

Carbon Footprint Deficits in Environmental Impact Assessment under the Ecological Environment Code: Gaps and Improvement Pathways

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Abstract. Under the background of the "dual carbon" goals and the implementation of the Ecological Environment Code, China's environmental impact assessment (EIA) system is facing a transition from traditional pollution prevention to low-carbon governance. Carbon footprint, as a vital tool for measuring life-cycle greenhouse gas (GHG) emissions, plays a significant role in project-level carbon management. However, current EIA practices have not fully integrated carbon footprint assessment; legal provisions, technical standards, and institutional coordination remain inadequate. Although the Ecological Environment Code explicitly requires GHG emission assessment in EIA, specific rules for carbon footprint evaluation are still pending. This paper reviews the normative status of carbon footprint in China's EIA system, analyzes existing deficiencies and their causes, and draws on international experiences that incorporate climate factors into EIA. It proposes improvement pathways, including clarifying the legal positioning of carbon footprint assessment, refining technical standards, strengthening coordination with carbon management systems, and improving supervisory liability mechanisms. The paper argues that integrating carbon footprint into EIA is a crucial direction for ecological rule of law to respond to the "dual carbon" goals, but this integration should proceed incrementally, based on China's current institutional foundation and practical pilot experiences, to achieve gradual institutionalization and standardization.

Keywords: Ecological Environment Code, Environmental Impact Assessment, Carbon Footprint

1. Introduction

Against the backdrop of intensifying global climate change and advancing green and low-carbon transition, carbon emission reduction has become an important issue of common concern to the international community. Centering on the goals of achieving carbon peak by 2030 and carbon neutrality by 2060, China has successively introduced a series of legal, policy and institutional arrangements, and the "dual carbon" goals have gradually become an important direction for promoting the comprehensive green transformation of the economy and society [1]. Such development has been incorporated into the code system, and requirements for GHG emission

assessment have been added to the ecological environmental impact assessment system. This reflects that China's ecological and environmental legislation has begun to shift from traditional pollution prevention and control to the coordinated advancement of ecological protection and climate governance, providing a new institutional basis for the development of the environmental impact assessment system [2].

As a fundamental system in the field of ecological and environmental protection in China, the environmental impact assessment system undertakes the important functions of preventing environmental risks, controlling environmental pollution and optimizing project decision-making, and plays a key role in promoting the construction of ecological civilization. However, judging from the operation of the current system, environmental impact assessment has long focused on traditional pollutant discharge, ecological damage and resource utilization. There is still a lack of a complete and unified normative system for carbon footprint, which can reflect the life-cycle GHG emission level of construction projects. This also leads to certain institutional deficiencies of environmental impact assessment in responding to the requirements of the "dual carbon" goals.

In recent years, as an important tool for measuring GHG emissions of products, projects or activities, carbon footprint has been increasingly widely used in international trade, green supply chains, product environmental information disclosure and carbon management. Its assessment objects have gradually expanded from products to industries, regions and even construction projects. With the deepening of the concept of green and low-carbon development, discussions on introducing carbon footprint assessment into the environmental impact assessment system have attracted more and more attention from theoretical and practical circles, and its institutional value has been gradually recognized.

At present, domestic research on the environmental impact assessment system is relatively mature, mainly focusing on institutional functions, procedure improvement and public participation. Research on carbon footprint focuses more on accounting methods, product certification, international trade rules and carbon management systems, and there is still room for further in-depth discussion on how to effectively connect the two. Especially under the background of the Ecological Environment Code, whether carbon footprint has been truly integrated into the environmental impact assessment system, whether existing norms can meet the needs of low-carbon governance, and whether relevant legal rules still have deficiencies are issues worthy of further research.

Based on this, this paper is grounded in the Ecological Environment Code and the current environmental impact assessment system. On the basis of sorting out the evolution of relevant norms in China, combined with existing academic views, this paper analyzes the necessity, practical obstacles and normative deficiencies of integrating carbon footprint into the environmental impact assessment system, and draws on relevant foreign institutional experience to put forward targeted improvement suggestions. It is hoped that this paper can provide some reference for the further improvement of the environmental impact assessment system under the background of the implementation of the Ecological Environment Code, and also contribute corresponding rule of law ideas for China to achieve the goal of green and low-carbon development.

2. Investigation on the normative status of carbon footprint in China's environmental impact assessment system

2.1. Principle-based provisions and institutional gaps at the level of legal norms

The environmental impact assessment system is a fundamental system in China's ecological and environmental governance system. Its main function is to control possible environmental impacts

before project implementation through ex-ante assessment and source prevention, so as to reduce the adverse impacts of construction activities on the ecological environment. Since the implementation of the *Environmental Impact Assessment Law of the People's Republic of China*, the objects of environmental impact assessment have mainly focused on traditional environmental elements such as atmosphere, water, soil, noise, solid waste and ecological impacts, forming a relatively mature institutional framework. However, for content closely related to climate change such as GHG emissions and carbon footprint, an independent and complete normative system has not been formed for a long time, and most of them are scattered in policy documents or local explorations.

In recent years, with the proposal of China's "dual carbon" goals, ecological and environmental protection and climate change response have gradually shifted from relatively independent development paths to collaborative governance, and the environmental impact assessment system has also begun to undertake the new task of serving green and low-carbon development. From the normative level, this change is particularly evident in the Ecological Environment Code. The *Ecological Environment Code of the People's Republic of China*, which came into force in 2026, has specially set up a chapter on "ecological environmental impact assessment", and explicitly proposes in Article 82 that the state shall strengthen the ecological environmental impact assessment of GHG emissions, and the specific measures and implementation steps shall be prescribed by the competent department of ecology and environment under the State Council [3]. This means that GHG emissions have been formally included in the adjustment scope of ecological environmental impact assessment, and also marks that China's environmental impact assessment system has begun to break through the traditional evaluation idea of pollution prevention and control, and gradually extend to the direction of coordinated development of pollution prevention and climate governance.

2.2. Introduction and evolution of carbon factors in policy documents

It is worth noting that although the Ecological Environment Code has clearly proposed to strengthen the environmental impact assessment of GHG emissions, the normative content still stays at the level of principle-based provisions. No further specific regulations have been made on issues such as whether carbon footprint is used as an evaluation indicator, how to determine evaluation objects, how to divide accounting boundaries, how to carry out evaluation procedures, and how to apply evaluation results. From the perspective of the normative system, what is currently confirmed by law is the GHG emission assessment system, while carbon footprint, as an important evaluation tool that can reflect the life-cycle GHG emissions of construction projects, has not yet truly entered the environmental impact assessment system, and there is still a certain distance between the two.

If we shift our perspective to the policy level, we can find that the introduction of carbon factors into the environmental impact assessment system has actually undergone a long development process. After the proposal of the "dual carbon" goals, important policy documents such as the *Opinion on Fully, Accurately and Comprehensively Implementing the New Development Concept and Doing a Good Job in Carbon Peak and Carbon Neutrality Work* and the *Action Plan for Carbon Peak Before 2030* were issued successively. While emphasizing the promotion of green and low-carbon development, they also proposed to strengthen the source control of construction projects and promote the connection between environmental impact assessment and GHG emission management. Subsequently, the competent department of ecology and environment successively issued relevant management documents for high-energy-consuming and high-emission construction projects, incorporating carbon emission factors into the important considerations of project

approval, enabling environmental impact assessment to initially have a certain low-carbon governance function.

2.3. Pilot exploration and practical progress of carbon emission assessment

The Ministry of Ecology and Environment has further organized pilot projects of carbon emission environmental impact assessment for construction projects in key industries, explored the integration of carbon emission analysis, accounting and emission reduction measures into environmental impact assessment reports, and continuously accumulated institutional experience through pilots [4]. From the perspective of institutional positioning, these reform measures are more centered on carbon emission assessment, with the evaluation focus mainly on GHG emissions during the operation phase of construction projects, and relatively less involvement in the assessment of the full life-cycle carbon footprint of products or projects. The existing system still takes total emission control as the core, and has not formed a carbon footprint assessment mechanism covering the whole process of raw material acquisition, production, transportation, use and waste disposal.

On the whole, China's environmental impact assessment system has completed an important transformation from "not paying attention to carbon" to "paying attention to carbon emissions", and the Ecological Environment Code also provides a clear legal basis for climate governance to enter environmental impact assessment. However, existing norms are more reflected as principle-based requirements, and relevant supporting systems still need to be improved. Especially in terms of carbon footprint assessment standards, accounting methods, evaluation procedures and legal liabilities, there is still a lack of unified, systematic and operable institutional arrangements, which means that the real integration of carbon footprint into the environmental impact assessment system is still in the exploratory stage.

Judging from the institutional reform and local pilot projects in recent years, both the environmental access requirements for high-energy-consuming and high-emission construction projects and the institutional design of the Ecological Environment Code for GHG emission environmental impact assessment reflect that environmental impact assessment is gradually developing towards the concept of whole-process and full-life-cycle green governance. Against this background, how to further integrate carbon footprint assessment into the environmental impact assessment system has become a common concern of theoretical and practical circles. Around this issue, different understandings and propositions have been formed in academic circles, which also constitute an important basis for the discussion of subsequent institutional improvement and are worthy of further sorting out and analysis.

3. Review of academic views on the integration of carbon footprint into the environmental impact assessment system

With the gradual advancement of pilot work on carbon emission environmental impact assessment in China, whether carbon footprint should be integrated into the environmental impact assessment system has become a topic of continuous attention in the fields of environmental law, environmental management and ecological governance. Judging from existing studies, the academic community generally recognizes that environmental impact assessment needs to respond to the requirements of the "dual carbon" goals. However, there are still some differences on how carbon footprint should enter the EIA system, to what extent it should enter, and what kind of institutional system should be

established. Based on the existing research results, they can be roughly summarized into the following categories of views.

3.1. The theory of full integration and its institutional value

Carbon footprint assessment should be fully integrated into the environmental impact assessment system, and an assessment mechanism covering the whole life cycle of construction projects should be gradually established. This view holds that traditional environmental impact assessment mainly focuses on pollutant discharge and ecological damage, while carbon emissions have the characteristics of cross-region, long-term and cumulative. Only carrying out carbon emission analysis on the operation phase of construction projects can hardly meet the current institutional needs of green and low-carbon development. Carbon footprint can reflect the GHG emissions generated by a project from raw material acquisition, production and construction, transportation, operation to waste disposal. Integrating it into environmental impact assessment will not only help improve the source prevention capacity, but also promote construction projects to optimize processes and adjust energy structure in the scheme design stage, so as to realize collaborative governance of pollution reduction and carbon reduction [5]. Some scholars further propose that clear provisions on carbon assessment should be made at the legislative level, and the legal effect of evaluation objects, evaluation content, evaluation procedures and evaluation conclusions should be improved, so that carbon assessment can truly become an important part of environmental impact assessment.

3.2. The theory of gradual integration and its practical considerations

The integration of carbon footprint into environmental impact assessment has practical necessity, but at this stage, it is more suitable to adopt a step-by-step institutional path. This part of the research points out that carbon footprint assessment involves many aspects such as life cycle assessment, emission factor database, industry accounting standards and professional technical capabilities. However, China has not yet formed a unified and mature evaluation norm, and there are still great differences in data quality and accounting methods among different industries. If carbon footprint assessment is fully implemented in all construction projects, it will not only increase the preparation cost of environmental impact assessment, but also may affect the efficiency of system operation. Therefore, a more prudent approach is to prioritize pilots in high-energy-consuming and high-emission industries and key construction projects, gradually expand the scope of application based on practical experience, and simultaneously improve technical standards, data platforms and supervision and management mechanisms, so that institutional construction is consistent with practical capacity.

3.3. View on maintaining the existing carbon emission assessment system

At present, China has established a pilot system of carbon emission environmental impact assessment, and added provisions on GHG emission environmental impact assessment in the Ecological Environment Code. It is sufficient to further improve carbon emission assessment under the existing institutional framework, and there is no need to separately establish a carbon footprint assessment system. This view emphasizes that environmental impact assessment itself belongs to the construction project approval system, focusing on identifying and predicting the possible environmental impacts of construction projects, while carbon footprint is more inclined to product

environmental information management, green supply chains and international trade rules. Although there is a connection between the two, their evaluation objects and institutional functions are not completely consistent. If product carbon footprint assessment is directly introduced into the environmental impact assessment of construction projects, it may lead to the continuous expansion of the evaluation scope, increase the overlap and duplication between systems, and instead weaken the institutional positioning of environmental impact assessment.

Judging from the current academic discussions, the above views have their own rationality. The theory of full integration is more in line with the long-term direction of green and low-carbon development, and also conforms to the development trend of the continuous expansion of the prevention principle of environmental law, but its implementation is still restricted by technical conditions and institutional foundations. The theory of gradual integration fully considers the realistic gap between China's current institutional construction and practical capacity, and has strong operability. However, if it stays at the pilot stage for a long time, it will easily lead to the difficulty of forming unified standards for institutional norms. The view of maintaining the existing carbon emission assessment system emphasizes institutional division of labor, which is of certain significance for avoiding institutional overlap. However, as the Ecological Environment Code formally includes GHG emissions into the scope of ecological environmental impact assessment, relying solely on existing carbon emission assessment can hardly meet the development requirements of whole-process and full-life-cycle green governance.

This paper holds that although carbon footprint and carbon emission assessment cannot be simply equated, they do not have a mutually alternative relationship, but have strong complementarity. Carbon emission assessment focuses more on the GHG emissions generated by construction projects at specific stages, while carbon footprint assessment can further reflect the full life-cycle environmental impact of construction projects. Both serve the institutional goals of source prevention and green development. Considering that China's current legal norms, technical standards and basic data are still in the process of continuous improvement, the integration of carbon footprint into the environmental impact assessment system should not adopt a one-step approach. Instead, it should adhere to the simultaneous advancement of legislative improvement and practical exploration. On the basis of first implementation in key industries and key construction projects, unified evaluation rules, accounting standards and legal application mechanisms should be gradually established, so that carbon footprint assessment can form an organic connection with the existing environmental impact assessment system, and better play the functions of source emission reduction and risk prevention. This also shows that there are still certain normative gaps in China's current environmental impact assessment system, and the causes and specific manifestations are worthy of further analysis.

4. Analysis of the causes for the absence of carbon footprint in China's environmental impact assessment system

Although China has included GHG emissions into the adjustment scope of the ecological environmental impact assessment system and carried out a series of pilot projects of carbon emission environmental impact assessment around key industries, judging from the overall operation of the system, carbon footprint has not truly become an important evaluation content of environmental impact assessment, and its institutional construction is still in the exploratory stage. This phenomenon is not simply caused by insufficient technical conditions, but is jointly affected by many factors such as legislative concepts, institutional positioning, evaluation standards and management systems. At this stage, there are still obvious normative gaps.

4.1. Lack of direct and specific provisions on carbon footprint assessment in legal norms

The current legal norms still focus on GHG emission control and lack direct provisions on carbon footprint assessment. Judging from the relevant provisions of the current *Environmental Impact Assessment Law* and the Ecological Environment Code, the legislation has begun to pay attention to the GHG emission issues of construction projects, but the normative content mostly stays at the level of principle-based requirements, and no clear provisions have been made on the legal attribute, application scope, evaluation procedure and legal liability of carbon footprint assessment. Due to the lack of unified legal basis, carbon footprint assessment currently relies more on departmental policies, industry norms or local pilot projects, with relatively limited legal binding force, and it is difficult to form a unified national institutional system. In the practice of environmental impact assessment, there is still great uncertainty about whether the project construction unit carries out carbon footprint analysis, what accounting method is adopted, and how the evaluation results affect project approval, which also makes it difficult for carbon footprint assessment to be truly integrated into the environmental impact assessment system.

4.2. Limitations of the traditional functional orientation of the EIA system on life cycle assessment

The traditional functional orientation of the environmental impact assessment system has formed certain restrictions on carbon footprint assessment. For a long time, China's environmental impact assessment system has mainly focused on pollution prevention and ecological protection, with the evaluation focus on the environmental impacts that may occur during the construction and operation periods of construction projects. It provides decision-making basis for project approval by predicting the degree of pollutant discharge and ecological damage. This institutional design pays more attention to the direct environmental impact in the process of project implementation, while carbon footprint assessment emphasizes the GHG emissions generated by products or projects from raw material acquisition, production and manufacturing, transportation, use to waste disposal. It needs to break through the spatial and temporal scope of the construction project itself and conduct a comprehensive analysis of the whole life cycle. There are obvious differences between the two evaluation ideas in terms of evaluation objects, evaluation boundaries and evaluation methods. Without the redesign at the institutional level, it is difficult for carbon footprint assessment to be directly embedded in the existing environmental impact assessment system, and it is also easy to lead to duplication of evaluation content or overlapping of responsibilities.

4.3. Technical standards for carbon footprint assessment are not yet unified

The technical standards for carbon footprint assessment have not yet formed a unified norm, which objectively affects the effect of institutional implementation. Carbon footprint assessment is highly professional and needs to be supported by life cycle assessment methods, a unified emission factor database and a sound data collection system. However, China's relevant standard system is still in the process of continuous improvement. There are certain differences in accounting rules, data sources and evaluation boundaries among different industries, and different accounting methods for the same construction project may even lead to different evaluation results. At the same time, the basic data of some industries are still not perfect, and the professional capacity of environmental impact assessment institutions to carry out carbon footprint accounting also has certain gaps. In the absence of unified technical norms, if carbon footprint assessment is directly used as an important

basis for construction project approval, it will easily affect the scientificity and comparability of evaluation results, and also increase the cost of system operation.

4.4. Insufficient connection with relevant carbon management systems

Effective connection has not yet been formed between existing environmental management systems, which weakens the institutional value of carbon footprint assessment. In recent years, centering on the goals of carbon peak and carbon neutrality, China has gradually established a number of systems such as carbon emission statistics, national carbon emissions trading, product carbon footprint management and green product certification, and different systems undertake different governance functions. However, judging from the operation of the systems, all systems are still managed separately. Information sharing and institutional connection between environmental impact assessment and carbon emission management, carbon market and product carbon footprint certification are still insufficient. The carbon emission data obtained from environmental impact assessment can hardly form an effective link with subsequent supervision and management, and the carbon footprint assessment results cannot directly serve the carbon management and green certification during the project operation phase, making environmental impact assessment stay more at the project approval stage and failing to give full play to the institutional advantages of whole-process environmental governance [6].

4.5. Supporting supervision mechanisms and legal liability systems need to be improved

Supporting supervision mechanisms and legal liabilities still need to be further improved. An important reason why the environmental impact assessment system can play a restrictive role is that it has established a relatively complete approval, supervision and legal liability system. However, carbon footprint assessment is currently mainly based on policy advocacy and pilot exploration, lacking a supporting supervision and management mechanism. If the construction unit fails to carry out carbon footprint assessment, there are deviations in the evaluation data, or relevant information is deliberately concealed, the current law does not have targeted liability provisions, and administrative organs also lack a unified legal basis in the process of law enforcement. Such institutional imperfection makes carbon footprint assessment more of an encouraging requirement, rather than a truly binding legal system, which objectively affects its institutional implementation effect.

On the whole, the absence of carbon footprint in China's environmental impact assessment system is not caused by a single factor, but by the joint action of legal norms, institutional positioning, technical standards, institutional connection and supervision guarantee. With the Ecological Environment Code formally incorporating GHG emissions into the ecological environmental impact assessment system, carbon footprint entry into environmental impact assessment has a certain legal basis. However, to truly achieve the goal of whole-process and full-life-cycle low-carbon governance, it is necessary to further improve relevant legal norms, improve evaluation standards, strengthen institutional coordination, and establish a corresponding supervision and guarantee mechanism. We will promote the gradual shift of carbon footprint assessment from policy exploration to institutional norms, so as to provide more stable legal support for the low-carbon transformation of the environmental impact assessment system.

5. Improvement pathways for integrating carbon footprint into the environmental impact assessment system

Under the background that the Ecological Environment Code has incorporated GHG emissions into the ecological environmental impact assessment system, how to further promote the true integration of carbon footprint assessment into the environmental impact assessment system has become an important topic for improving China's green and low-carbon rule of law construction [7]. Judging from the current operation of the system, China has the basic conditions for carrying out carbon emission environmental impact assessment, but there are still problems such as insufficient legal norms, inconsistent technical standards, unsmooth institutional connection and imperfect supervision and guarantee mechanism around carbon footprint assessment. In this regard, we should base on China's existing institutional foundation, adhere to the idea of step-by-step and categorized advancement, absorb foreign beneficial experience, and combine with China's ecological and environmental governance practice to continuously improve the relevant institutional design.

5.1. Improve legal norms for carbon footprint assessment and enhance institutional stability

We will further improve the legal norms for integrating carbon footprint into the environmental impact assessment system, and enhance the stability and predictability of system operation. The Ecological Environment Code has established the basic principle of strengthening the ecological environmental impact assessment of GHG emissions, providing a legal basis for carbon footprint to enter environmental impact assessment. However, the current provisions are still mainly principle-based, and unified norms have not yet been formed on the legal positioning, application scope and evaluation procedures of carbon footprint assessment. In the follow-up, we can combine the supporting legislation of the Ecological Environment Code to make more specific provisions on the carbon footprint assessment of construction projects, clarify that key industries, major construction projects and high-energy-consuming and high-emission projects should carry out carbon footprint assessment, and incorporate the evaluation requirements into the technical guidelines and management measures for environmental impact assessment, so that carbon footprint assessment can gradually shift from policy exploration to a legal system and further improve the standardization of system implementation.

5.2. Clarify the functional orientation of carbon footprint assessment and promote collaborative governance

We will clarify the functional orientation of carbon footprint assessment in the environmental impact assessment system, and promote the coordinated development of pollution prevention and climate governance. Carbon footprint assessment is not a simple addition to the content of traditional environmental impact assessment, but a further expansion on the basis of the original system. Its core goal is to identify the full life-cycle GHG emissions of construction projects and provide a basis for project optimization design and green decision-making. Therefore, in the process of institutional design, we should adhere to the idea of functional complementarity rather than repeated evaluation, organically combine traditional pollutant environmental impact assessment with carbon footprint assessment, pay attention to both the direct impact of construction projects on the ecological environment and the climate impact of the whole project life cycle, and realize the coordinated advancement of pollution reduction, carbon reduction, green expansion and growth. This institutional concept has certain similarities with the development direction of the European

Union in recent years to continuously strengthen the integration of climate change factors into environmental impact assessment. It emphasizes the comprehensive consideration of ecological and environmental protection and GHG emissions at the project approval stage, which provides useful reference for China to improve relevant systems.

5.3. Establish unified and scientific technical standards for carbon footprint assessment

We will establish unified and scientific technical standards for carbon footprint assessment to improve the operability of system implementation. Carbon footprint assessment involves many technical issues such as life cycle assessment methods, emission factor databases, accounting boundaries and evaluation index systems. Only by establishing unified standards can we ensure the comparability of evaluation results in different regions and industries. Combined with China's current institutional construction, we can rely on the national GHG emission accounting standard system, gradually improve the carbon footprint accounting rules for key industries, establish a unified data collection platform and emission factor database, further strengthen the professional capacity building of environmental impact assessment institutions, and improve the authenticity and accuracy of evaluation data. At the same time, differentiated evaluation standards should be formulated according to the characteristics of different industries, stricter evaluation requirements should be implemented for high-energy-consuming and high-emission industries, and categorized management should be adopted for general construction projects, so as to give consideration to administrative efficiency while ensuring the scientificity of the system.

5.4. Strengthen the coordination and connection between EIA and systems such as carbon emission management and carbon market

We will strengthen the coordination and connection between environmental impact assessment and relevant carbon management systems, and form a whole-process low-carbon governance mechanism. In recent years, centering on the realization of the "dual carbon" goals, China has gradually established a carbon emission statistical system, a national carbon emissions trading market, a product carbon footprint management system and a green product certification system, and each system undertakes different governance functions [8]. As a source management system for construction projects, environmental impact assessment should form a closer connection with these systems. On the one hand, we can explore using the carbon footprint data formed at the environmental impact assessment stage of construction projects as an important basis for subsequent carbon emission management, and realize information sharing among environmental impact assessment, project construction, operation supervision and carbon emission management. On the other hand, we can also promote the combination of environmental impact assessment results with green finance, green procurement and product carbon labeling systems, improve the practical application value of carbon footprint assessment results, and enhance the enthusiasm of construction units to actively carry out carbon emission reduction work.

5.5. Improve supervision and management mechanisms and legal liability systems

We will improve the supervision and management mechanism and legal liability system, and improve the execution of the carbon footprint assessment system [9]. Whether a system can really play its role depends not only on whether the evaluation standards are scientific, but also on whether the supervision mechanism is perfect. At this stage, carbon footprint assessment is still dominated by

pilot exploration, lacking a unified supervision and management system and accountability mechanism, which easily leads to formalistic evaluation. In this regard, combined with the existing supervision system of environmental impact assessment, we can establish a whole-process supervision mechanism covering construction units, evaluation institutions and administrative competent departments, and carry out continuous supervision on the authenticity of carbon footprint assessment data, the legality of evaluation procedures and the implementation of emission reduction measures. For acts such as deliberately providing false data, tampering with evaluation results or failing to carry out carbon footprint assessment in accordance with regulations, corresponding liabilities should be further clarified in laws and regulations to increase the cost of violations and enhance institutional binding force.

On the whole, integrating carbon footprint into the environmental impact assessment system is not simply adding an evaluation content, but an important reform direction to promote the environmental impact assessment system to meet the requirements of green and low-carbon development. From the perspective of international experience, whether the European Union gradually strengthens the climate impact assessment of construction projects, or the United States continues to pay attention to GHG emission factors in environmental impact assessment, it all reflects that the environmental impact assessment system is continuously developing from traditional pollution prevention to comprehensive ecological governance. China has taken an important step under the framework of the Ecological Environment Code. In the future, it is still necessary to continuously improve legal norms, technical standards, institutional connection and supervision guarantee, promote carbon footprint assessment to gradually become an important part of environmental impact assessment, better give play to the institutional functions of source prevention, whole-process governance and promoting green development, and provide more perfect rule of law guarantee for achieving the goals of carbon peak and carbon neutrality [10].

6. Conclusion

Against the background of the continuous advancement of the "dual carbon" goals and the formal implementation of the Ecological Environment Code, the environmental impact assessment system is facing an important task of transformation from traditional pollution prevention to green and low-carbon governance. As an important system in the field of ecological and environmental protection, environmental impact assessment needs to not only pay attention to the pollution impact caused by construction projects, but also respond to the new requirements put forward by climate change governance. As an important tool that can reflect the full life-cycle GHG emissions of projects or products, the integration of carbon footprint into the environmental impact assessment system is of great significance for improving the ecological environment source governance mechanism and promoting the coordinated development of pollution reduction and carbon reduction.

Through the analysis of China's current norms and institutional practices, it can be found that China's environmental impact assessment system has begun to pay attention to GHG emission issues, and the Ecological Environment Code also provides a legal basis for GHG emission environmental impact assessment. However, at this stage, carbon footprint has not been truly integrated into the environmental impact assessment system. The main manifestations are the lack of specific provisions in legal norms, the ununified evaluation standards, the imperfect institutional connection mechanism and the need to strengthen the supervision and responsibility system. The reasons for this situation are not only related to the pollution prevention and control orientation formed by China's environmental impact assessment system for a long time, but also affected by

practical factors such as the complex technology of carbon footprint assessment and the immature institutional foundation.

From the perspective of theoretical discussion, there are different understandings in academic circles on whether and how to integrate carbon footprint into the environmental impact assessment system. On the one hand, integrating carbon footprint into EIA helps to break through the limitations of traditional environmental impact assessment scope and realize the comprehensive consideration of the full life-cycle environmental impact of construction projects. On the other hand, the full implementation of carbon footprint assessment at this stage still faces challenges in terms of technical standards and institutional costs. Therefore, on the basis of adhering to the direction of institutional improvement, China should adopt a step-by-step promotion method according to the development of different regions and industries, accumulate practical experience in key industries and key projects, and gradually expand the scope of application.

In the future, China can further improve the relevant supporting systems of the Ecological Environment Code, clarify the legal positioning of carbon footprint assessment in environmental impact assessment, establish a unified accounting standard and data system, strengthen the coordination between environmental impact assessment and systems such as carbon emission management and green certification, and improve the supervision, management and accountability mechanism, so that carbon footprint assessment can truly become an important part of the environmental impact assessment system.

Of course, this paper still has certain limitations. Since the integration of carbon footprint into the environmental impact assessment system is still in the exploratory stage, relevant practical cases and institutional operation data are still limited. This paper mainly carries out research from the perspective of normative analysis and institutional construction, and lacks in-depth empirical analysis on the carbon footprint assessment standards of specific industries and the effect of local pilots. In the future, with the continuous improvement of the supporting systems of the Ecological Environment Code and the gradual establishment of the carbon footprint management system, further research can be carried out on the application scope, technical methods and institutional effects of carbon footprint assessment combined with specific industry practices, so as to promote the more systematic improvement of China's environmental impact assessment system under the background of green and low-carbon development.

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