

RESEARCH ARTICLE



Organizational Readiness for Green Accounting Integration in Waste Management: A Case Study of PTPN IV Regional II Mayang Unit

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Abstract

Purpose	This study examines organizational readiness for green accounting at PTPN IV Regional II Mayang Unit, focusing on environmental management practices and the gap between established practices and their accounting integration.
Design/Methodology	This qualitative case study used in-depth interviews with four informants from managerial, administrative, processing, and accounting functions, direct observation, and organizational documents. Data were analyzed through condensation, display, and conclusion drawing, with source and method triangulation.
Findings	Readiness is uneven across dimensions. Wastewater treatment, solid-waste utilization, hazardous-waste management, and environmental monitoring are operationally established. However, environmental costs are not separately identified, measured, recorded, or reported, indicating limited accounting-system readiness. This pattern reflects institutional decoupling between environmental practices and internal accounting routines.
Practical Implications	Management should integrate environmental practices into accounting through environmental sub-accounts, cost centers, and systematic cost classifications, supported by stronger policies, coordination, and competencies.
Originality/Value	This study explains green accounting readiness at the operational-unit level of a state-owned oil palm plantation enterprise. Using institutional decoupling, it shows how environmental practices coexist with limited integration of environmental costs, emphasizing managerial use of environmental information rather than performance measurement.

Keywords: Green accounting; Environmental management accounting; Organizational readiness; Institutional decoupling; Case study

JEL Classification: M41; M11; Q56

SDG: SDG 6, SDG 12, SDG 16



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1. Introduction

The palm oil industry is one of the strategic sectors that contributes significantly to Indonesia's economy. This sector's contribution is evident not only in the increase in foreign exchange earnings but also in job creation and rural development. The 2024 publication of Statistics Indonesia reports approximately 15.93 million hectares of oil palm plantations and 47.08 million metric tons of CPO production in 2023 (Badan Pusat Statistik, 2024). The high level of oil palm production has led plantation companies to continuously increase their operational capacity to meet global market demand. However, this increase in production has also resulted in a rise in the volume of industrial waste generated, including liquid waste (Palm Oil Mill Effluent/POME), solid waste, and gas emissions from oil palm processing (Dashti et al., 2022; Kristanti et al., 2021).

As concern for environmental issues grows, the Indonesian government is encouraging natural resource-based companies to adopt sustainable business practices. Through Law No. 40 of 2007, Article 74, on Limited Liability Companies and Government Regulation No. 47 of 2012, companies involved in the utilization of natural resources are required to fulfill their social and environmental responsibilities (Republik Indonesia, 2007, 2012). In addition, the government continues to promote the development of green industries and palm oil-based bioenergy, including the development of biodiesel and Sustainable Aviation Fuel (SAF) or Green Avtur, thereby requiring plantation companies to improve their environmental accountability and resource management efficiency.

Environmental problems caused by palm oil industry waste have become a major issue in recent years. Reviews identify palm oil mill effluent and solid residues as important waste-management challenges, without establishing a national ranking of pollution contributors (Dashti et al., 2022; Kristanti et al., 2021). Liquid waste from palm oil mills contains high levels of organic matter that can potentially contaminate soil and water sources if not properly treated. In addition, solid waste such as empty fruit bunches, shells, and fibers also requires effective management to prevent environmental damage. These conditions force companies to incur significant environmental management costs. If waste management is carried out inefficiently, the company's operating costs will increase, potentially reducing the company's long-term efficiency.

Table 1. National CPO Production and Availability of Waste and Cost Data, 2021–2024

Year	National CPO Production (Millions of Metric Tons)	POME Liquid Waste (Millions of Metric Tons)	Waste Management Costs (%)
2021	46,8	140,4	8,2%
2022	47,3	141,9	8,7%
2023	48,2	144,6	9,1%
2024	49,5	148,5	9,6%

Source: BPS (2024),

Table 1 provides production context for 2021–2023; it does not demonstrate a corresponding trend in waste volumes or environmental costs. Estimating POME from CPO would require a justified conversion basis, while a cost percentage requires a defined numerator and denominator. This situation requires companies to implement more effective and efficient environmental management systems so that waste treatment costs can be controlled without compromising the quality of the company's environmental management. In response to the demands of sustainable development, companies can no longer focus solely on achieving economic profits but must also take social and environmental aspects into account.

The triple bottom line concept asserts that a company's success is measured not only by its economic profits but also by its responsibility toward people and the planet (Elkington, 1998). In the context of the palm oil industry, companies are required to manage environmental

impacts sustainably through effective and accountable waste management systems. One emerging approach to support environmental management is green accounting an accounting system that integrates environmental aspects into the processes of identifying, measuring, recording, and reporting environmental costs (Gonzalez & Peña-Vinces, 2023). Through this approach, companies are expected to be able to generate more transparent information on environmental costs as a basis for decision-making and the evaluation of sustainable environmental management. Identifying suitable green accounting indicators is an important implementation task (Azizi et al., 2023).

In addition to green accounting, another aspect closely related to a company's environmental management is environmental performance. Environmental performance reflects a company's ability to manage environmental impacts through regulatory compliance, effective waste management, efficient resource use, and pollution control efforts (Arocena et al., 2021; Hassan et al., 2024; Marrucci et al., 2024). Good environmental performance reflects a company's commitment to sustainability and serves as a key indicator in assessing the quality of a company's environmental governance.

Based on the results of initial observations at PTPN IV Regional II Mayang Unit, the company has implemented various environmental management activities in compliance with applicable regulations, such as the management of liquid and solid waste and monitoring of the company's operational impacts. However, the company has not yet formally implemented green accounting. Costs related to environmental activities are still recorded as part of the company's operating expenses, so there is no specific mechanism for identifying, measuring, or reporting environmental costs. This situation prevents a comprehensive evaluation of the cost efficiency of waste management through an environmental accounting approach.

Previous quantitative studies examine relationships between green accounting, environmental performance, and corporate outcomes, including Indonesian company performance and profitability (Bellamy et al., 2023; Wulandhari & Machdar, 2025). These relationships are not uniformly positive: Bellamy et al. (2023) report an insignificant effect of green accounting on company performance. A closer qualitative comparison is Ilyas et al. (2025), who examine environmental management accounting and eco-efficiency at PTPN's Takalar sugar factory using a phenomenological approach. The present study differs by examining organizational readiness for accounting integration at a palm oil operational unit, using policy, accounting, operational-information, commitment, and competency dimensions. Its contribution is this contextual implementation diagnosis, rather than a claim that previous research is exclusively quantitative or that qualitative studies are absent. The unit-level analysis asks how existing environmental activities can supply information for managerial planning and control, while leaving regional policy mechanisms and measured efficiency outcomes outside the available evidence.

Based on these conditions, this study aims to analyze organizational readiness for integrating green accounting with environmental management practices at PTPN IV Regional II Mayang Unit to support waste-management planning and cost control. The analysis was conducted by identifying existing environmental cost management practices, examining reported environmental management practices, and assessing various factors that support or hinder the implementation of green accounting. The research findings are expected to serve as recommendations for the company in preparing for the implementation of green accounting as part of strengthening sustainable environmental governance and inform subsequent evaluation of waste management costs at PTPN IV Regional II Mayang Unit.

2. Literature Review

2.1 Theoretical Perspectives

Stakeholder Theory explains that a company is not only accountable to its shareholders but also to all parties with a stake in the company's activities, such as the community, the government, employees, consumers, and the surrounding environment (Mahajan et al., 2023). This theory emphasizes that a company's sustainability is influenced by its ability to meet stakeholders' expectations, including in the areas of environmental management and corporate social responsibility (Kivits & Sawang, 2021). In the context of the palm oil industry, companies are required to manage waste and environmental impacts responsibly in order to gain legitimacy and trust from the public. The implementation of green accounting and the improvement of environmental performance are forms of corporate responsibility toward stakeholders, as these systems enable companies to identify, control, and report environmental costs in a more transparent and accountable manner (Riyadh et al., 2020). Thus, stakeholder theory serves as a crucial foundation for explaining the relationship between the implementation of green accounting, environmental performance, and the accountability of a company's waste management. Here, it directs attention to reporting responsibilities and regulatory or community expectations; external stakeholder satisfaction is not directly assessed. Transparency and public trust are also examined in a different organizational context by Harahap et al. (2026), whose zakat-organization findings are not evidence of cost recording at Mayang.

In addition to stakeholder theory, this study is also supported by the Triple Bottom Line framework introduced by Elkington (1998). This framework explains that a company's success is not only measured by economic profit but also through social responsibility (people) and environmental sustainability (planet) (Larivière & Smit, 2022). This concept emphasizes that companies must be able to strike a balance between profit generation and sustainable environmental management (Barauskaite & Streimikiene, 2021; Sheehy & Farneti, 2021). In the palm oil industry, the implementation of green accounting and environmental performance plays a crucial role in supporting the triple bottom line concept, as companies are required to manage waste effectively without compromising operational cost efficiency. Environmental practices and outcomes must be evaluated using appropriate indicators (Hassan et al., 2024; Marrucci et al., 2024). Their relationship with economic performance requires empirical examination, as illustrated by Aslam et al. (2021), rather than an assumption of lower costs. Therefore, the Triple Bottom Line framework is used as the basis for explaining the importance of integrating economic and environmental aspects in improving a company's waste management cost efficiency. The framework organizes economic, social, and environmental implications without producing a composite performance score. Dalimunthe et al. (2022) apply it to CSR in Islamic banking, illustrating its use across sectors rather than validating palm oil environmental outcomes.

Furthermore, Institutional Theory explains that organizational behavior and policies are influenced not only by economic considerations but also by institutional pressures originating from the external environment. According to this theory, organizations tend to adapt their structures, policies, and operational practices to gain legitimacy and acceptance from the environment in which they operate (DiMaggio & Powell, 1983; Scott, 2013). Such institutional pressures can take the form of coercive pressure stemming from the government and legislation, normative pressure arising from professional standards and industry best practices, and mimetic pressure that encourages organizations to emulate the practices of other companies deemed more successful or possessing high legitimacy. In the context of green accounting, Institutional Theory explains that a company's decision to adopt an environmental accounting

system is not only based on economic efficiency considerations but is also influenced by environmental regulatory requirements, growing stakeholder attention to sustainability issues, and the drive to enhance organizational legitimacy through responsible business practices (Ngo, 2023; Tang et al., 2022). Therefore, this theory serves as a relevant foundation for analyzing the readiness of PTPN IV Regional II Mayang Unit to implement green accounting as part of strengthening sustainable environmental governance. In the analysis, policy and recording-standard statements are linked to institutional arrangements, while reporting activities are linked to legitimacy pressures. Digital integration and institutional pressures are examined in related studies by De Silva et al. (2025) and Lee et al. (2024); neither independently confirms the unit's policy arrangements.

2.2 The Concept of Green Accounting

Green accounting is an extension of conventional accounting systems that integrates environmental aspects into the process of identifying, measuring, recording, and reporting costs arising from a company's operational activities. This concept aims to generate information on environmental costs in a more systematic manner so that companies have an adequate basis for managing environmental impacts and supporting sustainability-oriented decision-making (Burritt et al., 2002; International Federation of Accountants [IFAC], 2005). In addition to serving as an accounting tool, green accounting also reflects a company's accountability to stakeholders by transparently providing information on environmental activities and costs.

In practice, the implementation of green accounting encompasses several key components, namely the identification of environmental costs, the recognition of environmental costs, the measurement of environmental costs, the recording of environmental costs, and the presentation of environmental cost information in reports (IFAC, 2005). The implementation of these components enables companies to obtain information regarding the amount of costs incurred for environmental management activities, which can then be used as a basis for evaluating waste management and the company's sustainability policies (Apriani et al., 2023). Thus, green accounting serves not only as a cost-recording mechanism but also as part of an environmental management system that supports better corporate governance. Harahap et al. (2025) discuss green accounting in corporate environmental responsibility, while Hasibuan and Hasibuan (2025) examine its relationship with financial performance and environmental ratings in energy companies; these are contextual studies rather than specifications of accounting components.

Several studies indicate that the implementation of green accounting is often hindered by organizational and policy barriers (Gonzalez & Peña-Vinces, 2023), together with technology, cost, and employee-awareness challenges reported in the Takalar case (Ilyas et al., 2025). In the present case, the inclusion of environmental costs within operating expenses is a field finding, not a result attributed to a profitability study. This situation indicates that organizational readiness is a key aspect that must be analyzed before green accounting can be implemented optimally.

2.3 Environmental Performance

Environmental performance is a measure of a company's ability to manage the environmental impacts resulting from its operational activities through the implementation of sustainable environmental management policies, systems, and practices (Hassan et al., 2024). Environmental performance not only indicates a company's level of compliance with laws and regulations but also reflects the organization's commitment to controlling pollution, managing waste, improving resource efficiency, and minimizing negative impacts on the environment (Appannan et al., 2023; Aslam et al., 2021). In the palm oil industry, environmental

performance is a critical aspect, given that production activities generate liquid waste (Palm Oil Mill Effluent/POME), solid waste, and emissions that require sustainable management to prevent environmental pollution. A company's environmental performance can be assessed using various approaches.

In Indonesia, one of the most widely used tools is the Corporate Environmental Performance Rating Program (PROPER), administered under the Ministry of Environment and Forestry framework ([Kementerian Lingkungan Hidup dan Kehutanan \[KLHK\], 2021](#)). This program evaluates companies' compliance with environmental management standards across several aspects, such as water and air pollution control, management of hazardous and toxic waste (B3), energy conservation, resource efficiency, and community empowerment. The PROPER ratings—which consist of gold, green, blue, red, and black—serve as indicators of a company's environmental performance level while also reflecting its level of compliance with applicable environmental regulations. In addition to PROPER, the implementation of the ISO 14001:2015 Environmental Management System (EMS) also serves as an international benchmark for evaluating an organization's environmental performance. This study uses the cited PROPER regulation and ISO edition as analytical references, not as evidence of a current official rating or certification ([International Organization for Standardization \[ISO\], 2015](#)).

This standard emphasizes the importance of a systematic approach to identifying environmental aspects and impacts, managing environmental risks, ensuring regulatory compliance, pursuing continual improvement, and enhancing the effectiveness of the environmental management system ([ISO, 2015](#)). By implementing the principles of ISO 14001, companies are expected to be able to establish a more structured environmental management system that supports the sustainability of their operations. In the context of this study, environmental performance is not viewed as a variable that influences other variables, but rather as one of the focal points of analysis to evaluate the actual state of environmental management at PTPN IV Regional II Mayang Unit. The analysis was conducted by identifying waste management practices, compliance with environmental regulations, pollution control systems, and the company's readiness to adopt green accounting practices. The assessment concerns reported activities; actual effluent concentrations, emission results, permits, and audit records would be needed to establish compliance.

2.4 Green Accounting, Waste Management, and Managerial Decision-Making

Green accounting can support environmental management by providing information on environmental costs and resource utilization for managerial decision-making. In the context of waste management, the identification and classification of environmental costs can help management understand how organizational resources are allocated to waste treatment, pollution prevention, environmental monitoring, and waste utilization activities. This information can provide a basis for strengthening cost control, resource allocation, and the evaluation of environmental management activities. Accordingly, efficiency in this study is not treated as a directly measured outcome, but as a potential managerial objective that may be supported by more systematic environmental cost information ([Chen et al., 2022](#); [Riyadh et al., 2020](#); [Wulandhari & Machdar, 2025](#)). Evaluating eco-efficiency also requires explicit indicators and measurement boundaries ([Ardiana et al., 2023](#); [Heras-Saizarbitoria et al., 2020](#)). Strategic cost information can support longer-term managerial analysis ([Rounaghi et al., 2021](#)). [Rahman and Islam \(2023\)](#) examine energy efficiency as a mediator in Bangladeshi pharmaceutical and chemical companies, while [Zainab and Burhany \(2020\)](#) distinguish environmental costs and environmental performance in Indonesian manufacturing firms. These relationships provide context, not measured outcomes for Mayang.

In the palm oil industry, waste management involves various operational activities related to liquid waste (Palm Oil Mill Effluent/POME), solid waste, and other environmental

impacts generated by production processes. The utilization of waste as an organizational resource, including its potential use as organic fertilizer or alternative energy, illustrates how environmental management can be linked to resource utilization and operational decision-making. However, realizing potential economic benefits from these practices requires management to have adequate information regarding environmental activities, resource flows, and their associated costs. Therefore, the integration of environmental management information into organizational accounting and managerial processes can provide a stronger information basis for evaluating waste-management practices and identifying potential opportunities for future operational efficiency (Ilyas et al., 2025). Circular-economy studies provide related resource-recovery context: Masudin et al. (2025) examine SMEs, Wani et al. (2024) review food-waste management, and Jerin et al. (2022) examine municipal waste-policy implementation in Dhaka. These sources do not measure Mayang's benefits. Technology and accounting-information quality may support integration, as examined by Chiarini (2021) in manufacturing technology and Khan and Gupta (2025) in green accounting.

2.5 Organizational Readiness and Analytical Dimensions

Organizational readiness for change concerns shared commitment to implement a change and confidence in the collective capacity to do so (Weiner, 2009). For this study, these concepts are adapted to accounting integration alongside EMA's physical and monetary information requirements (Burritt et al., 2002; IFAC, 2005). The five dimensions in Table 4 are an analytical adaptation, not a validated scale: policy readiness addresses formal responsibilities; accounting-system readiness addresses identifiable costs and records; environmental-management readiness addresses potential physical information; management commitment addresses support for implementation; and human-resource readiness addresses relevant competence. Each dimension requires case evidence. Hotel-sector research links green commitment and intellectual capital with environmental performance (Haldorai et al., 2022), supporting attention to these organizational factors without establishing their presence at Mayang. The model distinguishes operational foundations from demonstrated accounting integration.

3. Research Method

This study employs a qualitative approach using a case study design to gain an in-depth understanding of organizational readiness for implementing green accounting and its integration with environmental management practices at PTPN IV Regional II Mayang Unit. This approach allows the researcher to explore the company's actual organizational conditions, environmental management practices, accounting practices, and the factors supporting and hindering the implementation of green accounting based on the informants' perspectives (Yin, 2018). The research was conducted at PTPN IV Regional II Mayang Unit over approximately three weeks, from April 16 to May 7, 2026. Data collection involved field observations, interviews conducted through a combination of face-to-face meetings and telephone calls, and the examination of supporting documentation. The research was conducted at this unit because it conducts various environmental and waste-management activities but has not yet formally integrated green accounting into its accounting practices. The unit of analysis is the unit-level arrangement for integrating environmental activities and accounting information; the case does not represent the entire holding company.

Informants were selected using purposive sampling based on their direct involvement in managerial, administrative, processing, and accounting activities relevant to environmental management and green accounting readiness at the unit level. The informants consisted of the Unit Manager (Informant 1), Administrative Assistant (Informant 2), Processing Assistant

(Informant 3), and Accounting Staff (Informant 4). The selection of these informants was intended to capture perspectives from different organizational functions involved in the practices examined in this study. Before data collection, the researcher coordinated with the relevant company representatives regarding access to the research site and participation of informants. Informants were provided with an explanation of the study's objectives and the voluntary nature of their participation. To maintain confidentiality, informants were identified using numerical codes (Informants 1–4) rather than personal names. The information collected was used solely for research purposes.

Data analysis was conducted using an interactive analysis process involving data condensation, data presentation, and the drawing and verification of conclusions (Miles et al., 2014). Interview, observation, and documentary evidence were first organized according to the main analytical themes of the study, including environmental management practices, organizational and policy readiness, environmental accounting-system readiness, management commitment, human-resource readiness, and supporting and inhibiting factors. The organized evidence was then compared across informants and data sources and presented in narratives, matrices, and tables to facilitate interpretation. Environmental management evidence was interpreted with reference to relevant PROPER criteria and ISO 14001:2015 principles, while green accounting readiness was interpreted based on the organizational and accounting dimensions developed in the literature review. Data credibility was strengthened through source and method triangulation by comparing statements across informants and cross-checking interview evidence with observations and available organizational documentation. Differences and similarities across the available evidence were considered during interpretation rather than treating individual interview statements as independent confirmation. The resulting themes were subsequently interpreted using the theoretical framework of the study, particularly Institutional Theory and the concept of institutional decoupling, to explain the extent to which environmental management practices have been integrated into internal accounting routines. The evidence displayed in this article supports source comparison on cost recording between Informants 2 and 4. However, specific observation notes and documentary identifiers are not presented for each theme, so the reported method triangulation is not independently traceable from the manuscript.

The readiness analysis was conducted by integrating evidence from environmental management practices and environmental accounting practices. Environmental management readiness was assessed with reference to relevant PROPER criteria and ISO 14001:2015 environmental management principles, including waste management, pollution control, environmental monitoring, regulatory compliance, resource management, and continual improvement. Green accounting readiness was assessed based on the extent to which these environmental practices were supported by organizational policies, management commitment, human-resource competencies, and accounting mechanisms for identifying, measuring, recording, and reporting environmental costs. The readiness levels were classified as Low when the required mechanisms were largely absent or had not been integrated into organizational practices, Medium when relevant practices or organizational support existed but remained partially developed or integrated, and High when the relevant practices and supporting mechanisms were consistently established and implemented. This classification was used as an analytical rubric for interpreting the qualitative evidence obtained from interviews, observations, and available documentation. These are provisional qualitative judgments, not validated scores. Table 4 links policy statements to Informants 1 and 4, cost-recording statements to Informants 2 and 4, and operational activities to Informants 2 and 3. Dimensions lacking direct evidence are designated Not established; no independent coder agreement is claimed.

For analytical traceability, the displayed statements can be grouped as POLICY (Informants 1 and 4: absent specific policy or recording standard), COST RECORDING (Informants 2 and 4: costs combined with operating expenses), REUSE (Informant 2: fertilizer and boiler fuel), and MONITORING/B3 (Informant 3: monitoring, reporting, and hazardous-waste procedures). These categories link existing excerpts to interpretation; they do not substitute for the original coding log, field notes, or document inventory. Stakeholder theory informs reporting responsibilities, institutional theory informs formal arrangements, and the triple bottom line framework informs potential economic and environmental decision uses.

4. Results and Discussion

4.1 Overview of PTPN IV Regional II Mayang Unit

PTPN IV Regional II Mayang Unit is one of the oil palm plantation business units under PTPN IV Regional II, engaged in the cultivation, processing, and production of crude palm oil (CPO) and palm kernels. As an agro-industrial company, the operational activities of PTPN IV Regional II Mayang Unit generate various types of waste, such as liquid waste (Palm Oil Mill Effluent/POME), solid waste in the form of empty fruit bunches, fiber, shells, as well as hazardous and toxic waste (B3). Therefore, the company has a responsibility to implement environmental management in accordance with applicable laws and regulations to minimize negative impacts on the environment while ensuring the sustainability of the company's operations.

In carrying out its environmental management activities, PTPN IV Regional II Mayang Unit has implemented various measures, such as liquid waste management through a Wastewater Treatment Plant (WWTP), the utilization of solid waste as organic fertilizer or boiler fuel, and the management of hazardous waste (B3) in accordance with applicable procedures. In addition, the company also conducts periodic environmental quality monitoring as a form of compliance with environmental regulations. However, based on preliminary observations, it was found that the company has not yet formally implemented green accounting, particularly regarding the separate identification, recording, and reporting of environmental costs. This situation makes PTPN IV Regional II Mayang Unit a relevant case study for analyzing the readiness to implement green accounting and examining environmental practices as a context for managerial use of cost information.

4.2 Environmental Management Practices at PTPN IV Regional II, Mayang Unit

Environmental management practices are one way companies fulfill their responsibility to minimize the environmental impact of their operational activities. In the palm oil industry, environmental management is a critical aspect because the production process generates liquid waste (Palm Oil Mill Effluent, or POME), solid waste, and hazardous and toxic waste (B3), all of which must be managed in accordance with environmental regulations. Effective environmental management not only reflects a company's compliance with regulations but also serves as the foundation for supporting the implementation of green accounting through the identification of cost-generating environmental activities and the sustainable management of resources (Appannan et al., 2023; IFAC, 2005).

Based on the results of observations, PTPN IV Regional II Mayang Unit has implemented various environmental management practices, including the treatment of liquid waste through a Wastewater Treatment Plant (WWTP), the use of solid waste as organic fertilizer and boiler fuel, the management of hazardous waste in accordance with applicable procedures, and periodic monitoring of environmental quality. These observations identify environmental activities; they do not establish verified regulatory compliance or superior

performance. Literature on environmental practices and performance provides comparative context rather than confirmation of the case findings (Hassan et al., 2024).

However, the findings also indicate that these environmental management practices have not yet been fully integrated into the green accounting system. Costs related to environmental activities are still recorded as part of the company's operating expenses, so there is currently no mechanism for separately identifying, measuring, recording, or reporting environmental costs. This situation indicates that the company has established reported environmental management activities, but the implementation of environmental accounting is still in its early stages. The accounting-information gap is consistent with the need to integrate environmental costs into accounting frameworks discussed by Khan and Gupta (2024), without demonstrating the unit's financial outcomes. Based on the results of interviews with the Administrative Assistant, the following information was obtained:

"The company already has waste management practices in place in accordance with company procedures; however, environmental costs are still combined with operating costs and have not yet been specifically separated." (Informant 2)

This statement indicates that environmental management practices have become part of the company's operational activities; however, from a green accounting perspective, the company has not yet identified and classified environmental costs separately. According to Institutional Theory, this situation indicates that the company has responded to regulatory pressures by implementing environmental management practices; however, its institutional readiness to integrate environmental aspects into its accounting system still needs to be strengthened (Chaudhry & Amir, 2020).

4.3 Reported Environmental Practices in Relation to PROPER and ISO 14001

Environmental performance is one indicator that demonstrates a company's commitment to managing the environmental impacts of its operational activities. In the oil palm plantation sector, environmental performance is evaluated not only based on regulatory compliance but also through the implementation of a structured and sustainable environmental management system. In Indonesia, such evaluations may refer to the Corporate Environmental Performance Rating Program (PROPER) administered by the Ministry of Environment and Forestry, as well as the ISO 14001:2015 standard on Environmental Management Systems. Both of these instruments serve as benchmarks for assessing waste management practices, pollution control, regulatory compliance, and ongoing improvement efforts (KLHK, 2021; ISO, 2015).

"Solid waste such as empty bunches is used as fertilizer on plantation land, while the fibers and shells are used as boiler fuel, allowing the waste to be reused." (Informant 2)

"We conduct regular monitoring of wastewater quality through our in-house laboratory, and the results are reported to the relevant agencies in accordance with applicable regulations. In addition, hazardous waste is managed in accordance with company procedures before being transferred to a licensed entity." (Informant 3)

Based on the results of these interviews and observations, the reported environmental management practices by PTPN IV Regional II Mayang Unit were then analyzed using PROPER indicators and the principles of the ISO 14001 Environmental Management System, as shown in Tables 2 and 3.

Table 2. Environmental Performance Assessment Indicators Based on PROPER

PROPER Assessment Criteria	Description
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1. Water Pollution Control	Wastewater management to ensure it meets quality standards before being discharged or reused.
2. Air Pollution Control	Control of emissions from operational activities in accordance with environmental quality standards.
3. Hazardous Waste Management	Management of hazardous waste, from storage and transportation to delivery to a licensed entity.
4. Energy efficiency	Efficient energy use to reduce energy consumption and emissions.
5. Water efficiency	Water management and conservation in the production process.
6. Waste Utilization	Efforts to reduce waste through reuse, recycling, or recovery.
7. Regulatory Compliance	The company's compliance with all applicable environmental regulations.

Source: KLHK (2021);

Based on the PROPER indicators in Table 2, this study focuses on evaluating several aspects relevant to the operational activities of PTPN IV Regional II Mayang Unit, namely liquid waste management, hazardous waste management, waste utilization, environmental quality monitoring, and compliance with environmental regulations. These aspects were selected because they are directly related to the company's environmental management practices and serve as the basis for analyzing its readiness to implement green accounting. The available evidence does not quantify air emissions, energy efficiency, or water-use efficiency. Methane from POME treatment and emissions from boilers therefore remain unassessed, and the seven topics in Table 2 should not be read as seven empirically verified results.

Table 3. Environmental Performance Evaluation Based on PROPER and ISO 14001 Indicators

Evaluation Aspect	Empirical Evidence	Analytical Reference	Interpretation
Wastewater Management	Wastewater is treated through a WWTP before land application.	Water Pollution Control (PROPER)	Evidence indicates that a wastewater-management mechanism is operational; this study does not independently verify compliance with applicable effluent-quality standards.
Solid Waste Utilization	Empty fruit bunches are utilized on plantation land, while fiber and shells are used as boiler fuel.	Waste Utilization (PROPER)	Evidence indicates operational reuse and recovery of solid waste; the economic or environmental efficiency of these practices was not quantified.
Hazardous Waste Management	Hazardous waste is stored in a designated facility and transferred to a licensed entity.	Hazardous Waste Management (PROPER)	Evidence indicates the existence of a hazardous-waste management procedure; formal regulatory compliance was not independently assessed.
Environmental Monitoring	Wastewater quality monitoring is reported to be conducted periodically.	Monitoring and Evaluation (ISO 14001)	Evidence indicates the presence of environmental-monitoring activities; specific laboratory results were not evaluated in this study.
Regulatory Compliance Activities	Environmental reports are reported to be submitted periodically to relevant agencies.	Compliance Obligations (ISO 14001)	Evidence indicates organizational procedures directed toward regulatory compliance; this does not constitute an independent compliance audit.

Source: Interview findings; data compiled by the author (2026).

Based on Table 3, it can be seen that environmental management practices at PTPN IV Regional II Mayang Unit have covered several key aspects that serve as indicators in the PROPER assessment as well as the principles of the ISO 14001 Environmental Management System. The management of liquid waste through a wastewater treatment plant (WWTP), the utilization of solid waste as organic fertilizer and boiler fuel, and the management of hazardous

waste (B3) in accordance with procedures demonstrate that the company has made efforts to comply with applicable environmental management regulations. Furthermore, periodic environmental quality monitoring and reporting to relevant agencies indicate the existence of environmental control mechanisms aligned with the principle of continual improvement in ISO 14001 (ISO, 2015).

Nevertheless, the interview results also indicate that these environmental management activities are not yet supported by an environmental accounting system capable of identifying and recording environmental costs separately. Thus, while the company has operational practices that support environmental performance, it has not yet fully integrated these aspects into its green accounting system. This situation identifies an operational foundation, whereas its readiness in environmental accounting still requires improvement; the relative strength of environmental outcomes is not independently established. This need for integration is consistent with EMA's use of physical and monetary information (Burritt et al., 2002).

4.4 Analysis of Readiness for the Implementation of Green Accounting

The implementation of green accounting depends not only on a company's commitment to environmental sustainability but also on the organization's readiness to integrate environmental aspects into its accounting system. This readiness encompasses policy, human resources, environmental cost recording systems, documentation, and management's commitment to sustainable environmental management (Weiner, 2009; IFAC, 2005). In this study, readiness for the implementation of green accounting was analyzed based on the results of interviews and observations, which were then compared with the concept of green accounting as described in the literature review. The adapted model in Section 2.5 distinguishes available operational information from the commitment and capacity needed for accounting integration.

"Operationally, the company already has environmental management procedures that must be followed, but there is no specific policy governing the implementation of green accounting or the separate recording of environmental costs." (Informant 1)

"Costs related to environmental management are still included in the company's operating expenses, so there is no specific account for environmental costs yet." (Informant 2)

"So far, there has been no specific standard for recording environmental costs because companies still follow their own accounting systems." (Informant 4)

Based on the results of interviews and observations, the level of readiness for implementing green accounting at PTPN IV Regional II Mayang Unit was then analyzed using several key components of green accounting, as presented in Table 4.

Table 4. Matrix for Analyzing Organizational Readiness for Green Accounting Implementation

Readiness Dimension	Field Findings	Readiness Level	Analysis
1. Institutional and Policy Readiness	No specific internal policy governing green accounting or the separate management of environmental cost information has been established. Informants 1 and 4.	Low	Environmental management is primarily oriented toward operational and regulatory compliance, while a specific institutional framework for green accounting has not yet been established.
2. Environmental Accounting-System Readiness	Environmental costs remain incorporated into general operating expenses, with no separate mechanism for their	Low	The absence of separate environmental accounts and reporting mechanisms indicates that environmental information has not yet been

	identification, measurement, recording, and reporting. Informants 2 and 4.		systematically integrated into the accounting system.
3. Environmental-Management Readiness	Waste management, environmental monitoring, and environmental compliance practices have been implemented operationally. Informants 2 and 3; outcomes unverified.	Medium	Existing environmental-management practices provide an operational foundation for future integration with environmental accounting; however, their integration into the accounting system remains limited. Provisional operational foundation, not verified performance.
4. Management Commitment	Environmental activities are described; direct evidence of commitment to accounting integration is not provided.	Not established	Support for compliance cannot establish shared commitment to implement green accounting.
5. Human-Resource Readiness	Operational experience is reported; specific green-accounting competence is not directly demonstrated.	Not established	Competence requires further interview or training evidence; absence of a recording standard is not a skills test.

Source: Interview findings; data processed by the author (2026).

Based on Table 4, the readiness for implementing green accounting at PTPN IV Regional II Mayang Unit remains uneven across the assessed dimensions. Environmental management practices, including waste management, environmental monitoring, and regulatory compliance activities, have been operationally established, whereas institutional and accounting-system readiness remains limited. In particular, the absence of a specific green accounting policy and separate mechanisms for identifying, measuring, recording, and reporting environmental costs indicates that environmental information has not yet been systematically integrated into the accounting system. Management commitment to accounting integration and specific human-resource competence require additional evidence; operational experience alone does not establish either dimension. The integration need is consistent with the managerial information purpose of EMA (IFAC, 2005).

The readiness assessment also identifies several supporting and inhibiting factors. Supporting factors include established environmental management practices, management support for environmental compliance, routine environmental monitoring, and employees' existing experience in environmental management activities. In contrast, the absence of a specific green accounting policy, separate environmental cost accounts, systematic environmental cost information, and specific green accounting competencies represents the main barriers to implementation. From the perspective of Institutional Theory, this uneven development can be interpreted as *institutional decoupling*, in which environmental management practices developed in response to regulatory and legitimacy pressures have become embedded in operational activities, while corresponding accounting routines remain insufficiently integrated. Stakeholder Theory further suggests that the environmental management practices already undertaken reflect organizational responses to stakeholder expectations regarding responsible environmental management. In addition, the Triple Bottom Line perspective indicates that stronger integration of environmental information into managerial and accounting processes can support greater alignment between economic, social, and environmental considerations. Thus, the principal readiness gap lies in the organizational integration of existing environmental management practices with environmental accounting mechanisms rather than in the absence of environmental activities themselves.

5. Managerial Implications

The findings provide several managerial implications for strengthening organizational readiness for green accounting at PTPN IV Regional II Mayang Unit. The primary managerial priority is not to establish new environmental activities, but to integrate existing environmental management practices with the company's accounting and managerial information systems. As an initial step, management can develop specific environmental sub-accounts within the existing chart of accounts to distinguish environmental expenditures from general operating expenses. Environmental cost centers can subsequently be assigned to major environmental activities, such as wastewater treatment, hazardous-waste management, environmental monitoring, and waste-utilization activities. This approach would enable management to identify where environmental resources are allocated without requiring an immediate restructuring of the entire accounting system.

The next stage involves developing a more systematic classification of environmental costs according to the nature and purpose of environmental activities. Environmental expenditures can be progressively categorized into prevention, appraisal or monitoring, internal environmental failure, and external environmental failure costs, where such classifications are supported by available accounting information. Once environmental cost information becomes more systematically identifiable, management may consider applying analytical approaches such as Material Flow Cost Accounting (MFCA) to selected material and waste flows, particularly those associated with POME, empty fruit bunches, fiber, and shells. Such an approach could help management connect physical material flows with monetary information and provide a stronger information basis for identifying potential resource losses and opportunities for operational improvement. However, because the present study does not quantify environmental costs, material losses, or economic benefits, the potential efficiency effects of these measures should be evaluated through subsequent accounting and operational analysis rather than inferred from the present findings. EMA distinguishes physical and monetary information, while ISO 14051 provides a general MFCA framework (IFAC, 2005; ISO, 2011).

Management could evaluate the potential economic benefits of waste reuse by comparing avoided expenditure with the costs of collection, transport, processing, and utilization over a defined period. For empty fruit bunches, estimated net benefit would comprise avoided fertilizer expenditure less collection, transport, and application costs. For fiber and shells used as boiler fuel, estimated net benefit would comprise avoided purchased-fuel expenditure less handling and preparation costs and any forgone sales revenue. The calculation should use documented waste quantities, substitution rates, unit prices, and operating costs, with scenario assumptions identified separately from actual records. Relevant boiler-emission control and POME methane-management costs should also be considered when comparing alternatives. As these inputs were not quantified in this study, the proposed calculation provides a basis for subsequent managerial evaluation; it does not demonstrate realized savings at the Mayang Unit.

From an organizational perspective, implementation should be gradual and coordinated across managerial, processing, environmental, and accounting functions. Management commitment can be translated into internal policies that define responsibilities for environmental-cost identification, documentation, recording, and reporting, while relevant personnel can be provided with competencies related to environmental accounting and environmental-cost management. This staged integration is particularly important given the institutional decoupling identified in this study: environmental management practices have developed operationally, while corresponding accounting routines remain less integrated. Reducing this separation would allow environmental information to become part of routine

managerial planning, control, and decision-making rather than remaining primarily within environmental-compliance activities.

At the broader organizational level, regional or corporate management could coordinate with operational units to develop common environmental-cost classifications, reporting procedures, and internal guidance. At the Mayang Unit, this coordination could begin by documenting existing waste-management activities and linking available operational records to related expenditures for management review. Any proposed changes to the chart of accounts or ERP configuration should first be assessed against the applicable accounting policies and approval responsibilities. These measures are managerial recommendations arising from the unit-level findings; the study does not establish the allocation of accounting authority or the operation of regional audit procedures. A subsequent internal review could assess the feasibility of these measures and evaluate waste-reuse benefits, methane-management costs, and PROPER-related improvement options.

6. Conclusion, Limitations, and Suggestions

Based on the findings, PTPN IV Regional II Mayang Unit has established several environmental management practices, including wastewater treatment, solid-waste utilization, hazardous-waste management, and periodic environmental monitoring. However, organizational readiness for green accounting remains uneven across the assessed dimensions. Environmental management practices have been operationally established, while institutional and accounting-system readiness remains limited because environmental costs have not yet been separately identified, measured, recorded, and reported. Operational experience provides a potential foundation; specific commitment, staff competencies, policies, and accounting mechanisms need further evidence or development. From an Institutional Theory perspective, this condition reflects institutional decoupling, in which environmental management practices have developed operationally while corresponding environmental accounting routines remain insufficiently integrated. Thus, the principal readiness gap identified in this study concerns the organizational integration of existing environmental management practices with accounting and managerial information systems.

This study is subject to several limitations. First, the research was conducted as a qualitative case study within a single operational unit of PTPN IV, and the findings therefore represent the organizational conditions of PTPN IV Regional II Mayang Unit rather than all units of the company or the palm oil industry more broadly. Second, the study involved four informants from managerial, administrative, processing, and accounting functions at the operational-unit level and did not include informants responsible for accounting-policy decisions at the regional or corporate level. Third, the assessment of environmental management was based on the qualitative evidence available in the study and used PROPER criteria and ISO 14001 principles as analytical references; therefore, the findings should not be interpreted as an official PROPER rating, an ISO 14001 conformity assessment, or an independent regulatory-compliance audit. Finally, the study did not quantify environmental costs, material losses, waste-management savings, or eco-efficiency outcomes. Consequently, the potential economic benefits of integrating green accounting with waste management cannot be empirically determined from the present findings. Interview dates and durations, the original guide, observation protocols, documentary identifiers, researcher role, and consent or ethics procedures are not specified in the supplied material. Neither original Indonesian transcripts nor regional policy documents and multi-unit account comparisons are supplied. Interviews with environmental or laboratory personnel and regional accounting authorities would be needed to address these gaps. Methane, boiler emissions, and water and energy efficiency remain outside the demonstrated findings.

Future research should extend the analysis to multiple operational units and different organizational levels to examine whether green accounting readiness and the degree of integration between environmental management and accounting practices vary across units. Particular attention should be given to identifying the organizational, institutional, and accounting-system factors that distinguish units that separately identify and report environmental costs from those that continue to incorporate such costs into general operating expenses. Future studies may also combine qualitative organizational analysis with environmental cost data, material-flow information, and environmental-performance indicators to evaluate the managerial and economic implications of green accounting more objectively. The application of approaches such as Material Flow Cost Accounting may further support the analysis of physical and monetary flows associated with POME, empty fruit bunches, fiber, shells, and other relevant waste streams. A specific research question is: how do chart-of-accounts authority, information-system integration, and cross-functional coordination explain differences in environmental-cost identification across PTPN operational units?

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