

Article

The Feasibility of Constructing a Greenhouse Gas Emission Assessment System in China and Its Legislative Path

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Abstract: In order to achieve the ambitious carbon peak and neutrality targets, China is in the process of revising Environmental Impact Assessment Law. This study is devoted to the proposition of how to incorporate activities regulating greenhouse gas emissions into the legal system of Environmental Impact Assessment (EIA). This study is inspired by the Embedding Theory, which provides the explanatory framework that allows economic activities to be regulated by political and social norms. This framework requires a relevance and cost analysis of the three indicators required to regulate economic activities: administrative support, technical support, and legal support. The results reveal that the structure of China's Greenhouse Gas Emissions Assessment (GGEA) system and that of the EIA system are closely related and that the generation and transaction costs involved in the process of institution embedding are low. This result satisfies the requirements of the Embedding Theory for achieving institutional coupling. In conclusion, this study provides an outlook on the direction of the revision of China's EIA Law from the perspective of building a rule of law pathway for GGEA with "4EM-3CS-3RC" as the core.

Keywords: carbon neutrality; Greenhouse Gas Emissions Assessment system; institutional coupling; institution embedding



Citation: Zhao, S.; Tian, Y. The Feasibility of Constructing a Greenhouse Gas Emission Assessment System in China and Its Legislative Path. *Sustainability* **2023**, *15*, 3762. <https://doi.org/10.3390/su15043762>

Academic Editor: Roberto Mancinelli

Received: 6 January 2023

Revised: 15 February 2023

Accepted: 16 February 2023

Published: 18 February 2023



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1. Introduction

1.1. Background

The 26th Conference of the Parties of the United Nations Climate Change Conference was held in Glasgow, United Kingdom, from October 31 to November 13, 2021. At this conference, the parties reached a consensus on the implementation rules of The Paris Agreement. In recent years, based on the global Respond to Climate Change (RCC) action framework, countries have been implementing their own RCC actions to mitigate and adapt to climate change. According to the Energy & Climate Intelligence Unit in the United Kingdom, 133 countries have set the net zero target [1], which reflects international efforts to control greenhouse gas emissions.

China attributes great significance to the development of measures to mitigate and adapt to climate change. In September 2020, it set the goal of striving to reach a CO₂ emissions peak before 2030 and achieving carbon neutralization before 2060 as its Intended Nationally Determined Contributions. Subsequently, China established the Carbon Peak and Carbon Neutralization Leading Group at the central government level, formulated and implemented the 1 + N policy system, and gradually formed a governance scheme for achieving a carbon peak and carbon neutralization. The scheme comprises three governance dimensions. Specifically, in the subject dimension, central and local governments collaboratively provide guidance and coordination and perform territory management; in the object dimension, regions, sectors, and industry make joint efforts; and in the method dimension, technology, policy, and laws are integrated with each other.

Currently, many countries are gradually adopting Environmental Impact Assessment (EIA) as an important tool to mitigate and adapt to climate change [2]. Further, China

actively carried out EIA reform to examine the integration of climate change impacts into the assessment so that it serves as an important reference for making economic and social development decisions [3,4]. As the administrative authority for EIA and RCC [5], the Ministry of Ecology and Environment (MEE) specifies the timeline and road map for the establishment of the Greenhouse Gas Emissions Assessment (GGEA) system in the relevant guidance document.

1.2. Literature Review

Scholars have earlier focused on and argued for the positive effects of the EIA system on combating climate change. Barry Sadler proposed a “quick start” agenda for applying EIA to global climate change in 1996, suggesting that maximum use should be made of existing methods and procedures, and together with Shillington and others, argued in 1997 for ways to incorporate climate change considerations into EIA [6]. On this basis, scholars have also gradually paid attention to the importance of incorporating factors to deal with climate change into the legal system of EIA. Dave Owen suggests that attention should be given to the possible role of the EIA legal system in responding to climate change by creating new legal mechanisms and using a series of other older mechanisms to provide a comprehensive response to climate change issues [7]. Sofia Yazykova and Carl Bruch analyze the legal provisions on climate change in several countries and suggest that EIA should be one of the topics that should be emphasized in the “adaptation provisions” [8]. In order to further guide the legislative practice of GGEA, scholars have also argued for the applicability of the legal system of EIA to GGEA and legal revision measures from different perspectives. Toby Kruger analyzes the objective criteria for applying the term “significance” to greenhouse gas emissions in the Canadian Environmental Assessment Act [9]. Nicole Rushovich analyzes the Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews, suggesting that the document clarifies how federal agencies can address climate change and greenhouse gas emissions in environmental impact assessments and that Congress should amend the National Environmental Policy Act to restore this guidance [10]. The above scholars’ research provides a reference for constructing GGEA in the EIA system in China.

Recently, Chinese scholars have conducted research on both the technical and institutional aspects of GGEA. First, they mostly used quantitative and technical research models [11] to study EIA techniques focusing on the synergistic control of greenhouse gases such as carbon dioxide and various pollutants. The main findings are as follows. Although there are industry-level [12] and regional [13] variations in China’s carbon emissions, there is a strong positive correlation [14] between industries and regions with high pollutant emissions and their carbon emission intensity. Therefore, green and low-carbon strategies should be the guiding principle for the construction of the EIA technical system [15] and the establishment of technical routes [2] and evaluation methods [16] for EIA based on low-carbon development goals. Second, scholars have mostly adopted a “legislative” approach [17] to study the institutional structure of GGEA. Their observations indicate the necessity of having legal means to promote the goal of carbon peak and carbon neutralization [18–20]. Scholars specializing in climate change legislation [21–23] should realize that greenhouse gases and pollutants are homologous compounds [24]. Hence, the legal attributes of greenhouse gases should be clarified [25] under the existing legal framework of EIA [26] by means of synergistic control [27] and prevention in source [28]; subsequently, the GGEA system should be established [29]. The aforementioned research accomplished the demonstration of necessity + feasibility at the technical level and proved the necessity at the institutional level. Accordingly, this study analyzes the feasibility of GGEA legislation.

This study makes the following innovative contributions. First, it focuses on and fills the gap in the feasibility demonstration of GGEA in Chinese EIA-related laws. Second, it selects institution coupling as the methodology and analyzes the relevance and cost of GGEA embedded in EIA by using three main observation indicators: administrative support,

technical support, and legal support. Third, this study proposes a specific legislative and legal implementation path for GGEA in the context of the reform of China's EIA system.

2. Materials and Methods

2.1. Technical Route: An Analysis of Institutional Coupling

Path-dependent characteristics are observed [30] in the current implementation framework of the GGEA system in China. In other words, the current institutional structure of EIA reinforces the GGEA system's institutional inertia. Accordingly, the construction of the GGEA system depends not only on the reformer's subjective desire and ultimate goal but also on the path selected at the beginning. It necessitates an analysis of the relationship between the GGEA system and the current structure of the EIA system in China. In particular, attention should be paid to whether the GGEA and EIA systems present institutional coupling.

In institutional coupling, the institutional arrangements within an institutional structure are organically combined to achieve core functions and motivate and constrain people's behavior from different perspectives [31]. Further, institutional arrangements aim to constrain people's specific behavior patterns and relationships, whereas an institutional structure is a systematic configuration of related institutional arrangements. When the degree of coupling [32] (degree of interaction) is high, the overall institutional structure is systematically ordered, and the institutional arrangements are coherent.

To this end, this study examines all aspects of the institutional structure of China's EIA and clarifies the degree of coupling between the GGEA system (institutional arrangement) and the institutional structure of EIA. In case the degree of coupling is high (i.e., institutional dependence is feasible), it discusses the feasible path for incorporating the GGEA system into China's EIA system.

2.2. Relevance and Cost Based on a Two-Level and Three-Pronged Observation Index

The analytical framework proposed by this study is inspired by some of the research ideas pertaining to the Embedding Theory, which was first applied to the study of economic sociology. Karl Polanyi first proposed the idea of "embeddedness" and maintained that "economic systems, as a rule, are embedded in social relations" [33]. Further, Mark Granovetter elaborated on this theory and argued "the embeddedness argument to have very general applicability" [34]. Subsequently, a large number of scholars enriched and developed the Embedding Theory and applied it in many disciplines [35]. In particular, Neil Fligstein derived "institutional embeddedness" based on the idea of "Markets as Politics" [36]. In general, Embedding Theory has been extended to the political and legal fields. It mainly argues that the value judgment of economic and social behaviors should be embedded in the value judgment system of policies and laws, and thus the standards of these two value judgments should be unified. This finding is not unique and is supported by other research findings, such as Keynes' argument that the state can intervene in the economy on a macro-level [37], Habermas' argument on the theory of communicative action [38], and Pound's argument that social behavior needs to be controlled by law [39]. In this paper, after comparing and studying many theories, we believe that the expression of Embedding Theory is closer to the theoretical support required for the combination of GGEA and EIA. It is necessary to state that Embedding Theory is not the only correct approach to support the arguments of this paper. The next paragraph will focus on describing the connection between Embedding Theory and this study.

Based on the concept of embedded, this study evaluates the degree of coupling between the specific institutional arrangement of the GGEA system and the overall institutional structure of the EIA system in China. The logic of the analytical framework is that institutional arrangements can be embedded in the institutional structure where there is a high degree of coupling between the institutional arrangement and institutional structure, with two characteristics. The first is relevance [40]; that is, the institutional structure determines institutional arrangements. As institutional arrangements are embedded in the institutional structure, the effectiveness of institutional arrangements depends to a

large extent on the institutional structure. The second characteristic is cost [41]; that is, we can maximize cost savings only by reasonably embedding a new system and making it grow naturally into the original system structure. Here, the cost includes the cost of generating the system, that is, Generate Cost (GC), and the cost of organizing, maintaining, and implementing the institutional arrangement, that is, Transaction Cost (TC). By analyzing relevance and cost, we can evaluate the coupling degree of the GGEA system and EIA institutional structure. When the relevance of the two is strong and the cost of embedding the GGEA system in the EIA institutional structure is low, the coupling degree of the two can be considered high. To assess relevance and cost more systematically and comprehensively, this study constructs a “two-level and three-pronged” indicator system to deconstruct all aspects of the structure of the EIA system (Figure 1).

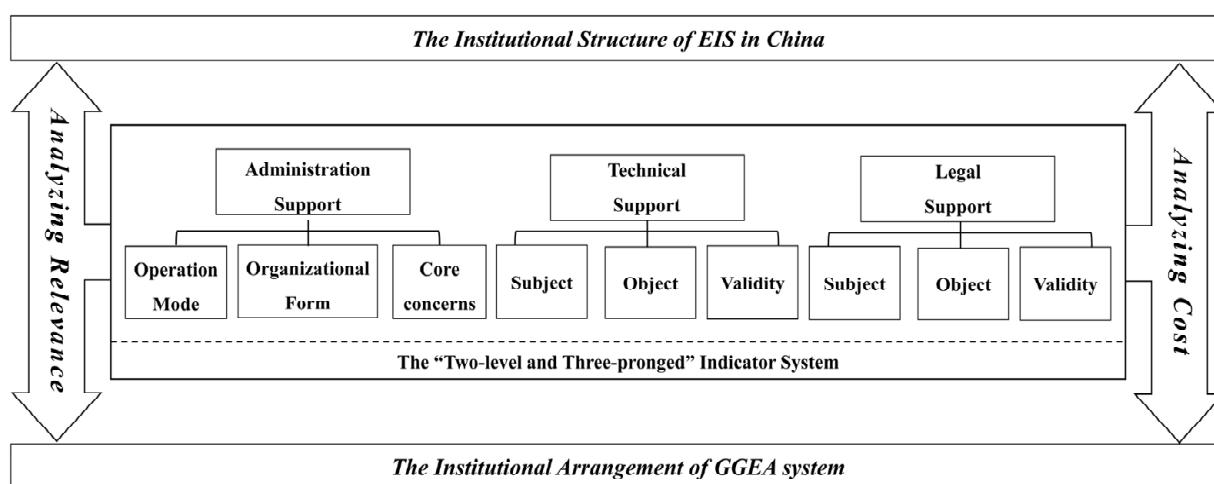


Figure 1. An approach to institutional coupling analysis based on a two-level and three-pronged observation index.

The first-level index layer comprises Administrative Support, Technical Support, and Legal Support. The Administrative Support index, Operation Mode, Organizational Form, and Core Concerns are set as secondary indexes. Among them, Operation Mode refers to the interaction between power and rights and their internal forms. Further, Organizational Form refers to the spatial structure of power. Finally, Core Concerns denote the value pursuit of system operation. Under the indexes of Technical Support and Legal Support, three second-level observation indexes, including Subject, Object, and Validity, are set.

2.3. Information and Data Sources

2.3.1. Information and Data on Administrative Support

To examine the Operation Mode, Organizational Form, and Core Concerns of China’s EIA system, this study takes the three major Chinese EIA legislations, Environmental Impact Assessment Law, Regulations on the Administration of Environmental Protection of Construction Projects, and Regulations on Planning Environmental Impact Assessment, as basic analysis materials. In addition, this study collected 9 documents of the central government in effect since the 18th National Congress of the Communist Party of China by full-text search in the document library of the official website of the MEE using the Environmental Impact Assessment as the keyword. Under the same limited search conditions, this study retrieved 32 documents and regulations of the MEE with the topics of Environmental Impact Assessment management and addressing climate change (Table 1).

Table 1. Documents on Administrative Support.

Number	Document
1	Environmental Impact Assessment Law
2	Regulations on the Administration of Environmental Protection of Construction Projects
3	Regulations on Planning Environmental Impact Assessment
4	Outline of the Construction Plan for the Twin-city Economic Circle in the Chengdu-Chongqing Region
5	Guiding Opinions on Building a Modern Environmental Governance System
6	Regulations on the Ministry of Ecology and Environment Function Configuration, Internal Structure, and Staffing
7	Guidance on the Implementation of the Lake Manager System in Lakes
8	National Ecological Civilization Pilot Zone (Jiangxi) Implementation Plan
9	National Ecological Civilization Pilot Zone (Guizhou) Implementation Plan
10	Provincial-Territorial Spatial Planning Preparation Guide
11	Overall Program of Ecological Civilization System Reform
12	Opinions on Accelerating the Construction of Ecological Civilization
13	Classified Management List of Environmental Impact Assessment of Construction Projects (2021)
14	Regulations on the Approval Procedures for Environmental Impact Statements (Forms) of Construction Projects of the Ministry of Ecology and Environment
15	Administrative Measures for the Compilation and Supervision of Environmental Impact Statements (Forms) of Construction Projects
16	Regulations on the Public Participation in Environmental Impact Assessment
17	Administrative Measures for the Recordation of Environmental Impact Registration Forms of Construction Projects
18	Management Approach of the Assessment of Construction Projects after the Environmental Impact Assessment (Trial)
19	Regulations on the Construction Projects Environmental Impact Assessment Documents Hierarchical Approval
20	The Code of Conduct and Integrity Provisions of Environmental Impact Assessment of Construction Projects
21	Measures for the Examination of Environmental Impact Statements of Special Plans
22	Regulations on the Management Environmental Impact Assessment Review Expert Pool
23	Notice on the Work of Environmental Impact Assessment of Major Investment Projects
24	The “14th Five-Year Plan” of Environmental Impact Assessment and Emissions Permit Implementation Program
25	Guidance on the Implementation of the “Three Lines One Permit” Ecological Environment Zoning Control
26	Guiding Opinions on Strengthening the Prevention and Control of Eco-environmental Sources in Energy-Intensive and High-emission Construction Projects
27	Guiding Opinions on Coordinating and Strengthening the Work Related to Climate Change and Ecological Environmental Protection
28	Opinions on Further Strengthening the Environmental Impact Assessment of Industrial Park Planning
29	Notice on Further Strengthening the Management of Environmental Impact Assessment of Coal Resources Development
30	Opinions on Optimizing the Environmental Impact Assessment of Small and Micro-enterprise Projects
31	On the Strict Punishment for Falsification to Improve the Quality of Environmental Impact Assessment
32	Notice on Matters Related to the Fixed Source Emissions Deadline for Rectification
33	Implementation Opinions on Tightening Interim and Ex-Post Regulation of Environmental Impact Assessment of Construction Projects
34	Guidance on the Implementation of Regional Differentiated Environmental Access to Implement the “Water Pollution Prevention and Control Action Plan”

Table 1. *Cont.*

Number	Document
35	Notice on Improving Environmental Quality as the Core to Strengthen the Management of Environmental Impact Assessment
36	The “13th Five-Year Plan” Environmental Impact Assessment Reform Implementation Plan
37	Guidance on the Conduct of Planning Environmental Impact Assessment Meetings (Trial)
38	Opinions on Strengthening the Linkage of Planning Environmental Impact Assessment and Construction Project Environmental Impact Assessment
39	Regulations on the Management of Construction Project Environmental Impact Assessment of Regional Restrictions (Trial)
40	Program of Construction Project Environmental Impact Assessment Information Disclosure Mechanism
41	Notice on Strengthening the Environmental Impact Assessment of Mineral Resources Planning
42	Notice on Deepening the Implementation of Ecological and Environmental Protection Measures for Hydropower Development
43	Notice on Further Strengthening the Environmental Impact Assessment of Water Resources Planning
44	Notice on Further Strengthening the Protection of Aquatic Biological Resources and Strict Environmental Impact Assessment Management

Source: MEE (Ministry of Ecology and Environment), <https://www.mee.gov.cn/wjk/> (accessed on 15 October 2022).

2.3.2. Information and Data on Technical Support

The information and data on the currently valid EIA technical standard documents in China are obtained from the National Public Service Platform for Standards Information and the official website of the MEE (Table 2). Specifically, this study retrieved 65 national standards and industry technical standards with Environmental Impact Assessment as the keyword in the National Public Service Platform for Standards Information and eliminated 15 standards that had been repealed or revised through secondary proofreading. In addition, this study analyzed the publicly released documents in the Eco-environmental Standards-Environmental Impact Assessment section of the official website of the MEE and retrieved 7 valid standards after eliminating the duplication with the National Public Service Platform for Standards Information.

Table 2. Documents on Technical Support.

Number	Document
1	Industrial Robot—Life Cycle Impact on Environment Evaluation Method
2	Environment Impact Evaluating Method on Mechanical Refrigerating Systems Used for Cooling and Heating
3	Technical Guidelines for Environmental Impact Assessment of Marine Engineering
4	Directives of Strategic Environmental Assessment for the Reclamation Planning in Bays
5	Technical Guidelines for Environmental Impact Assessment of Seawater Multi-purpose Utilization Engineering
6	Criteria for Environmental Impact Assessment of the Animal Manure Land Application
7	Regulation for Radiation Environmental Impact Assessment in Uranium Mine and Mill
8	Code for Environmental Impact Assessment of Hydropower Projects
9	Regulation for Content and Depth of Environmental Impact Assessment of UHV Power Transmission and Transformation Engineering
10	Operating License Extension of Nuclear Power Plants—Part 5: Environmental Impact Assessment
11	Technical Specification in Assessing the Environmental Impact of Thermal Discharge for Nuclear Power Plants

Table 2. Cont.

Number	Document
12	Technical Code for Environmental Impact Assessment of Cooling Towers in Nuclear Power Plants
13	Technical Specification of Radiation Environmental Impact Assessment for Liquid Radioactive Effluent by Coastal Nuclear Power Plants
14	Technical Specification of Radiation Environmental Impact Assessment for Airborne Radioactive Effluents of Nuclear Power Plants on Operational States
15	Technical Specification of Radiation Environmental Impact Assessment for Gaseous Releases of Nuclear Power Plant on Accident Conditions
16	Technical Specification for Environmental Impact Assessment of Photovoltaic Power Station
17	Technical Regulations for Impact Assessment of Electromagnetic Environment Produced by 1000 kV Transmission and Transfer Power Engineering
18	Code for Environmental Impact Assessment of River Hydropower Planning
19	Technical Code for Environmental Impact Assessment of Wind Farm Projects
20	Technical Specification for Environmental Impact Assessment of Traffic Planning—Part 1: Highway Network Planning
21	Technical Specification for Environmental Impact Assessment of Traffic Planning—Part 2: Overall Port Planning
22	Technical Specification for Environmental Impact Assessment of Traffic Planning—Part 3: Inland Waterway Planning
23	Specification for Environmental Impact Assessment on Shipyard
24	Technical Guideline for Environmental Impact Assessment Constructional Project of Petroleum and Natural Gas Development on Land
25	Code for Environmental Impact Assessment of Water Conservancy and Hydro Power Project
26	Technical Guideline for Environmental Impact Assessment Constructional Project of Petrochemicals
27	Technical Guidelines for Environmental Impact Assessment Constructional Project of Civil Airport
28	Guidelines on Management of Radioactive Environmental Protection—Environmental Impact Assessment Methods and Standards on Electromagnetic Radiation
29	Environmental Impact Assessment Index System of Mountain Landscape Resource Development
30	Requirements for Environmental Impact Assessment of Uranium Mine Geological Radiation
31	Guidelines for Post-Environmental Impact Assessment of a Water Project
32	Technical Guidelines for Environmental Impact Assessment of Electric Power Transmission and Distribution
33	Technical Guidelines for Environmental Impact Assessment—Satellite Up-link Earth Station
34	Technical Guidelines for Environmental Impact Assessment—Radio and Television
35	Technical Guidelines for Environmental Impact Assessment—Urban Rail Transit
36	Technical Guidelines for Environmental Impact Assessment—Surface Water Environment
37	Technical Guidelines for Environmental Impact Assessment—Soil Environment
38	Technical Guidelines for Environmental Impact Assessment—Atmospheric Environment
39	Technical Guideline for Environmental Impact Assessment of Construction Project—General Programme
40	Technical Guidelines for Environmental Impact Assessment Format and Content of Environmental Impact Reports for Nuclear Power Plants
41	Technical Guidelines for Environmental Impact Assessment—Groundwater Environment
42	Technical Guideline for Environmental Impact Assessment Iron and Steel Construction Projects
43	Technical Guidelines for Environmental Impact Assessment Constructional Project of Coal Development
44	Technical Guideline for Environmental Impact Assessment—Ecological Impact
45	Technical Guidelines for Environmental Impact Assessment—Pharmaceutical Constructional Project
46	Technical Guideline for Environmental Impact Assessment—Constructional Project of Pesticide
47	Technical Guidelines for Noise Impact Assessment

Table 2. *Cont.*

Number	Document
48	Technical Guidelines for Plan Environmental Impact Assessment—Coal Industry Mining Area Plan
49	Technical Guideline for Planning Environmental Impact Assessment—Comprehensive River Basin Planning
50	Technical Guideline for Planning Environmental Impact Assessment—Industrial Park
51	Technical Guidelines for Environmental Impact Assessment—Uranium Mining and Milling Decommissioning
52	Technical Guidelines for Environmental Impact Assessment—Uranium Mining and Milling
53	Technical Guidelines for Environmental Risk Assessment on Projects
54	Technical Guideline for Planning Environmental Impact Assessment—General Principles
55	Technical Guideline for Environmental Risk Assessment of Tailings Pond (Trial)
56	Regulation for Environmental Impact Assessment of River Basin Planning
57	Environmental Impact Assessment Code Hydroelectric Station Project for Rural Area

Source: The National Public Service Platform for Standards Information. <https://std.samr.gov.cn> (accessed on 15 October 2022); MEE (Ministry of Ecology and Environment). <https://www.mee.gov.cn/ywgz/fgbz/bz/bzwb/hp/> (accessed on 15 October 2022).

2.3.3. Information and Data on Legal Support

The information and data on the currently valid EIA legal documents in China are obtained from the National Laws and Regulations Database (Table 3). Specifically, this study searched the database by title and full text with Environmental Impact Assessment as the keyword and found a total of 40 legal documents in effect within the scope of constitution, laws (excluding legal interpretations, decisions on legal issues, and major problems, decisions on amendments and repeals), administrative regulations, supervision regulations, and judicial interpretations (excluding decisions on amendments and repeals).

Table 3. Documents on Legal Support.

Number	Document
1	Law of the People’s Republic of China on Noise Pollution Prevention and Control
2	Amendments to the Criminal Law of the People’s Republic of China (XI)
3	Criminal Law of the People’s Republic of China
4	Wetland Protection Law of the People’s Republic of China
5	Law of the People’s Republic of China on the Prevention and Control of Environment Pollution Caused by Solid Wastes
6	Law of the People’s Republic of China on Environmental Impact Assessment
7	Law of the People’s Republic of China on Desert Prevention and Transformation
8	Atmospheric Pollution Prevention and Control Law of the People’s Republic of China
9	Wild Animal Conservation Law of the People’s Republic of China
10	Soil Pollution Prevention and Control Law of the People’s Republic of China
11	Marine Environment Protection Law of the People’s Republic of China (Amendment 2017)
12	Nuclear Safety Law of the People’s Republic of China
13	Water Pollution Prevention and Control Law of the People’s Republic of China
14	Meteorology Law of the People’s Republic of China
15	Environmental Protection Law of the People’s Republic of China
16	Island Protection Law of the People’s Republic of China

Table 3. *Cont.*

Number	Document
17	Law of the People’s Republic of China on Prevention and Control of Radioactive Pollution
18	Law of the People’s Republic of China on Ports
19	Circular Economy Promotion Law of the People’s Republic of China
20	Waterway Law of the People’s Republic of China
21	Cleaner Production Promotion Law of the People’s Republic of China
22	Oil and Natural Gas Pipeline Protection Law of the People’s Republic of China
23	Law of the People’s Republic of China on Township Enterprises
24	Regulations on Groundwater Management
25	Regulation on Biosafety Management of Pathogenic Microbiology Laboratory
26	Administrative Regulation on the Prevention and Control of Pollution Damages to the Marine Environment by Coastal Engineering Construction Projects of the People’s Republic of China
27	Regulations on the Administration of Water Supply of the South-to-North Water Diversion Project
28	Regulations on the Prevention and Control of Pollution from Large-Scale Breeding of Livestock and Poultry
29	Regulations on the Safety Management of Radioactive Waste
30	Regulations on the Administration of the Taihu Lake Basin
31	Regulations on Environmental Impact Assessment of Planning
32	Administrative Regulations on the Prevention and Treatment of the Pollution and Damage to the Marine Environment by Marine Engineering
33	Regulations on Environmental Protection Management of Construction Projects
34	Regulations on Land Requisition Compensation and Resettlement of Migrants for Large and Medium Water Conservation and Power Construction Projects
35	Administrative Regulations on the Prevention of Environmental Pollution by Ship Breaking
36	Measures for the Administration of Radioactive Pharmaceuticals
37	Procedures for Administration of Registration of Mining of Mineral Resources
38	Interpretation of the Supreme People’s Court and the Supreme People’s Procuratorate on Several Issues Concerning the Application of Law in the Handling of Criminal Cases of Environmental Pollution
39	Interpretation of the Supreme People’s Court on the Application of Punitive Damages in the Trial of Ecological and Environmental Tort Disputes
40	Interpretation of the Supreme People’s Court on Several Issues Concerning the Application of Law in the Trial of Environmental Tort Liability Disputes

Source: The National Laws and Regulations Database. <https://www.mee.gov.cn/ywgz/fgbz/bz/bzwb/hp/> (accessed on 15 October 2022).

2.4. Analysis of the Current Situation of China’s EIA System

2.4.1. Analysis of Administrative Support Indexes

The Operation Mode of the EIA system is divided into three levels (See documents 1–3, 13–22, 24, 31, 33, 36, 37, 39, 40, 43 in Table 1). First, evaluation objects are identified and the corresponding first level of evaluation methods determined. For major policies, regional ecological environment, plans and construction projects, and individual evaluation procedures are designed. Second, the evaluation objects are classified into different types to determine the corresponding second-level evaluation methods. For major policies and the regional ecological environment, there is no systematic secondary or tertiary evaluation method in China. For plans, the planning authority (PA) prepares the corresponding EIA documents according to the plan’s category. For construction projects, the Construction Unit (CU) prepares (fills in) the corresponding EIA documents according to construction project’s influence degree. Finally, the types of EIA documents are identified to determine

the corresponding third-level evaluation method, and the specific process includes documentation, approval, and post-supervision. In the documentation process, PA or CU organizes the preparation (filling in) of EIA documents and submits the documents to the corresponding administrative departments (after consulting the relevant interest subjects for some types of documents). Further, in the approval process, administrative departments can review the EIA documents by convening a review group or commissioning a technical unit. Finally, in the post-supervision process, administrative departments cooperate with the public, experts, other relevant stakeholders, and other administrative agencies [42], to supervise the environmental impacts of evaluation objects by strengthening information disclosure, strictly verifying the effective implementation of EIA documents, setting the validity period for approval, and dynamically monitoring environmental conditions.

Moreover, the Organizational Form of the EIA system is a power space structure comprising four levels and four categories (See documents 1–3, 5, 6, 14–22, 31, 33, 36, 37, 39 in Table 1). The four levels are national, provincial, prefectural, and county levels, and the four categories are Policy Environmental Impact Assessment (PLEIA), Strategic Environmental Impact Assessment (SEIA), Planning Environmental Impact Assessment (PEIA), and Environmental Impact Assessment of Construction Project (EIACP). Among them, the main responsibilities of the EIA administration institution are the (1) implementation of EIA; (2) approval or review of EIA documents; (3) preparation and implementation of EIA-related laws, administrative regulations, departmental regulations, local regulations, local government regulations, standards, and norms; and (4) post-supervision of the ecological and environmental impact of construction projects and planning implementation.

The Core Concerns of the EIA system have three progressive levels. The first level is concerned with the effect of system implementation (See documents 32, 34, 35, 42, and 44 in Table 1); that is, it examines whether EIA system implementation can promote ecological and environmental improvement with the strictest ecological environmental protection system through source access. The second level focuses on the system's significance in the construction of an environmental governance system (See documents 4, 5, 7, 11, 12, 24, 25, and 36 in Table 1). In other words, it ascertains whether EIA system implementation can promote the construction of a modern environmental governance system. Finally, the third level concentrates on the system's contribution to human society (See documents 8, 9, 11, 12, 41, and 44 in Table 1); that is, it examines whether EIA system implementation can help satisfy people's growing demands for a better ecological environment, promote the construction of an ecological civilization, and achieve sustainable development [43].

2.4.2. Analysis of Technical Support Indexes

Establishing a scientific environmental assessment system is necessary for economic and social development [44]. As shown in Figure 2, the current technical standard of EIA exhibits the following characteristics. First, from the perspective of Subject, the technical standard of EIA presents a practice pattern led by MEE (31) and supplemented by other governmental agencies (23), social groups (2), and enterprises (1). Second, from the perspective of Object, the technical standard of EIA presents an application mode in which programmatic documents (2) serve as the core and planning or construction projects of specific areas (38), environmental influencing factors (9), and environmental elements function (8) as supplements. Third, from the perspective of Validity, the technical standard of EIA presents four types of standard forms—National Standard-Recommended (7), Industry Standard-Mandatory (26), Industry Standard-Instructive (1), and Industry Standard-Recommended (23). The systematic construction of technical standards for EIA in China provides the basis for the construction of a technical system for GGEA, which will be discussed in detail in Sections 3.1 and 3.2.

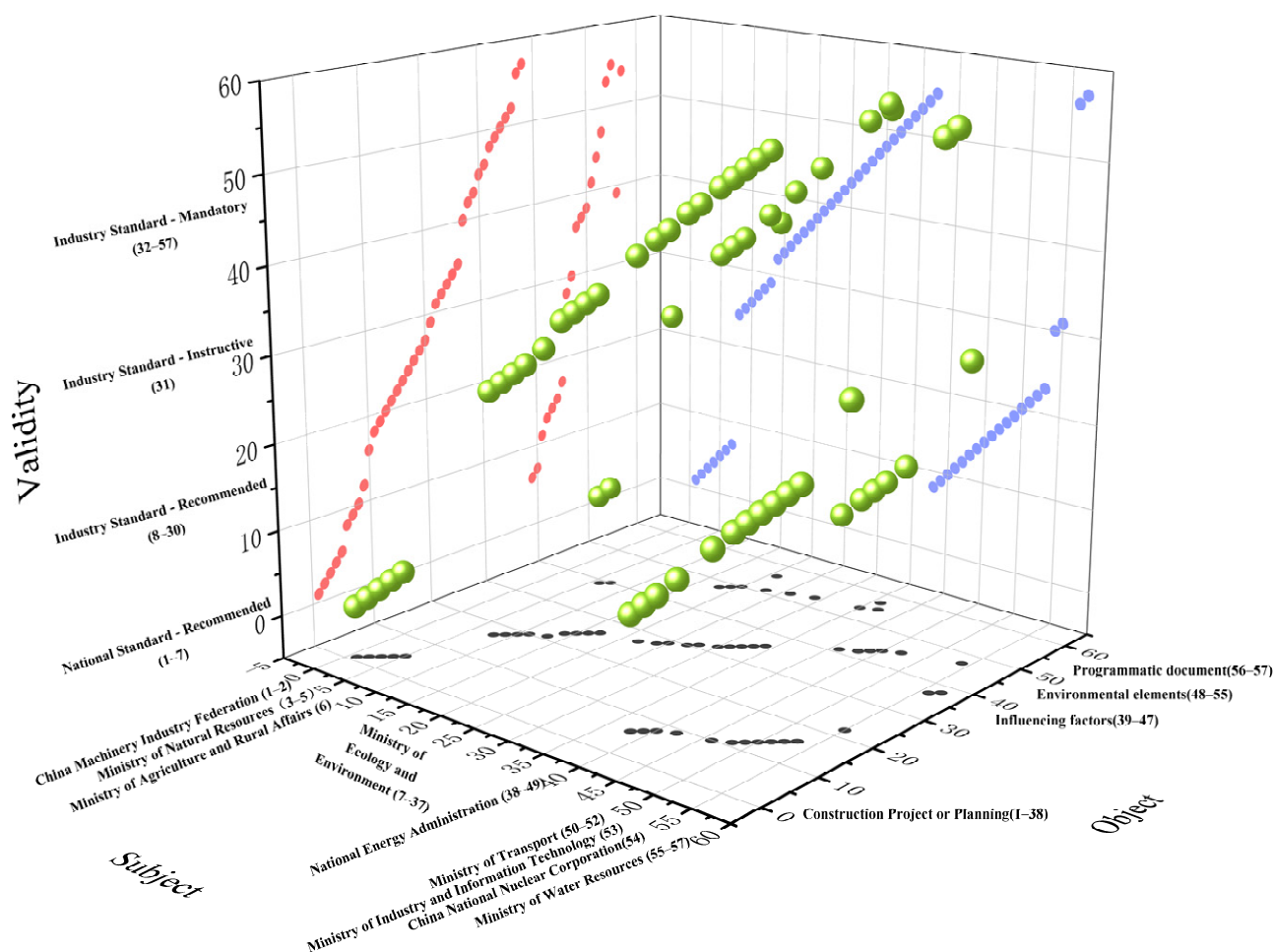


Figure 2. Depiction of an analysis of 57 technical documents on EIA in China; Note: The green spheres in the figure represent the 57 EIA technical documents, while the colored circles in each plane represent their projections mapped to that plane. The positions of the colored circles represent the intervals to which they belong and reflect the relevant attribute information of the EIA technical documents.

2.4.3. Analysis of Legal Support Indexes

Law is a basic component of the EIA system [45] and has an important impact on EIA performance [46]. From the perspective of Subject and Validity, 23 legal documents formulated by the National People's Congress (NPC) and the NPC Standing Committee are considered laws. Further, 14 legal documents formulated by the State Council (SC) are regarded as administrative regulations. Finally, 3 legal documents formulated by the Supreme People's Court (SPC) and Supreme People's Procuratorate (SPP) rank as judicial interpretations. On the contrary, from the perspective of Object, 40 legal documents cover the operating rules of EIA (10); evaluation rules of relevant environmental elements (7), pollution factors (5) and regions, and fields and industries (18); principle that EIA should be conducted according to law; and clarification of processes and legal liability of evaluation, approval, and review. The assessment procedures include PEIA (14) or (and) EIACP (38). The above richly layered and widely applicable EIA laws can provide the basis for the generation and operation of a legal system for GGEA (Figure 3), which will be discussed in detail in Sections 3.1 and 3.2.

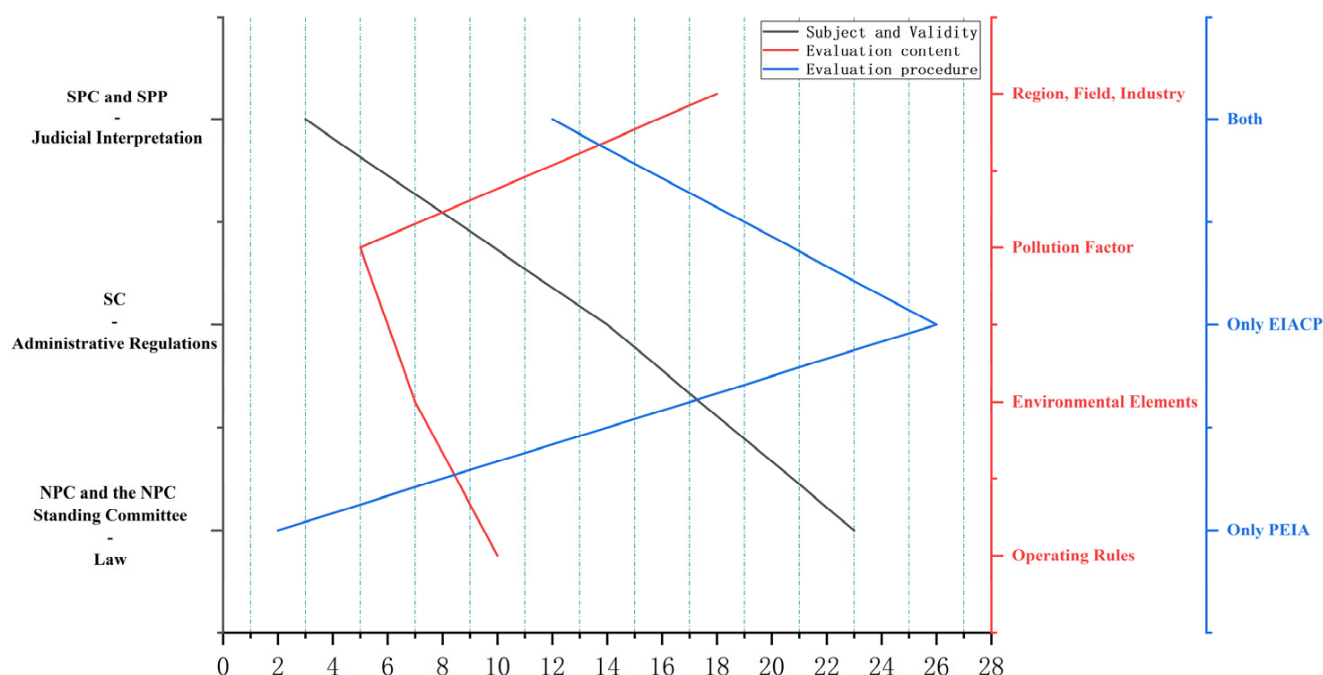


Figure 3. Analysis of 40 legal documents; EIACP, Environmental Impact Assessment of Construction Project; PEIA, Planning Environmental Impact Assessment; SC, State Council; NPC, the National People's Congress; SPC, Supreme People's Court; SPP, Supreme People's Procuratorate.

2.5. Analysis of the Reform Trend of China's EIA System

In China, EIA reform focuses on three aspects: the administrative system, operating mechanism, and concept of development. Among them, administrative system reform refers to the government's power structure, governmental organization, governmental functions, administrative system, and administrative means and methods [47]. Operating mechanism reform focuses on the interaction among the internal elements of the institutional structure. Finally, the reform of concept of development considers the value orientation of institution operation.

2.5.1. Reform Trend of the Administrative System

First, the centralization and decentralization aspects of administrative power are combined. On the one hand, the administrative authority of EIA is integrated into the Department of Ecological and Environmental Protection (DEEP) to build an environmental governance model featuring centralized decision making [48] (See document 6 in Table 1). On the other hand, further analysis of the responsibilities of the agencies within the MEE reveals that it has specialized agencies of the institution and professional organization management models within the ministry, emphasizing the coordination and cooperation between powers and unified management (Figure 4). Second, the independence of the administrative organization is enhanced (See document 5 in Table 1). The vertical management reform of DEEP at the provincial level helped eliminate the adverse factors related to financial support and personnel management affecting the implementation of the system [49] (Figure 4). The third aspect is the transformation of governmental functions to "streamline administration, delegate powers, improve regulation, and strengthen services" and the resulting innovation in management methods (See documents 23, 29, 30 in Table 1). For example, the Environmental Impact Registration Form is changed from the approval to filing system. The Classified Management List of Environmental Impact Assessment of Construction Projects (2021) is revised to promote accurate assessment [50]. Another example is promoting public participation to improve the long-term benefits of decision making [51,52].

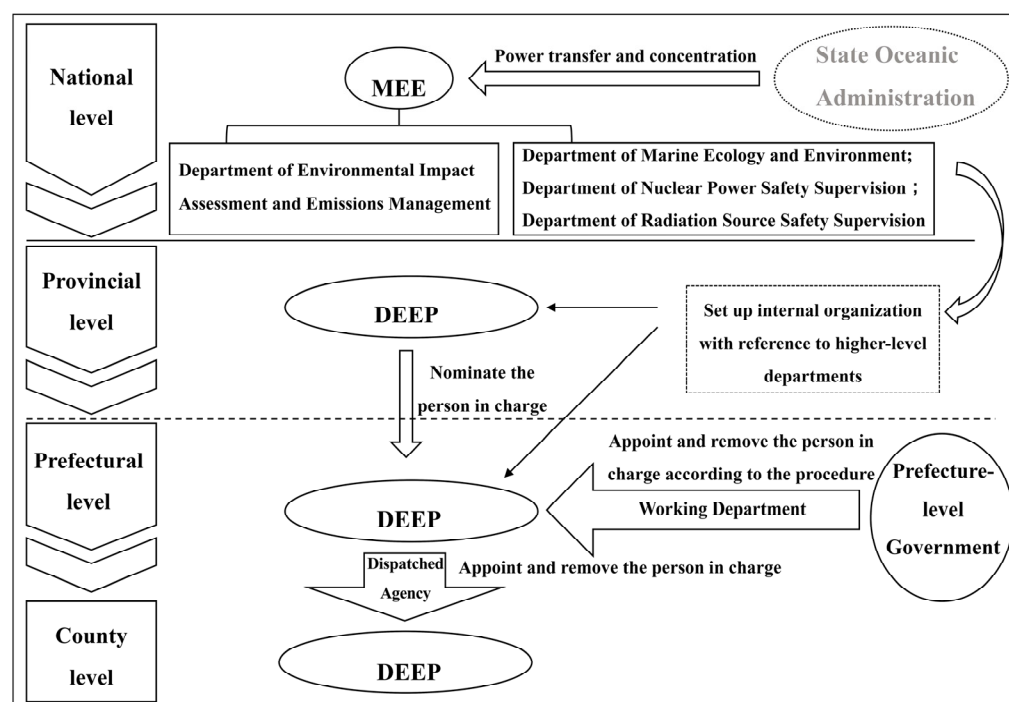


Figure 4. Schematic diagram of China's EIA administrative management system; DEEP, Department of Ecological and Environmental Protection; MEE, Ministry of Ecology and Environment.

2.5.2. Reform Trend of the Operation Mechanism

The first aspect is examining and carrying out PLEIA (See documents 24 and 36 in Table 1). In 2014, China amended its Environmental Protection Act. Article 14 provides a legal basis for conducting PLEIA. In 2020, MEE formulated the Technical Guidelines for Ecological and Environmental Impact Analysis of Economic and Technological Policies (Trial) to further clarify the technical path of PLEIA [53]. The second aspect is promoting SEIA relying on the Three Lines One Permit (TLOP) model (See documents 24, 25, and 36 in Table 1). In accordance with this model, China is expected to establish the Regional EIA system by 2025 [54]. The third is structurally optimizing PEIA and EIACP (See documents 10, 13, and 25 in Table 1). In particular, after reconstructing its planning system [55], China is promoting PEIA reform to connect with the new planning system.

2.5.3. Reform Trend of the Concept of Development

First, the dimension of evaluation time emphasizes realizing the full life cycle management of evaluation objects through source prevention + in-process and post-event supervision (See documents 26 and 33 in Table 1). Second, the dimension of evaluation space stresses the connection and coordination of means of evaluation (See documents 28 and 38 in Table 1). For example, the conclusions of PEIA can guide and constrain EIACP. Finally, the dimension of the evaluation object highlights the collaborative control of pollutants and greenhouse gases (See documents 24 and 27 in Table 1).

3. Results

3.1. Coupling Degree of Relevance Dimension

Initially, we consider the Administration Support observation indexes. First, in terms of the Operation Mode of China's EIA, the evaluation of major policies [53], regional ecological environment [54], plans [56], and construction projects [57] are related to greenhouse gas emissions. Second, in terms of Organizational Form, DEEP, which is the main power subject in the four levels and four categories of power space, has the dual administrative responsibilities of Environmental Impact Assessment and climate change response [5]. Third, in terms of Core Concerns, the logical extension of the institutional value of "focusing

on implementation effects—focusing on environmental governance system—focusing on human society development” is highly consistent with the value orientation of carrying out RCC action to solve the climate crisis.

Now, we consider Technical Support observation indexes. First, in terms of evaluated objects, the environmental impacts of plans or construction projects in petrochemical, steel, coal, transportation, and other industries are related to greenhouse gas emissions [58]. As it is a component of the atmosphere, the amount of carbon dioxide (CO₂) in the atmosphere is considered in the assessment of atmospheric environmental impact. Second, greenhouse gases are considered to impact factors of assessment in some technical EIA documents [59]. Further, some technical documents of EIA include climate change risks as environmental elements of assessment [60].

Finally, we consider Legal Support observation indexes. On the one hand, in the dimension of evaluation content, pollution factors, such as large-scale livestock and poultry breeding, and environmental factors, such as the atmosphere, enhance greenhouse gas emissions [61]. On the other hand, in the dimension of the evaluation procedure, PEIA and EIACP are related to greenhouse gas emissions, as mentioned earlier (see Section 2.4.3).

In summary, the Administrative Support indicators show that the Operation Mode, Organizational Form, and Core Concerns of China’s EIA are all relevant to controlling greenhouse gas emissions; the Technical Support indicators show that the objects of China’s EIA all involve the control of greenhouse gas emissions; and the Legal Support indicators show that the content and operational procedures of China’s EIA legal system are related to the control of greenhouse gas emissions. The above shows that the GGEA system is strongly related to China’s EIA system.

3.2. Coupling Degree of Cost Dimension

3.2.1. Coupling Degree of Generate Cost Dimension

Initially, we consider the Administrative Support observation indexes. First, in the Operation Mode, the three-level assessment method provides an institutional basis for GGEA system generation in plans and the construction project. Second, in the Organizational Form, the dual responsibilities of DEEP offer an organizational basis for GGEA system generation. Third, in Core Concerns, the consistency of value orientation between RCC and EIA delivers top-level centripetal force for GGEA system generation.

Subsequently, we consider the Technical Support observation indexes. The subject is dominated by MEE and supplemented by other relevant subjects. The object is centered on programmatic documents and supported by documents applicable to specific fields, environmental elements, and influencing factors. The technical support system for EIA, including mandatory guidelines and recommendations, provides the technical basis for GGEA system generation.

Finally, we consider Legal Support observation indexes. Following the construction of the EIA system as the main body; establishment of EIA rules for specific environmental elements, pollution factors, and different regions; and setting up of fields and industries as supplements, the EIA legal system, including laws, administrative regulations, and judicial interpretations, provides the legal basis for GGEA system generation.

3.2.2. Coupling Degree of Transaction Cost Dimension

We scrutinize the administrative system. First, the centralization and decentralization of administrative power enable the synergy of administrative subjects between GGEA and RCC. Second, the enhanced independence of administrative subjects guarantees the in-depth application of the GGEA system. Third, the transformation of governmental functions and innovation of management methods form a prerequisite for the refined and innovative management of the GGEA system. Regarding the operation mechanism, the in-depth reform (or starting exploration) of the four types of assessment methods provides policy opportunities for GGEA system development. Finally, regarding the concept of development, the full life cycle management in the time dimension, three-dimensional

connection in the space dimension, and synergy of pollution and carbon reduction in the evaluation object dimension can ensure the GGEA's effectiveness.

In summary, China's EIA system can provide positive administrative, technical, and legal support for carrying out actions to control greenhouse gas emissions. The analysis of the reform trend of the existing EIA system can provide a useful contribution to the further development of the GGEA system. The above shows that the integration of the GGEA system into the process of China's EIA system presents a low-cost nature.

Through the above empirical analysis, this study concludes that the GGEA system can couple with the institutional structure of China's EIA.

3.3. Validation Based on Practical Experience of Other Countries

International practices have been carried out, and a systematic system has been developed to incorporate GGEA into EIA. Some developed countries have developed relevant policies and introduced some guidelines as a basis for assessing climate change factors, making the integration of GGEA into the EIA system operational.

The United States, as the world's largest historical emitter of greenhouse gases, has the pressure and need to reduce emissions in the context of climate change. The practice of conducting GGEA in EIA has been carried out in the United States, and a summary of the U.S. experience can validate the idea of this study. First, in terms of administrative support, the U.S. has established a broad regulatory authority for the Environmental Protection Agency (EPA) over greenhouse gases such as CO₂ by interpreting them as air pollutants through the judicial system, which has determined that greenhouse gases can be harmful to human health and welfare. Second, in terms of technical support, the U.S. promotes joint control of greenhouse gases and general pollutants through greenhouse gas emission estimates and proposes plans for the development of key control industries and emission standards. Third, in terms of legal support, according to the legal provisions of the National Environmental Policy Act and the Clean Air Act and court decisions, greenhouse gas emissions are "cumulative environmental impacts", and it is reasonable that greenhouse gas emissions be considered in the EIA [62].

The UK has established a GGEA system and model, and its experience is sufficient to provide evidence of the soundness of the methodology for this study. First, in terms of administrative support, the UK Environment Agency (EA) has established a governance-based administrative system involving government, business, and the public in addressing climate change and greenhouse gas emissions reduction, and has incorporated actions to address climate change into the strategic EIA. Second, in terms of technical support, the UK has set the following assessment matters in the strategic EIA: (1) describing the baseline of current and future climate change; (2) identifying the significant problems and limitations caused by climate change; (3) setting climate change targets and indicators; (4) considering climate change in alternative scenarios; and (5) monitoring the ongoing impacts of climate change and preparing contingency measures. Third, in terms of legal support, the UK has adopted a concerted approach of legislative and economic instruments to constrain greenhouse gas emissions, organizing the Strategic Environmental Assessment and Climate Change: Guidance for Practitioners in 2004 and revising it in 2007 and 2011 [63].

Canada is the first country to translate the policy will of incorporating climate change factors in EIA into action, and this study was also inspired by Canadian practice. First, in terms of administrative support, the Canadian federal government requires that large-scale development projects should be assessed for climate change impacts, with the active participation of all provincial and local governments. Second, in terms of technical support, the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment has proposed a series of procedural guidelines for the integration of climate change into EIA, including calculation and assessment methods for greenhouse gas emissions of proposed projects, methods for assessing the impact of climate change consequences on proposed projects, and data and information sources on climate change and its consequences. Third, in terms of legal support, Canada has issued Incorporating Climate

Change Considerations in Environmental Assessment: General Guidance for Practitioners based on the Environmental Assessment Act. The guidance requires the integration of climate change factors into the environmental assessment process and is used to guide environmental assessors in conducting climate change analyses [64].

4. Discussion

To promote the incorporation of the GGEA system into the EIA system, this study proposes using China's scheme of four evaluation models—three coping strategies—three refinement channels (4EM—3CS—3RC) (Figure 5).

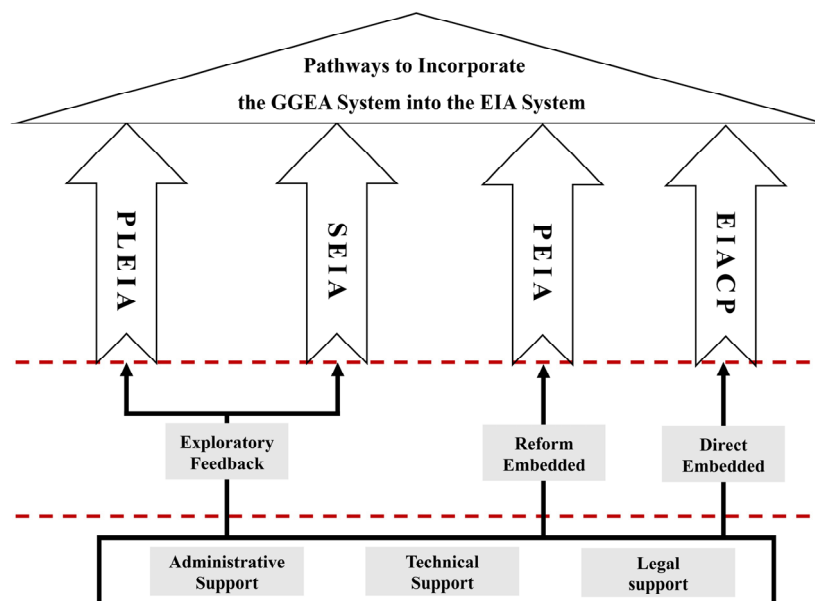


Figure 5. Pathways to Incorporate the Greenhouse Gas Emissions Assessment (GGEA) system into the Environmental Impact Assessment (EIA) system; EIACP, Environmental Impact Assessment of Construction Project; PEIA, Planning Environmental Impact Assessment; PLEIA, Policy Environmental Impact Assessment; SEIA, Strategic Environmental Impact Assessment.

First, consider the GGEA system as an innovative pilot to examine and improve PLEIA and SEIA based on the spatiotemporal correlation of regional development in the economy and environment [65]. In Administrative Support, implement a mandatory GGEA system to enable major policy formulation. In addition, the provincial TLOP ecological environment zoning management and control system enhances the development of SEIA. In Technical Support, take national-level technical guidelines as the main body and encourage local governments to develop local standards to refine the evaluation indicators and methods of PLEIA and SEIA at all levels. Finally, for Legal Support, amend the Environmental Protection Law and Environmental Impact Assessment Law, examine the formulation of Regulations on Environmental Impact Assessment of Greenhouse Gas Emissions, and fix the aforementioned measures in a legal form.

Second, reform the existing PEIA and incorporate the GGEA system into the PEIA. In Administrative Support, adjust the original three-level evaluation method. In the secondary assessment method, adjust the planning category for EIA to Overall Planning, Detailed Planning, and Special Planning. Among them, the Overall Planning and Special Planning of guiding plans include compiling the Environmental Impact Chapter or Description. Detailed Planning and other relevant Special Planning are performed to compile the Environmental Impact Statement. In addition, based on the four-level power space structure, strengthen DEEP's powers to monitor and sanction the implementation of the PEIA document review recommendations. DEEP is in charge of Technical Support; further, administrative subjects in other fields and social organizations participate in the revision of

relevant standard documents to provide technical support to determine carbon emission control objectives and build constraint indices from aspects such as planning the spatial layout, performing structural adjustment, conducting total amount control, and identifying key material flows [66]. Legal Support entails incorporating the aforementioned reform measures into the rule of law by amending the Environment Impact Assessment Law and Regulations on Environmental Impact Assessment of Planning.

Third, directly embed the GGEA system into the EIACP system. In Administrative Support, based on the existing three-level evaluation method, the six types of greenhouse gases specified in the Kyoto Protocol are included in the evaluation process as constraint indices. Based on a region's carbon emissions and carbon emission intensity, the classified management system of construction projects is implemented considering the impact of upstream industrial construction projects on downstream industries [67]. Taking the existing power space structure as the framework, the administrative subjects of GGEA are clarified as DEEPs at all levels. For Technical Support, under MEE's leadership, competent departments in relevant fields and social organizations cooperate to promote the effective identification of key points, main categories, and emission levels and the emission reduction potential of greenhouse gases through the revision of relevant standard documents, and by scientifically calculating carbon emissions and formulating targeted carbon reduction measures. Legal Support involves incorporating the procedure of GGEA into EIACP by amending the Environment Impact Assessment Law and Regulations on Environmental Protection Management of Construction Projects.

Currently, the political will for EIA reform is strong in China. In this situation, it is feasible to promote the systematic incorporation of the GGEA system into the EIA system through the practice path of 4EM—3CS—3RC. The embedding framework proposed in this study should be refined according to the overall development of China and the stage of local social development and transformed into a systematic, compatible, and specific system design. In addition, in the embedded construction of the GGEA system, we should closely observe the practice and emphasize post-legislation evaluation work.

5. Conclusions

In light of ongoing EIA reform efforts in China, this study analyzes the coupling degree between the GGEA system and China's EIA system and addresses the issue of constructing the GGEA system. Further, it draws the following conclusions and recommendations:

(1) Establish a GGEA system. First, the NPC Standing Committee of China should start the work of amending the Environmental Impact Assessment Law in due course and make provisions in the law for greenhouse gas emission assessment. Second, the SC of China may amend the Regulations on Environmental Impact Assessment of Planning and Regulations on Environmental Protection Management of Construction Projects and formulate the Regulations on Environmental Impact Assessment of Greenhouse Gas Emissions. Third, the MEE of China could develop operational Implementation Measures for Environmental Impact Assessment of Greenhouse Gas Emissions, as authorized by laws and administrative regulations, and also develop national and industry standards at the technical level.

(2) Improve the content of the GGEA system. First, the relevant legislation is required to set up GGEA specialties in multi-level EIA procedures such as SEIA, PLEIA, PEIA, and EIACP. Second, the relevant legislation should clarify the central and local distribution of EIA authority and establish an EIA approval and documentation system that combines central supervision and local governance. Third, the relevant legislation should promote the technical control role of the TLOP and require governments at all levels to prepare the TLOP ecological environment zoning control program to identify greenhouse gas emission control indicators.

(3) Safeguard the implementation of the GGEA system. First, the policies relevant to the GGEA system within China's administrative system are considered. The GGEA legislation may be combined with China's 1 + N policy system of carbon peak and carbon neutralization to enable a positive interaction between law and policy. Second, it is impor-

tant to recognize the part of China's administrative orders and regulatory tools that work well, such as the role of party regulations and central ecological environmental protection inspectors in controlling local government decisions and limiting the introduction of policies, plans, or projects that exacerbate greenhouse gas emissions. Third, it is necessary to utilize modern public governance tools, particularly good governance tools represented by public participation and information tools represented by information disclosure to control greenhouse gas emissions within the EIA framework by means of third-party supervision.

Author Contributions: S.Z., Y.T. developed the argument presented in this article. Conceptualization, S.Z. and Y.T.; methodology, S.Z. and Y.T.; software, S.Z.; validation, S.Z.; formal analysis, S.Z. and Y.T.; investigation, S.Z.; resources, S.Z.; data curation, S.Z.; writing—original draft preparation, S.Z. and Y.T.; writing—review and editing, S.Z.; visualization, S.Z.; supervision, Y.T.; project administration, Y.T.; funding acquisition, Y.T. All authors have read and agreed to the published version of the manuscript.

Funding: 2021 Ministry-level Research Projects on Rule of Law Construction and Legal Theory Research of Ministry of Justice of the People's Republic of China: 21SFB3027.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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