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Applying Institutional Theory to Environmental Auditing: Empirical Evidence from Industrial Parks in Phu Tho Province, Vietnam

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Abstract

This paper explores how environmental auditing contributes to sustainable industrial transformation in Vietnam, focusing on institutional change within industrial parks in Phu Tho Province. 1) Introduction with rationale: This study examines how environmental auditing shapes governance and sustainability performance in industrial parks in Phu Tho Province, Vietnam, addressing the practical need to align provincial industrial growth with international Eco-Industrial Park (EIP) standards through an Institutional Theory lens. 2) Objectives: It clarifies why environmental auditing matters in developing contexts by specifying the policy and implementation gaps it can close-compliance deficits, weak coordination, and slow diffusion of EIP practices. 3) Methodology: A qualitative case study synthesizes documentary evidence and stakeholder insights from two state-led audits (2021, 2025), evaluating four dimensions (management, environmental, social, economic). 4) Results and Discussion: Auditing functions as both a coercive compliance instrument and a catalyst of institutional change: coercive pressures strengthened enforcement; normative pressures fostered inter-agency collaboration and stakeholder engagement; mimetic pressures accelerated convergence with international EIP practices. However, persistent weaknesses remain in transparency, infrastructure provisioning, and the internalization of sustainability values. 5) Conclusions: Environmental auditing can drive institutional transformation where regulatory capacity and coordination are uneven, offering actionable policy levers to integrate auditing with sustainable industrial governance and to operationalize EIP frameworks in similar developing regions.

Keywords: *Institutional theory, environmental auditing, eco-industrial parks*

1. Introduction

In the context of Vietnam's rapid economic transformation, industrial parks (IPs) play a pivotal role in attracting investment, generating employment, and accelerating socio-economic development. According to the Ministry of Planning and Investment (Phạm Hồng Điệp, 2025), as of the first quarter of 2025, Vietnam has planned approximately 420 IPs, with nearly 300 currently in operation and an average occupancy rate of about 81%. Key provinces such as Binh Duong (31 IPs), Dong Nai (32), Long An (29), Hai Phong (14), and Bac Ninh (22) continue to lead in scale, infrastructure, and investment efficiency. The expansion of these industrial zones has contributed significantly to exports, fiscal revenues, and national industrialization, becoming an indispensable engine of Vietnam's modernization process. Nevertheless, the rapid growth of industrial zones has also generated increasing environmental and social pressures. Without effective environmental governance, industrialization may exacerbate pollution, degrade ecosystems, and pose risks to community health. This tension between economic growth and environmental protection highlights the urgent need for a more balanced and institutionalized approach to industrial management, where compliance, coordination, and sustainability are integrated into decision-making.

In this context, the UNIDO, World Bank, and GIZ (2021)'s international Eco-industrial park framework (EIP) has emerged as a strategic solution. EIP emphasize resource efficiency, waste recycling, and pollution reduction while fostering cooperative linkages between firms. They also highlight the importance of institutional mechanisms, particularly environmental auditing, as instruments that ensure compliance, promote accountability, and guide continuous improvement in environmental performance. Studies demonstrate that environmental auditing and performance assessment under EIP principles foster stronger environmental compliance, innovation diffusion, and inter-firm cooperation (Daddi, Testa, Frey, & Iraldo, 2016; Erkman & Ramaswamy, 2003; Li & Ji, 2020; Zhu & Geng, 2013) . These studies emphasize that EIP transformation is not merely a technical upgrade but an institutional process, where governance, regulatory enforcement, and stakeholder coordination co-evolve toward sustainability. Despite these advances, empirical research applying the EIP to evaluate environmental auditing in Vietnam remains limited, especially at the provincial level where governance capacities vary widely.

From a theoretical standpoint, Institutional Theory provides a valuable framework for analyzing how such mechanisms operate. It posits that organizations respond to external institutional pressures: coercive, normative, and mimetic, which drive them to conform to accepted standards of legitimacy (DiMaggio & Powell, 1983; Scott, 2005). Within the EIP context, environmental auditing can be seen not only as a regulatory requirement but also as a strategic institutional process through which environmental norms and governance practices are embedded into industrial structures. Besides, environmental auditing reflects these institutional pressures. It enforces legal mandates, reinforces professional norms of transparency, and encourages imitation of best practices observed in leading eco-industrial models (Hoffman, 1999; Jennings & Zandbergen, 1995; Kagan, Gunningham, & Thornton, 2003).

2. Objectives

Despite the growing adoption of EIP principles in Vietnam, empirical studies on how environmental auditing influences institutional change within IPs remain limited. Most prior research has focused on technical efficiency or environmental outcomes rather than the institutional dynamics underlying compliance and coordination. Addressing this gap, the present study investigates the institutional impacts of environmental auditing through two audit cycles (2021 and 2025) conducted in Phu Tho Province, an emerging industrial hub in northern Vietnam. By interpreting audit results within the UNIDO et al. (2021)'s EIP through the lens of Institutional Theory, this research aims to elucidate how environmental auditing drives organizational behavior, strengthens governance structures, and contributes to the broader institutionalization of sustainable industrial practices in a developing economy context.

This paper comprises six sections: beyond the Introduction, section 2 presents the theoretical framework and literature review, section 3 provides details the research methodology, section 4 reports the results and discussion, section 5 offers conclusions and recommendations, and section 6 provides the references.

3. Theoretical framework and literature review

3.1 Applying Institutional Theory to environmental auditing

The concept of environmental auditing has been defined by several official and professional organizations, each emphasizing its systematic and managerial nature. According to the United States Environmental Protection Agency, an environmental audit is a systematic, documented, periodic, and objective review of an organization's operations and practices to ensure compliance with environmental requirements (Emery & Watson, 2003). This definition highlights the procedural and compliance-oriented aspect of auditing, positioning it as a self-assessment mechanism for regulated entities. Similarly, the Confederation of British Industry extends the concept by defining an environmental audit as a systematic examination of the interactions between a business and its environment, encompassing emissions, legal obligations, community impacts, and public perceptions. The Confederation of British Industry's perspective frames environmental auditing as a strategic management tool that goes beyond mere legal compliance, aiming to align corporate operations with broader ecological and social considerations. Given its dual role as a compliance and strategic management tool, environmental auditing can be better understood through the lens of Institutional Theory, which explains how external institutional forces shape organizational behaviors toward environmental responsibility.

Building on this conceptual understanding, Institutional Theory offers a useful framework for explaining why and how organizations adopt environmental auditing practices. Institutional Theory, developed by Meyer and Rowan (1977) as well DiMaggio and Powell (1983), argues that organizational behavior and practices are largely influenced by institutional pressures that arise from the broader external social environment, including laws, regulations, culture, norms, values, and social expectations (Colwell & Joshi, 2013; Scott, 2005). In the realm of environmental auditing, institutional pressures significantly influence organizations to implement environmental auditing practices. Regulatory agencies establish mandates for environmental disclosures and audits, which compel organizations to adhere to environmental regulations in order to avoid penalties and uphold their legitimacy with both regulators and the public (O'Dwyer & Unerman, 2008). Additionally, various stakeholders such as investors, customers, employees, and advocacy groups apply pressure on organizations to adopt these auditing practices as a demonstration of their dedication to sustainability and corporate social responsibility (Deegan, 2002). Consequently, institutional pressures act as a key motivator for organizations to embrace environmental auditing practices, reinforcing the notion that external factors play a crucial role in shaping these practices.

This theory posits that institutions impose three forms of isomorphic pressures on organizations: coercive, normative, and mimetic pressures (DiMaggio & Powell, 1983). Within the context of environmental auditing, these pressures play a central role in shaping how firms adopt and institutionalize environmental management and auditing systems.

First, coercive pressures arise from both formal regulations and informal expectations imposed by governments, regulatory agencies, and broader societal norms (DiMaggio & Powell, 1983; Sarkis, Gonzalez-Torre, & Adenso-Diaz, 2010). In environmental governance, these pressures are most visible through mandatory environmental laws and enforcement mechanisms that require firms to comply with specific environmental standards. Empirical research demonstrates that strict environmental regulations effectively encourage organizations to improve their environmental management and audit practices (Henriques & Sadorsky, 1996; Rivera, 2004; Winter & May, 2001). Environmental audits, in particular, serve as compliance instruments, ensuring that firms minimize pollution, monitor emissions, and report sustainability outcomes in line with legal mandates (Farrukh, Mathrani, & Sajjad, 2023). Conversely, non-compliance can result in penalties, fines, or even the suspension of operating licenses (Darnall, Henriques, & Sadorsky, 2008, 2010). As firms are embedded within the regulatory structures of the states where they operate, coercive pressures from governments and regulators remain one of the most influential determinants of environmental auditing behavior (Henriques & Sadorsky, 1996; Wang, Li, & Qi, 2020).

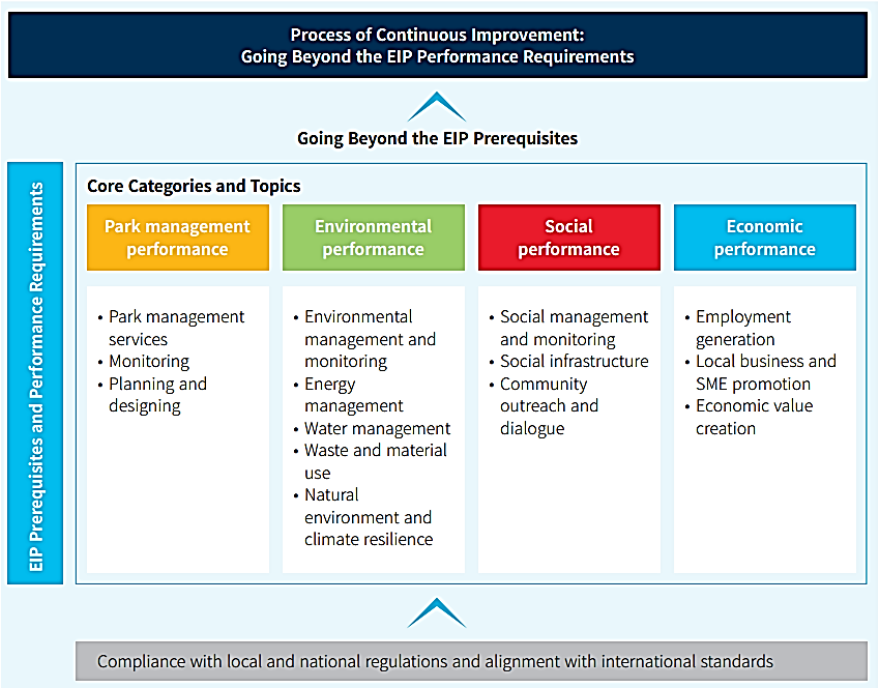
Second, normative pressures stem from social expectations, professional standards, and the growing process of environmental professionalization (Hoffman, 1999). These pressures emerge both internally and externally. Internally, firms with strong environmental values and accountability cultures are more likely to adopt environmental audits as part of their environmental management systems (Sharfman, Shaft, & Tihanyi, 2004). Employees also play a pivotal role, often initiating or supporting proactive environmental initiatives within organizations (Sarkis et al., 2010). Externally, normative pressures are exerted by customers, professional associations, the media, and local communities. Customers, in particular, have been found to be a major source of normative influence, as their environmental expectations drive firms to adopt sustainable practices and undergo environmental audits to enhance legitimacy (Henriques & Sadorsky, 1996; Zhang et al., 2008). By aligning with these expectations, organizations demonstrate social responsibility and strengthen stakeholder trust.

Third, mimetic pressures arise when organizations, confronted with uncertainty, emulate the structures or practices of other firms perceived as successful or legitimate within their institutional environment (Carpenter & Feroz, 2001; DiMaggio & Powell, 1983). In the case of environmental auditing, firms may adopt auditing procedures and environmental reporting standards modeled after industry leaders or recognized “best practices” to reduce uncertainty and enhance legitimacy (Abrahamson & Rosenkopf, 1993; Malmi, 1999). This imitation helps organizations mitigate risks, align with dominant environmental norms, and achieve greater operational stability (Davidsson, Hunter, & Klofsten, 2006; Greenwood & Hinings, 1996). Through this process of institutional isomorphism, firms operating within the same industrial or regulatory context, such as those in eco-IPs, tend to develop similar environmental auditing behaviors, contributing to sectoral standardization and continuous improvement in environmental governance.

In summary, coercive, normative, and mimetic pressures collectively explain why organizations adopt environmental auditing not merely as a regulatory requirement but as an institutionalized practice that reinforces legitimacy, accountability, and sustainability in the industrial context. Thus, Institutional Theory provides a robust explanation for the institutionalization of environmental auditing within industrial contexts. The following section expands this theoretical grounding by examining how environmental auditing outcomes can be assessed through the International Eco-industrial park framework.

3.2 The international Eco-industrial park framework and environmental auditing

The EIP was developed jointly by the United Nations Industrial Development Organization (UNIDO), the World Bank, and GIZ (UNIDO et al., 2021), provides a comprehensive structure for assessing the sustainability performance of IPs. It identifies four interrelated dimensions of performance: park management, environmental, social, and economic, that together determine the overall sustainability of IPs. These criteria serve as practical benchmarks for transforming conventional industrial zones into eco-IPs through improved management systems, cleaner production, and efficient resource use (UNIDO et al., 2021). The framework has been applied in multiple countries, particularly in developing economies, to assess how regulatory interventions, corporate practices, and environmental audits contribute to sustainable industrial transitions (Daddi et al., 2016).



Source: UNIDO et al. (2021)

Figure 1 Overall Framework for Describing Eco-IPs

An environmental audit is a specialized form of audit that evaluates an organization's compliance with environmental obligations and assesses whether its infrastructure is sufficient to meet these obligations (Boyd & Banzhaf, 2007). According to Gray and Bebbington (2000), environmental auditing represents a structured assessment that determines whether a firm's environmental performance aligns with its strategic objectives and environmental policy. Similarly, Therivel et al. (2013) describe environmental auditing as a systematic process of overseeing the interactions between firms and their surrounding environments, encompassing emissions into air, water, and soil. Importantly, environmental auditing extends beyond legal compliance. It also involves a strategic approach to tracking and managing the environmental consequences of corporate activities. In this sense, audits act as both a compliance mechanism and a management tool that supports continuous improvement in environmental performance (Boiral, 2007; González-Benito & González-Benito, 2008).

When examined through the lens of Institutional Theory, the implementation of environmental auditing within the EIP can be understood as a response to institutional pressures that shape organizational behavior. Coercive pressures arise from formal environmental regulations and state-led audit requirements, compelling firms to meet mandated environmental standards (Darnall et al., 2008). Normative pressures stem from professional standards, industry associations, and stakeholder expectations that promote environmental transparency and accountability (Hoffman, 1999; Sharfman et al., 2004). Meanwhile, mimetic pressures emerge as firms emulate industry leaders with advanced environmental practices. As Jennings and Zandbergen (1995) and Bansal and Roth (2000) noted, organizations frequently replicate others' environmental strategies under ecological uncertainty. Competition, in particular, plays a decisive role: Kagan et al. (2003) and Sharfman and Fernando (2008) found that market leaders establish environmental norms that others in the sector adopt to maintain legitimacy and competitiveness. This imitation process often referred to as competitive benchmarking (Li & Ji, 2020) encourages organizations to internalize the environmental auditing standards and management systems of successful peers. Empirical evidence from (Zhu & Geng, 2013) further demonstrates that mimetic pressures motivate firms to enhance their supply chains, improve energy efficiency, and reduce emissions, thereby aligning with institutional expectations of sustainable performance.

While environmental auditing has been widely studied in developed economies, research on its institutional impacts within Vietnam's industrial governance remains absent. Vietnam is undergoing rapid

industrialization and institutional transformation, yet little is known about how environmental audits function as mechanisms shaping compliance, coordination, and sustainability in this emerging context. This gap is critical, as the country's shift toward eco-IPs requires evidence-based insights into how coercive, normative, and mimetic pressures influence local environmental governance. Therefore, this study addresses that gap by analyzing the institutional effects of environmental auditing in Phu Tho Province, providing both theoretical contribution and practical relevance for sustainable industrial development in Vietnam.

3.3. Research methods

This study employs a qualitative case study design to explore how institutional pressures influence the implementation and outcomes of environmental auditing within IPs, using evidence from Phu Tho province, Vietnam. A case study approach is appropriate because it enables an in-depth examination of environmental audit practices in their real-life context, particularly when the boundaries between the phenomenon and the context are not clearly defined (Yin, 2018). The focus on a single province allows for a contextualized understanding of how state-led environmental audits, conducted under the supervision of the SAV, have affected industrial park performance in terms of management, environmental, social, and economic aspects as outlined in the EIP.

The empirical data for this study were collected from two official environmental audit reports conducted by the SAV in Phu Tho province, covering two distinct time periods. Period 1 covers from 2017 to 2020 and period 2 covers from 2021 to 2024. These reports represent formal environmental audits performed at the provincial industrial park level, where the State Audit examined enterprises' compliance with environmental laws, waste and emission management, investment in pollution treatment systems, and the coordination between local authorities and industrial park management boards. The selection of these two audit periods allows for a comparative temporal analysis, highlighting changes in audit scope, methodology, and outcomes across time.

The collected data were analyzed using a qualitative content analysis approach (Krippendorff, 2018). Each audit report was reviewed and coded according to the four dimensions of the EIP. For each dimension, the analysis identified (i) the key environmental issues reported, (ii) institutional pressures and policy interventions observed, and (iii) the improvement outcomes recorded between the two periods. The comparison between the 2017–2020 and 2021–2024 reports enabled the study to evaluate institutional evolution and audit-driven change within Phu Tho's IPs.

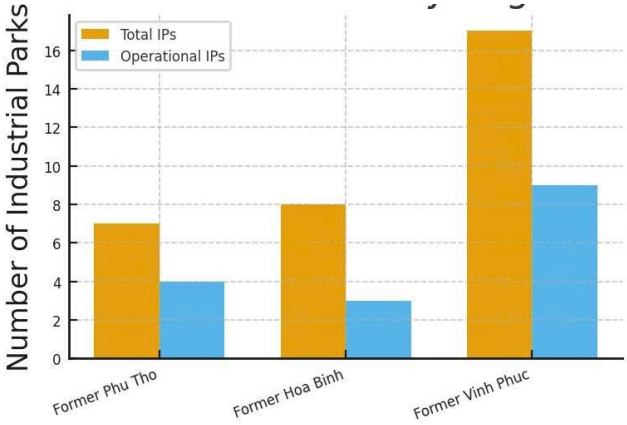
Finally, the findings were interpreted through the lens of Institutional Theory, emphasizing how coercive, normative, and mimetic pressures, originating from state regulations, professional norms, and inter-park benchmarking, have shaped the environmental audit processes and their impacts on industrial park performance.

4. Results and discussion

4.1 Overview of the environmental audits in Phu Tho province

In the context of a global shift toward sustainable development and the reduction of environmental impacts, Vietnam has been actively transforming its industrial development model toward greener and more sustainable practices. However, the number of IPs developed in accordance with eco-industrial standards remains limited. Since 2015, only around ten projects have been in the process of conversion or development under the eco-industrial park model, primarily within a pilot program implemented by the Ministry of Planning and Investment in collaboration with the UNIDO. The initial success of these models has generated growing momentum for the transition to eco-IPs across various localities, in line with both national and global sustainable development strategies.

Against this backdrop, Phu Tho Province, a midland region located at the gateway to the Northwest, approximately 80 kilometers from Hanoi, holds a strategic position in logistics, situated at the confluence of the Red, Lo, and Da Rivers, with Viet Tri as its industrial hub. The province enjoys favorable connections to major transportation routes such as the CT.05 expressway, National Highways 2 and 32C, railways, and inland ports. With abundant industrial land and competitive costs, Phu Tho has emerged as an attractive investment destination, hosting 32 planned IPs, 16 of which are currently operational (Bình Khang, 2025). However, the rapid expansion of industrial zones has also underscored the urgent need to standardize environmental protection infrastructure, strengthen management capacity, and ensure compliance with environmental laws. In response to these challenges, the SAV selected Phu Tho Province to conduct two thematic audits (in 2021 and 2025) to evaluate the effectiveness of environmental management activities within its IPs.



Source: CPA Vietnam (2025)

Figure 2 Industrial parks by region in Phu Tho province

According to Quynh Anh (2023) and CPA Vietnam (2025) the two performance audits on environmental management in IPs of Phu Tho Province were conducted in two different periods with the common objective of assessing the effectiveness, efficiency, and compliance with laws in the environmental management and protection activities of relevant agencies and units. The 2021 audit focused on the period 2017–2020, aiming to comprehensively review environmental management practices at the Management Boards of economic and industrial zones, identify existing shortcomings, limitations, causes, and responsibilities of the concerned entities, and propose recommendations to improve related mechanisms and policies. Subsequently, the 2025 audit (covering the period 2022–2024) continues to assess the effectiveness and legal compliance in environmental protection activities within the province's IPs, clarify the responsibilities of relevant organizations and individuals, and suggest remedial measures to enhance the effectiveness of environmental management in the subsequent period.

The scope of the two performance audits on environmental management in IPs of Phu Tho Province was defined to ensure comprehensive and comparable assessments across audit periods. The 2021 audit focused on the Phu Tho IPs Management Board and the Department of Natural Resources and Environment of Phu Tho Province as the primary audited entities (Quynh Anh, 2023). Meanwhile, the 2025 audit expanded its scope both in institutional coverage and operational depth. It included the Department of Agriculture and Environment, the Management Boards of Phu Tho IPs, and investors of the Infrastructure Development and Service Centers of key IPs such as Thuy Van and Trung Ha (CPA Vietnam, 2025). In addition, comparative assessments were carried out at Cam Khe and Phu Ha IPs. The broader and more in-depth scope of the 2025 audit, covering more entities, extended fieldwork duration, and enhanced evaluation of operational effectiveness, reflects a progressive approach toward improving the comprehensiveness and impact of environmental management audits in the province.

The two performance audits on environmental management in Phu Tho Province's IPs were conducted at different times and with varying levels of depth to ensure a progressive improvement in audit coverage and analytical rigor. The 2021 audit was carried out over 14 days, from July 13 to July 26, 2021, focusing on two main aspects: (1) assessing the responsibilities of relevant state authorities in managing and protecting the environment in IPs during the 2017–2020 period, and (2) evaluating environmental management practices at manufacturing, business, and service establishments within those parks (State Audit Office of Vietnam, 2021). In comparison, the 2025 audit, lasting 45 days from March 24 to May 7, 2025, expanded both its temporal and operational scope. It concentrated on (1) assessing the responsibilities of competent state management bodies in environmental governance across IPs, and (2) evaluating the accountability of infrastructure developers and operators for environmental protection in those parks (State Audit Office of Vietnam, 2025). The extended audit duration and broader scope reflect an effort to deepen the examination of policy implementation and enhance the overall assessment of environmental performance in the province's industrial sectors.

4.2 Comparative findings across two audit periods under EIP

4.2.1 Park management performance

The assessment of Phu Tho's industrial park management, based on UNIDO et al. (2021)'s EIP, shows gradual improvement between the 2021 and 2025 audits but continuing weaknesses in environmental governance and infrastructure. In 2021, the province established an IPs Management Board (IPMB) as the direct regulatory body, environmental inspections, and compliance monitoring consistent with EIP's criteria for a centralized management entity. The Provincial People's Committee issued Decision No. 13/2017/QD-UBND to formalize coordination among agencies, assigning the IPMB a leading role in incident prevention and response. The Department of Natural Resources and Environment (DONRE) conducted 4 inspections and 25 compliance checks, resulting in VND 627.2 million in fines. Several IPs such as Thuy Van, Trung Ha, Phu Ha, and Cam Khe had approved 1:2000 master plans promoting "clean and low-pollution industries." However, weaknesses persisted include unclear legal mandates under Decision No. 13/2017 such as the lack of real-time monitoring data, absence of annual or five-year waste emergency plans, and incomplete environmental infrastructure. Notably, Trung Ha and Cam Khe IPs operated without certified centralized wastewater treatment systems, violating EIP's basic infrastructure requirement. Inspection efforts were also fragmented and lacked effective enforcement.

By 2025, institutional coordination improved through a revised regulation clearly defining the roles of the Department of Agriculture and Environment, IPMB, district authorities, police, and infrastructure developers. Environmental management was integrated into the province's development plan to 2030, covering 12 IPs (≈5,095 ha), with 7 key parks prioritized for investment. Between 2022–2024, 77 environmental permits were approved (13 reports and 64 environmental licenses), and inspection activities increased: 17 by DONRE, 45 by the IPMB, and several by the provincial police, totaling nearly VND 496 million in penalties. A formal incident-response mechanism was also introduced, designating the IPMB as the provincial focal point.

Despite these advances, the 2025 audit identified serious gaps. Over 4.6 million m^3 of wastewater was discharged untreated or insufficiently treated (Thuy Van: 3.10 million m^3; Phu Ha: 0.216 million m^3; Cam Khe: 0.636 million m^3; Trung Ha: 0.681 million m^3), breaching EIP's minimum infrastructure standards. Centralized wastewater treatment plants failed to meet capacity, with unauthorized expansions and poor maintenance. Trung Ha IP accepted high-pollution industries such as steel, paper, and construction materials despite inadequate treatment facilities. Environmental data among the IPMB, DONRE, and enterprises remained inconsistent, undermining transparency and accountability.

4.2.2 Environmental performance

In 2021, the audit recorded several positive developments in environmental infrastructure and monitoring. Centralized wastewater treatment systems were operational in Thuy Van and Phu Ha IPs, both equipped with automatic monitoring devices transmitting data to the provincial DONRE. Certain enterprises had also installed automatic emission or effluent monitoring systems, for example, the Vietnam-France Aluminum Company in Trung Ha and the Saigon-Phu Tho Brewery, indicating early compliance with EIP's requirement for continuous monitoring of key pollution sources. Enforcement activity was evident: firms such as Seshin Vietnam and Viglacera were fined for wastewater violations, while Junma Phu Tho was penalized for excessive boiler emissions exceeding carbon monoxide limits by 1.18 times. Additionally, DONRE issued 32 hazardous-waste generator licenses, maintained reporting systems, and required periodic submission of hazardous waste reports, representing a foundational waste-management mechanism aligned with EIP's Criteria.

However, significant shortcomings persisted. Several operating parks, most notably Trung Ha and Cam Khe, lacked fully completed and certified centralized wastewater treatment systems and drainage separation, yet remained in operation. Instances of unlicensed or non-compliant discharge were reported, including enterprises with flows exceeding 10 m^3/day without proper discharge permits. Hazardous-waste management remained weak: some firms lacked compliant storage facilities or contracts with licensed disposal units, and leakage incidents were observed. Ambient air quality monitoring around industrial zones revealed sporadic exceedances in dust, CO, NO_2, SO_2, and H_2S concentrations, while community complaints of odor and black smoke highlighted continuing local impacts. Furthermore, environmental data management was fragmented: DONRE received only 66 of 118 required monitoring reports, and the IPs Management Board (IPMB) collected 1,149 of 1,290 enterprise submissions, indicating incomplete datasets and the absence of a centralized environmental information system. These gaps revealed that Phu Tho's performance in 2021 largely remained at a compliance-maintenance level rather than integrated environmental governance.

By 2025, notable improvements were recorded, reflecting closer alignment with EIP. Three of four operating IPs had invested in and operated centralized wastewater treatment plants (CWWTPs) with associated retention ponds for emergency response, meeting a key infrastructural benchmark of the EIP. Secondary enterprises were required to conduct pre-treatment of wastewater to at least Column B of QCVN 40:2011/BTNMT (and heavy metals to Column A) before discharge to the park's system, which in turn treated effluent to Column A standards prior to release, an effective "two-tier" treatment structure consistent with international best practice. The province also developed an integrated monitoring system and software platform (EMMA, later upgraded to Envisoft in December 2023) to collect and analyze automatic monitoring data from IPs and major pollution sources. Between 2021 and 2025, four annual monitoring campaigns were conducted, sampling 141 air points, 66 irrigation sites, 55 river locations, and 56 soil points, with results showing ambient air quality "generally meeting current standards."

Despite this progress, the 2025 audit still identified major challenges. Groundwater and community water-supply sources remained at risk; environmental information disclosure was limited; on-site inspections were inconsistent; and occupational safety and chemical incident prevention measures were inadequately implemented. These weaknesses reveal that while Phu Tho achieved infrastructural compliance with wastewater and waste-management standards, broader dimensions of environmental and social performance, such as public health protection, transparency, and proactive risk management, lagged behind comprehensive EIP criteria.

4.2.3 Social performance

In 2021, the audit found that social aspects were not the main focus but certain elements aligned with EIP's baseline criteria. IPMB conducted annual inter-agency inspections covering occupational safety, fire prevention, and environmental protection—addressing the EIP's requirement for safe working environments. Public engagement was also observed: community complaints about smoke and odor emissions from Junma Phu Tho in Thuy Van Industrial Park prompted an investigation and a fine of VND 70 million, showing responsiveness to local grievances. Moreover, local governments were held politically accountable to the Provincial People's Committee for environmental conditions affecting nearby residents, reflecting an administrative accountability framework for social impacts. However, the audit did not identify any labor welfare infrastructure such as worker housing, childcare, on-site health facilities, or cultural and transport amenities, core social indicators in UNIDO et al. (2021)'s model. Nor did it include indicators on occupational accidents, formal employment rates, training, or gender equality. These omissions suggest that social responsibility remained peripheral and unmeasured at the park level.

By 2025, social performance improved modestly, primarily through expanded employment and the institutionalization of grievance and emergency-response mechanisms. The province's IPs provided approximately 57,700 jobs, with an average income of VND 7 million per month, contributing significantly to local livelihoods, an indicator consistent with EIP's emphasis on inclusive economic development. Formal procedures were also established for receiving and resolving community complaints related to odor, emissions, or wastewater, and for emergency coordination in case of environmental incidents. The IPMB served as the lead focal point, reporting directly to the Chairman of the Provincial People's Committee, while environmental inspections indirectly contributed to workplace safety monitoring by identifying risks related to chemical exposure and air quality. Nevertheless, major social gaps persisted: community water sources remained under threat, environmental information disclosure was limited, and on-site safety and chemical accident prevention measures were not consistently implemented.

4.2.4 Economic performance

The 2021 assessment revealed a strong phase of industrial expansion supported by high investment density and sectoral diversity. Thuy Van Industrial Park achieved an occupancy rate of approximately 96.8%, with 84 active projects and a total investment volume of around VND 7,236 billion and USD 453 million, focusing on electronics, mechanical assembly, chemicals, and high-end construction materials. Trung Ha Industrial Park was described as a multi-sector zone oriented toward high-tech and low-emission industries, aligning with EIP's principle that eco-IPs should promote cleaner, higher value-added production structures. The presence of the Industrial Infrastructure and Services Development Center and other infrastructure investors responsible for shared utilities such as wastewater treatment, transportation, and water supply indicated the emergence of a financial model for maintaining common infrastructure, an essential feature of EIP economic sustainability.

Nevertheless, several weaknesses limited progress toward EIP's economic standards. The slow completion of environmental infrastructure reduced occupancy and risked undermining investor confidence. The province lacked systematic data on employment quality, local supplier integration, and the long-term financial sustainability of shared infrastructure. These gaps show that while Phu Tho's economic expansion was robust, it remained primarily quantitative and infrastructure-driven rather than innovation- or efficiency-based, falling short of the holistic sustainability that UNIDO et al. (2021) associates with eco-industrial development.

By the 2025 audit period, industrial growth in Phu Tho had become more diversified and partially institutionalized under a framework of planned expansion. Across the four operating IPs, there were between 143 and 182 projects, covering industries such as packaging, plastics, garments, wood processing, electronics, mechanical assembly, chemicals, and high-end materials. The average occupancy rate reached about 61%, with several parks maintaining high levels of investment attraction from both domestic and foreign enterprises. This expansion demonstrates the continued economic vitality of the province and its alignment with EIP's goal of maintaining stable, value-generating industrial activity.

Economic competitiveness was strengthened by the presence of centralized wastewater treatment plants, emergency retention ponds, and automatic monitoring systems in three out of four IPs, allowing investors to operate in compliance-ready zones, what UNIDO et al. (2021) refers to as "value-added environmental services." The province also integrated its industrial expansion into a master plan to 2030, ensuring that new parks could be developed in a more controlled manner with built-in environmental, logistical, and social infrastructure.

However, persistent weaknesses continued to constrain sustainable economic performance. Industrial development remained heavily dependent on rapid land occupation, sometimes in areas where environmental infrastructure had not yet met regulatory standards. Ecological buffer zones were reduced to accommodate additional industrial land, and environmental risks increasingly translated into financial and reputational liabilities. While the province successfully attracted labor and investment, the underlying growth model prioritized short-term expansion over long-term economic resilience. No significant evidence of local supply-chain linkages, industrial symbiosis, or financial self-sufficiency of shared infrastructure was identified, key economic indicators under the UNIDO et al. (2021)'s EIP.

In summary, Phu Tho's industrial economy evolved from an early phase of extensive, high-occupancy growth toward a more structured but still compliance-oriented model. Although the province demonstrated improvement in investment diversification and infrastructure-based competitiveness, its development remains short of UNIDO et al. (2021) vision of sustainable industrial ecosystems, where economic growth is balanced with environmental integrity, social welfare, and long-term value creation.

4.3 Impacts of environmental auditing from Institutional Theory perspective

The two environmental audits conducted in Phu Tho Province in 2021 and 2025 reveal how environmental auditing functions as a powerful institutional mechanism that shapes organizational behavior and provincial governance toward greater environmental accountability. When analyzed through the lens of Institutional Theory, the observed changes across the two audit periods demonstrate the interplay of coercive, normative, and mimetic pressures in driving compliance, coordination, and gradual institutionalization of sustainability practices within the province's industrial ecosystem.

Through the lens of institutional theory, Phu Tho's environmental auditing practices reflect how coercive, normative, and mimetic pressures shape organizational behavior within the UNIDO et al. (2021)'s EIP. The province's establishment of the IPMB and the issuance of Decision No. 13/2017/QD-UBND illustrate strong coercive pressures, compliance with formal regulations rather than deep institutional change, consistent with Darnall et al. (2008) and Boiral (2007), who argue that legal mandates often lead to surface-level conformity. Emerging normative pressures were evident in inter-agency collaboration, 77 environmental permits (2022–2024), and inspection protocols, aligning with Hoffman (1999) and Sharfman et al. (2004), yet weak data sharing and limited follow-up reveal that professional norms remain procedural. Meanwhile, mimetic pressures drove Phu Tho to emulate UNIDO et al. (2021)'s EIP standards through benchmarking and planning reforms, echoing the dynamics described by Jennings and Zandbergen (1995). However, as in other developing contexts (Zhu & Geng, 2013), such imitation remains instrumental rather than transformative.

Coercive pressures were the most visible institutional force. The 2021 audit initiated a compliance-oriented transformation, compelling local authorities and the IPMB to establish environmental regulations, inspection frameworks, and penalty mechanisms. These coercive interventions resulted in the creation of

centralized wastewater treatment systems, regular environmental inspections, and administrative sanctions against violators. By 2025, these pressures had intensified through the formalization of environmental permits, automatic monitoring systems, and clearer accountability frameworks. Such enforcement-driven mechanisms enhanced rule compliance and standardized environmental governance, consistent with Institutional Theory's argument that formal regulation and state mandates create structural legitimacy (Darnall et al., 2008; DiMaggio & Powell, 1983). However, this process also exposed the limits of coercive alignment: while regulatory frameworks improved, the persistence of noncompliance and weak enforcement capacity revealed that conformity remained largely procedural rather than fully internalized.

Normative pressures emerged more gradually as professional and organizational expectations evolved. Between 2021 and 2025, Phu Tho's environmental auditing practices increasingly reflected inter-agency cooperation among the IPMB, the Department of Natural Resources and Environment, and industrial park operators. The diffusion of technical standards, such as pre-treatment requirements, automatic monitoring protocols, and periodic audit reporting, signaled the development of a shared professional norm around environmental management. Similarly, the establishment of mechanisms for community feedback and grievance handling illustrated an expanding recognition of stakeholder legitimacy. Yet, these normative structures were still evolving: data fragmentation, limited transparency, and the absence of integrated training and reporting systems indicated that environmental auditing had not yet become a deeply institutionalized professional culture. As Institutional Theory suggests (Hoffman, 1999; Sharfman et al., 2004), normative pressures can shape expectations and coordination, but without strong professionalization, they risk remaining administrative routines rather than genuine value commitments.

Mimetic pressures became increasingly evident as Phu Tho sought to align with UNIDO et al. (2021) model and replicate best practices from more advanced provinces and international standards. The 2025 audit reflected this mimetic adaptation through the adoption of "two-tier" wastewater treatment processes, integrated monitoring software (EMMA/Envisoft), and the restructuring of industrial planning to 2030 to include environmental and social infrastructure. These actions represented efforts to emulate recognized models of sustainable industrial governance - what Institutional Theory terms competitive benchmarking (Li & Ji, 2020). Such imitation provided legitimacy and international visibility but also underscored a path-dependent pattern: reforms were driven more by external models and international expectations than by endogenous innovation.

Collectively, the two audits illustrate how environmental auditing catalyzed an incremental process of institutional change in Phu Tho's industrial governance. Coercive pressures established a regulatory foundation; normative pressures fostered cross-agency coordination and stakeholder responsiveness; and mimetic pressures encouraged convergence with international EIP standards. Yet the institutionalization of environmental auditing remains partial, anchored in regulatory compliance rather than in deeply internalized sustainability values. In essence, the audits did not merely evaluate environmental performance; they reshaped the institutional logic of local governance, embedding environmental accountability into decision-making processes while revealing the ongoing tension between symbolic compliance and substantive transformation.

From an institutional perspective, Phu Tho's progress in environmental performance illustrates an evolving but still compliance-oriented institutionalization process across regulative, normative, and cognitive dimensions. At the regulative level, the development of centralized wastewater treatment plants in three of four IPs, the establishment of pre-treatment requirements, and the use of automatic monitoring systems demonstrate stronger coercive pressures from formal regulation, consistent with Darnall et al. (2008) but enforcement remains uneven, as seen in continued noncompliance and incomplete data disclosure. At the normative level, the introduction of technical standards for waste pre-treatment, contractual requirements for hazardous-waste management, and the creation of an integrated monitoring platform (EMMA/Envisoft) represent emerging professional norms that encourage transparency and environmental accountability. Yet, as Hoffman (1999) note, such normative pressures require stable professional networks to sustain improvement. In Phu Tho, these mechanisms remain largely procedural and administratively driven. At the cognitive level, while imitation of UNIDO et al. (2021)'s EIP model shows mimetic adaptation (Jennings & Zandbergen, 1995; Li & Ji, 2020), sustainability is still perceived primarily as a regulatory duty rather than an embedded organizational value. The persistence of risks to community water sources and limited public disclosure suggests that environmental responsibility has not yet become part of the shared cognitive framework among stakeholders.Overall, environmental performance in Phu Tho has been reinforced mainly by regulative conformity, with emerging

normative alignment and weak cognitive internalization, reflecting a transitional stage where environmental auditing drives formal compliance but has yet to embed sustainability as a collective institutional logic.

5. Conclusion

This study examined the environmental auditing of IPs in Phu Tho Province across two audit cycles from 2017-2020 (State Audit Office of Vietnam, 2021) and 2022 - 2024 (State Audit Office of Vietnam, 2025) through the analytical lens of the Institutional Theory and UNIDO et al. (2021)'s EIP. The findings reveal that environmental auditing served not only as a compliance mechanism but also as an institutional catalyst for improving governance, infrastructure, and accountability. Across the four performance dimensions: park management, environmental, social, and economic, the audits documented notable progress in institutional coordination, regulatory compliance, monitoring infrastructure, and community responsiveness. Nevertheless, key weaknesses persisted, including incomplete environmental infrastructure, fragmented data systems, and limited transparency. From an institutional perspective, these developments reflect the interplay of coercive, normative, and mimetic pressures, which collectively shaped Phu Tho's transition from a compliance-based system toward partial institutionalization of sustainable industrial practices.

The findings underscore several implications for policymakers and industrial park authorities. For state regulatory agencies, future policy should move beyond enforcement toward systemic institutionalization. This entails: (1) strengthening data integration between provincial and national monitoring systems; (2) embedding environmental auditing within broader sustainable development strategies; and (3) revising regulations to include performance-based incentives that reward transparency, innovation, and inter-firm collaboration. Moreover, environmental information should be publicly accessible to reinforce accountability and community trust. For industrial park management boards, the results highlight the need to institutionalize environmental auditing as a continuous management cycle rather than a compliance event. This requires (1) adopting real-time environmental data platforms; (2) providing technical training to enterprises on environmental management; (3) establishing formal communication channels with local communities; and (4) integrating social welfare infrastructure, such as worker housing, public transport, and safety systems into park development plans. Such actions would strengthen normative and cognitive dimensions of institutionalization, transforming environmental auditing from a regulatory obligation into an embedded governance practice.

Despite its empirical and theoretical contributions, this study has several limitations. First, the analysis relied primarily on audit findings and secondary documentation, which may not capture the full range of informal practices, behavioral dynamics, or inter-organizational learning processes within IPs. Second, the study focused on a single province, limiting generalizability across different institutional contexts in Vietnam. Consequently, while the study provides valuable institutional insights, its conclusions should be interpreted within these contextual boundaries.

Building on these findings, future research should expand both conceptual and empirical scopes. First, comparative studies across provinces or countries could clarify how institutional pressures vary in shaping environmental auditing outcomes under different governance systems. Second, mixed-method approaches combining audit data, firm-level surveys, and interviews with regulatory agencies could capture deeper institutional dynamics and behavioral responses. Third, future studies may employ quantitative models to evaluate the causal impact of environmental auditing on firms' environmental and financial performance. Lastly, longitudinal research could track how institutional logics evolve over time as environmental auditing becomes embedded within Vietnam's broader transition toward green industrial governance. In conclusion, environmental auditing in Phu Tho's IPs has demonstrated the potential to move beyond regulatory compliance toward institutionalized sustainability. However, achieving a mature eco-industrial model will depend on whether auditing continues to function not only as a tool of control but as a driver of institutional learning, cross-sector collaboration, and systemic transformation within Vietnam's evolving industrial landscape.

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