise A in terms of social benefits and management effectiveness of comprehensive evaluation, through the fuzzy comprehensive evaluation method of stakeholder satisfaction, green accounting information disclosure timeliness and accuracy of indicators for comprehensive scoring.

Table 3 Enterprise A comprehensive evaluation results of social benefits and management effectiveness

Evaluation dimensions	Specific indicators	Comprehensive score (out of 10)	Class
social benefits	Stakeholder Satisfaction	8.6	good
social benefits	Transparency of environmental information disclosure	7.9	better
management efficiency	Coverage rate and effect of green audit	7.2	better
management efficiency	Environmental Awareness and Ability Improvement of Managers	6.5	ordinary

It can be seen from the evaluation results in Table 3 that Enterprise A performs well in terms of stakeholder satisfaction and information transparency, but there is still room for improvement in green audit coverage and environmental awareness of management

personnel, which directly reflects the deficiencies of enterprise green accounting system at the management level.

5.3 Case study conclusions and recommendations

Based on the above analysis, the construction and implementation of the green accounting system of Enterprise A has achieved certain results in general, especially in the environmental performance and economic performance.There are still obvious deficiencies in the green audit of enterprises and the cultivation of environmental awareness of management personnel.It is suggested that Enterprise A should further strengthen the depth and breadth of green audit and increase the frequency and strength of audit coverage during the subsequent construction of green accounting system; meanwhile, it is necessary to strengthen the green development awareness training of enterprise managers and employees, improve the overall environmental responsibility awareness, and ensure that the green accounting system can be more effectively implemented within the enterprise.

6 Conclusion

Focusing on the goal of "double carbon," this paper deeply studies the construction path of enterprise green accounting system and its application effect evaluation method.The study finds that the construction of green accounting system for enterprises is of great significance to the realization of "double-carbon" goal. It can not only guide enterprises to accurately identify and calculate environmental costs and carbon emission responsibilities, promote green transformation and sustainable development of enterprises, but also improve the transparency of environmental information of enterprises, and enhance the trust of the public, investors and the government in environmental performance of enterprises.A sound green accounting system is conducive to optimizing the allocation of resources, promoting technological innovation, enhancing the competitive advantage of enterprises in the era of low-carbon economy, and boosting the smooth implementation of the national "double-carbon" strategy, which has significant theoretical and practical significance.

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