



Enhancing China's Environmental Impact Assessments: Integrating Carbon Emissions with Lessons from the US

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Abstract. China's Environmental Impact Assessment (EIA) system faces significant challenges, particularly in integrating carbon emissions assessments into local frameworks. These challenges include the lack of detailed guidelines, regional disparities in institutional capacity, and potential regulatory inconsistencies. Addressing these issues requires a comprehensive approach that draws on international best practices. By referring to the successful integration of carbon emissions into EIAs in several U.S. states, notably California, New York, and Washington, a robust method is provided for enhancing local EIA frameworks. Specifically, China should update its EIA laws to include greenhouse gases as pollutants, adopt standardized methodologies for quantifying emissions, and incorporate a life cycle approach to emissions analysis, ensuring thorough and effective assessments. These improvements will mitigate climate change impacts more effectively and ensure consistent application across diverse regions.

Keywords: EIA, carbon emissions, China, lessons from the United States

1 Introduction

As the world grapples with the urgent challenge of climate change, governments at all levels are seeking effective strategies to reduce greenhouse gas (GHG) emissions and promote sustainable development. China, as the world's largest emitter of GHGs, especially carbon dioxide, has a critical role to play in the global effort to mitigate

climate change [1]. In recent years, China has set ambitious national climate goals and policies, including the target to peak carbon emissions by 2030 and achieve carbon neutrality by 2060 [2]. The 14th Five-Year Plan (2021-2025) also emphasizes the importance of low-carbon development and the need to establish a comprehensive system for assessing and evaluating the climate impacts of development activities [3].

Specifically, China has undertaken various strategies to manage its carbon emissions, notably through the introduction of a carbon emission trading scheme orchestrated by the Ministry of Ecology and Environment [4]. This scheme distributes emission permits to businesses and penalizes those surpassing their quotas [4]. Despite its intentions, the scheme has its shortcomings, notably its narrow focus on large industrial entities, leaving other sectors and smaller entities less regulated. This approach primarily targets emissions after they occur rather than addressing the root causes such as the choice of technology, project design, and operational practices [4].

Therefore, it is essential to enhance pre-regulation measures to address the root causes of carbon emissions effectively. One of the most significant tools for pre-regulation is the Environmental Impact Assessment (EIA) [5]. The EIA process is designed to proactively identify potential environmental impacts, including greenhouse gas (GHG) emissions, at the earliest stages of project planning [5]. By integrating carbon emissions into EIAs, we can promote the adoption of sustainable technologies and practices across the entire life cycle of projects. This approach not only could help mitigate the impacts of climate change but also ensures that all sectors and regions are comprehensively evaluated, thereby complementing existing carbon trading policies.

The practice of Environmental Impact Assessments (EIAs) could be designed to offer a more proactive and comprehensive method for mitigating climate change impacts [5]. They facilitate the early identification of low-carbon alternatives, fostering the adoption of sustainable technologies and practices across the entirety of a project's life cycle [5]. Moreover, EIAs have the potential to highlight opportunities for emission reductions in areas beyond the reach of carbon trading schemes, thus enabling a more thorough approach to climate change mitigation [5]. Thus, integrating carbon emissions into the EIA process could present an opportunity for a more holistic and preventive strategy in addressing climate change.

This approach would enhance China's ability to evaluate and reduce the climate impacts of developmental activities across all sectors and regions, effectively complementing existing carbon trading policies.

However, the effectiveness of integrating carbon emissions into EIAs in China has been hindered by the absence of detailed guidelines and procedures. While some local governments in China have mentioned the inclusion of carbon emissions in Environmental Impact Assessments (EIAs), such as Tianjin, the lack of specific guidelines, methodologies, and procedures has made it difficult to implement in practice, resulting in insufficient legislative support and limited effectiveness in constraining enterprises' carbon emissions [6].

The challenges faced in the current implementation of EIAs in China highlight the need for learning from international best practices. While Chinese scholars have conducted various studies on EIAs, these are often limited in scope and focus primarily on specific aspects, such as technical methodologies or sector-specific applications [7]. For instance, recent articles by Chinese researchers have examined the technical aspects of EIA implementation but have not extensively covered the holistic integration of carbon emissions into the assessment process [7]. This gap underscores the necessity for a more comprehensive approach. Therefore, this paper aims to address this deficiency by exploring and adapting the successful practices from countries that have made significant advancements in incorporating carbon emissions into their EIAs. In particular, several states in the United States, such as California, New York, and Washington, have established comprehensive legal and regulatory frameworks, methodologies, and best practices for assessing the carbon impacts of development projects [8,9,10]. By studying and adapting these experiences to the Chinese context, China can accelerate its progress towards a robust and effective system for incorporating carbon emissions into EIAs, and advance its efforts to build a sustainable, low-carbon future.

2 The U.S. States' Experience in Incorporating Carbon Emissions into Eias

As mentioned above, several U.S. states have been at the forefront of incorporating carbon emissions into their environmental impact assessment (EIA) processes. Among these, California, New York, and Washington stand out as leaders in developing comprehensive legal and regulatory frameworks, methodologies, and best practices for assessing the carbon impacts of development projects [8,9,10].

California, for example, has been a pioneer in this field, with its landmark California Environmental Quality Act (CEQA) requiring the consideration of

greenhouse gas (GHG) emissions in EIAs since 2010 [11]. Under CEQA, lead agencies must analyze the GHG emissions of proposed projects, determine the significance of these emissions, and identify feasible mitigation measures to reduce any significant impacts [10]. In addition, California has also developed detailed guidelines for conducting GHG analysis in EIAs, including protocols for quantifying emissions, establishing significance thresholds, and assessing the consistency of projects with state and local GHG reduction plans [12].

Another great example is New York, which has similarly integrated carbon emissions into its State Environmental Quality Review Act (SEQRA) process. In 2009, the New York Department of Environmental Conservation (DEC) issued a policy requiring the consideration of GHG emissions in EIAs, and in 2018, the state enacted the Climate Leadership and Community Protection Act (CLCPA), which sets ambitious targets for reducing GHG emissions and requires state agencies to consider these targets in their decision-making [13]. The DEC has also developed guidance for assessing GHG emissions in EIAs, including methodologies for quantifying emissions and evaluating their consistency with the state's climate goals [14].

Washington is worth noting in that it has also taken steps to incorporate carbon emissions into its State Environmental Policy Act (SEPA) process. In 2011, the state issued a rule requiring GHG emissions to be considered in EIAs, and in 2020, it updated its SEPA handbook to provide more detailed guidance on assessing climate impacts [15]. Notably, Washington's approach emphasizes the use of best available science and the consideration of both direct and indirect GHG emissions throughout the lifecycle of a project [16].

Interestingly, the efforts of these states to integrate carbon emissions into their environmental assessments mark a significant advancement, yet this journey was fraught with challenges. Specifically, this progression mirrors a wider shift in national policy, driven by historic legal benchmarks, most notably exemplified by the Supreme Court's landmark decision in *Massachusetts v. EPA* (2007), a critical juncture in the U.S. regulatory approach to climate change [17]. In this landmark case, the Court ruled that greenhouse gases, including carbon dioxide, met the definition of "air pollutants" under the Clean Air Act and that the Environmental Protection Agency (EPA) had the authority to regulate these emissions [17].

The lawsuit, led by Massachusetts alongside other states and environmental groups, challenged the Environmental Protection Agency's (EPA) refusal under the Bush Administration to regulate greenhouse gas (GHG) emissions from vehicles,

arguing it was obligated under the Clean Air Act [17]. Contrary to the EPA's claim that GHGs did not fall within the "air pollutants" definition, the Supreme Court decisively disagreed, and by interpreting the Clean Air Act to encompass GHGs, the Court not only empowered the EPA to regulate emissions from a broad spectrum of sources, such as power plants, factories, and vehicles [17], but also laid the groundwork for significant federal climate initiatives like the Obama Administration's Clean Power Plan targeting power plant emissions [18]. Furthermore, this pivotal ruling has spurred the development of state-level GHG policies and regulations, notably influencing the integration of carbon emissions into Environmental Impact Assessments in states such as California, New York, and Washington [19].

The decision of the *Massachusetts v. EPA* case demonstrates the importance of legal interpretation and judicial decisions in shaping the regulatory framework for addressing climate change. By clarifying the scope of existing environmental laws, such as the Clean Air Act, courts can play a crucial role in enabling and promoting the development of policies and tools, like the integration of carbon emissions into EIAs, to mitigate the impacts of climate change.

Meanwhile, It is worth noting that in China, while there's a trend trying to include greenhouse gases into the EIAs, the scope of EIAs is currently still limited to pollutants, which raises the question of whether greenhouse gases are considered pollutants under the existing legal framework [20]. This limitation in the current legislation may pose challenges in effectively incorporating carbon emissions into the EIA process, as it may not provide a clear legal basis for assessing and mitigating the climate impacts of development projects. Thus, the *Massachusetts v. EPA* case could be a valuable lesson on the potential role of legal interpretation in expanding the scope of environmental regulations to include greenhouse gases in China's current EIA framework, by reinterpreting or amending existing laws and regulations to provide a clearer legal basis for incorporating carbon emissions into the EIA process.

3 Lessons for China

As China works to incorporate carbon emissions into its environmental impact assessment (EIA) process at the national level, it can learn valuable lessons from the experiences of U.S. states like California, New York, and Washington. By adapting these lessons to its local context, China can develop a robust, effective, and efficient system for assessing the carbon impacts of development projects nationwide.

3.1 Updating Existing EIA Laws and Regulations

One key lesson for China is the importance of establishing clear legal and regulatory frameworks for incorporating carbon emissions into EIAs. China could update its existing EIA laws and regulations, such as the Environmental Impact Assessment Law [21] and the Regulations on the Administration of Construction Project Environmental Protection [22], to explicitly include greenhouse gases (GHGs) as pollutants and require their assessment in EIAs.

By explicitly recognizing GHGs as pollutants, China can provide a clear legal basis for assessing and mitigating the climate impacts of development projects, similar to how the U.S. Clean Air Act was interpreted to include GHGs in the *Massachusetts v. EPA* case [17]. This legal clarification can help ensure that EIAs across the country are consistently and comprehensively addressing carbon emissions, and can provide a stronger foundation for enforcing mitigation measures and promoting low-carbon development.

In updating its EIA laws and regulations, China could draw from the experience of states like California, which has developed detailed guidelines for analyzing GHG emissions in EIAs under the California Environmental Quality Act (CEQA) [8]. These guidelines provide a standardized framework for quantifying emissions, establishing significance thresholds, and assessing the consistency of projects with state and local GHG reduction plans [11], which could serve as a useful reference for China in developing its own national guidelines and methodologies.

3.2 Adopting a Phased or Tiered Approach Based on Local Conditions

While incorporating carbon emissions into EIAs is crucial for achieving China's national climate goals, it is important to recognize that different regions may have varying levels of economic and institutional capacity to implement comprehensive carbon EIA frameworks. Some regions, particularly those with more developed economies and stronger environmental governance systems, may be better equipped to adopt robust carbon EIA practices in the near term, while others may face challenges in terms of technical expertise, data availability, and regulatory enforcement [23].

To address these regional disparities, China could consider adopting a phased or tiered approach to implementing carbon EIAs based on local conditions. For example, the central government could set a national framework and timeline for incorporating

carbon emissions into EIAs, but allow for some flexibility in how and when different regions implement these requirements based on their specific circumstances.

Regions with stronger capacity could be encouraged to take the lead in piloting and demonstrating best practices in carbon EIAs, while those with more limited capacity could be provided with additional support and resources to gradually build up their capabilities over time. This could include technical assistance, training programs, data sharing platforms, and financial incentives for adopting low-carbon technologies and practices identified through the EIA process [24].

A phased or tiered approach could help ensure that the incorporation of carbon emissions into EIAs is rolled out in a manageable and effective manner across the country, while still maintaining a consistent national framework and direction. It could also help foster peer learning and knowledge sharing among regions, as those with more advanced practices could share their experiences and lessons learned with others.

By establishing clear legal and regulatory frameworks, developing standardized guidelines and methodologies, and adopting a phased or tiered approach based on local conditions, China can create a robust and effective system for incorporating carbon emissions into EIAs at the national level. This system then can play a critical role in supporting China's transition to a low-carbon future and achieving its ambitious climate goals.

3.3 Enhancing EIA Effectiveness Through Standardization and Stakeholder Engagement

As China continues to refine its approach to Environmental Impact Assessments (EIAs), it can glean substantial insights from New York's integration of carbon emissions within its environmental regulatory framework. New York's State Environmental Quality Review Act (SEQRA) exemplifies a proactive stance in considering greenhouse gas (GHG) emissions [8]. The New York Department of Environmental Conservation (DEC) has not only mandated the assessment of GHG emissions but also has provided extensive guidance on incorporating climate change considerations into EIAs [13]. This comprehensive approach is crucial for ensuring that the potential impacts of projects on climate change are not merely acknowledged but are thoroughly analyzed and addressed. By adopting similar measures, China can

bolster the efficacy of its EIAs in mitigating climate impacts and align project assessments with its ambitious national climate targets.

Furthermore, New York's methodologies offer a blueprint for standardizing GHG emission assessments, thus ensuring consistency and comparability across various projects and regions [14]. These methodologies encompass the quantification of emissions, evaluation against emissions reduction targets, and identification of feasible mitigation strategies. The Climate Leadership and Community Protection Act (CLCPA) of 2018 has further advanced these efforts by setting stringent state-wide emissions reductions targets and by integrating climate change into the decision-making processes of state agencies [13]. For China, adopting a standardized, methodological approach exemplified by New York's policies could facilitate uniform implementation of carbon-sensitive EIAs across its provinces, which vary greatly in terms of economic development and industrial structure.

Lastly, New York has shown that engaging a broad spectrum of stakeholders, including the public, in the EIA process enhances the legitimacy and effectiveness of environmental policies [14]. The incorporation of public comments and concerns ensures that EIAs are not only technically sound but also socially robust. China's diverse population and regional differences necessitate a similarly inclusive approach. By inviting public participation and ensuring transparency, China can ensure that EIAs serve both environmental and social ends, thus fostering broad-based support for sustainable development initiatives.

3.4 Comprehensive Assessment and Regulatory Responsiveness

In the pursuit of enhancing Environmental Impact Assessments (EIAs), China can benefit from the practices adopted by the state of Washington, particularly its comprehensive assessment of greenhouse gas (GHG) emissions and responsive regulatory framework. Washington has set a precedent for the integration of climate change considerations into the State Environmental Policy Act (SEPA), underlining the necessity of evaluating both direct and indirect GHG emissions over the lifetime of a project [10]. This life cycle approach ensures a complete understanding of a project's climate impact, an aspect China can replicate to foster a more holistic evaluation of developmental activities across all sectors.

Moreover, Washington's SEPA process emphasizes the importance of using the best available science in environmental assessments, ensuring that decision-making is

informed by the latest and most reliable data on climate impacts [10]. Such a science-based framework provides a strong foundation for China's EIA processes, especially as the nation seeks to align its rapid development with its climate change mitigation commitments. By systematically incorporating the latest scientific insights into its EIA guidelines, China can set more accurate benchmarks and thresholds for GHG emissions, thereby enhancing the precision and effectiveness of its environmental policies.

On the other hand, Washington's adaptive legislative approach, illustrated by the periodic updates to its SEPA handbook, showcases the critical role of regulatory flexibility [25]. As environmental science and climate data evolve, so too must the legal instruments governing EIAs. For China, instituting a mechanism for the regular review and revision of EIA regulations in response to new scientific findings and technological advancements would ensure that the assessment processes remain at the forefront of climate change mitigation efforts [25]. It would also encourage continuous improvement and innovation in project design and implementation, driving progress towards a sustainable, low-carbon future.

4 Challenges and Opportunities for China

As China works to incorporate carbon emissions into its environmental impact assessment (EIA) process at the national level, it may encounter several challenges in adapting lessons from U.S. states to its local context. One significant concern is the potential for a "race to the bottom," where regions may lower environmental standards to attract economic investments. This issue has been observed in the United States, where varying state regulations can lead to competitive deregulation. For China, this could mean that less developed regions might weaken their already-weak EIA requirements to attract industries, undermining efforts to control carbon emissions. Thus, ensuring a robust and uniform regulatory framework across all regions will be crucial to prevent such scenarios, such as implementing stringent national guidelines and providing adequate support to less developed regions, helping maintain high environmental standards and promote carbon emissions control.

However, China also has unique opportunities and advantages that it can leverage to develop a robust and effective EIA framework.

One potential challenge is the disparity in institutional capacity and economic development among different regions in China. While some regions, particularly

those with more advanced economies and stronger environmental governance systems, may be well-equipped to adopt comprehensive carbon EIA practices, others may face difficulties in terms of technical expertise, data availability, and regulatory enforcement [26]. Less developed regions may struggle to allocate sufficient resources and personnel to conduct thorough carbon emissions assessments, and may lack the necessary tools and methodologies to quantify and mitigate emissions effectively [27].

To address these challenges, China could consider strategies for building capacity and providing support to less developed regions. This could include targeted training programs for EIA practitioners, the development of standardized tools and guidelines adapted to local contexts, and the establishment of regional support networks or knowledge-sharing platforms [24]. The central government could also provide financial and technical assistance to help less developed regions acquire the necessary expertise, data, and infrastructure to implement carbon EIAs effectively [26].

Another challenge is the need to balance economic development with environmental protection and climate mitigation. The incorporation of carbon emissions into EIAs may be perceived by some stakeholders as a potential barrier to economic growth, particularly in regions that rely heavily on carbon-intensive industries [28]. China will need to work closely with local governments, businesses, and communities to build consensus around the importance of low-carbon development, and to identify strategies for transitioning to cleaner technologies and practices in a way that supports both economic and environmental objectives.

Despite these challenges, China also has significant opportunities to leverage its national legislative and policy framework to support the incorporation of carbon emissions into EIAs. Specifically, China has introduced several important initiatives related to EIAs and climate change, which could provide a foundation for further reform.

For example, the newly revised Environmental Impact Assessment Law, which came into effect in 2021, includes provisions for strengthening the assessment of climate impacts and promoting low-carbon development [29]. The law requires EIAs to consider the potential impacts of projects on climate change, and to propose measures for mitigating greenhouse gas emissions [29]. This legal framework could provide a basis for developing more detailed guidelines and methodologies for incorporating carbon emissions into EIAs at the national level.

Similarly, China's 14th Five-Year Plan (2021-2025) and long-term climate goals, including the target to achieve carbon neutrality by 2060, have created a strong policy imperative for integrating climate considerations into decision-making processes across sectors and regions [3]. The central government has emphasized the importance of developing a comprehensive system for assessing and managing the climate impacts of development activities, which could provide further impetus for strengthening the carbon EIA process [3].

Thereupon, China could seize these legislative and policy opportunities to establish a clear and consistent framework for incorporating carbon emissions into EIAs nationwide. This could involve issuing national guidelines and standards for quantifying and mitigating emissions, establishing mechanisms for data collection and sharing, and creating incentives for local governments and businesses to adopt low-carbon technologies and practices identified through the EIA process.

By addressing regional disparities, building capacity and consensus, and leveraging its national legislative and policy framework, China can overcome challenges and seize opportunities to develop a robust and effective system for incorporating carbon emissions into EIAs. This system can then play a critical role in supporting China's transition to a low-carbon future and achieving its ambitious climate goals.

5 Conclusions

Incorporating carbon emissions into environmental impact assessments (EIAs) is a crucial step for China to achieve its ambitious climate goals and promote sustainable development nationwide. While local initiatives like Tianjin's efforts to integrate carbon emissions into its EIA process are valuable and commendable, a comprehensive and coordinated approach at the national level is necessary to ensure consistent and effective implementation across the country.

The experiences of U.S. states like California, New York, and Washington offer valuable lessons for China as it seeks to establish a robust and efficient framework for incorporating carbon emissions into EIAs. These lessons include the importance of establishing clear legal and regulatory frameworks, developing standardized methodologies and guidelines, considering emissions across project life cycles, encouraging mitigation measures, promoting consistency and comparability, engaging stakeholders, and embracing adaptive management and continuous improvement. By

referring from those examples, China can create a robust and effective EIA system that supports the transition to a low-carbon economy and contributes to global climate change mitigation efforts.

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