



Environmental accounting in medical waste management from a Pangkalbalam community health center

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ABSTRACT

This research examines the implementation of environmental accounting in medical waste management at a non-inpatient primary healthcare facility, namely the Pangkalbalam Community Health Center in Pangkalpinang City, Indonesia. Despite increasing regulatory pressure on healthcare institutions to manage environmental impacts, the integration between waste management practices and accounting systems remains underexplored, particularly at the primary care level. This research aims to analyze how environmental costs are identified, recognized, measured, presented, and disclosed within the context of medical waste management. A qualitative approach was employed, combining direct observation, document analysis, and in-depth interviews with key informants, including sanitation staff and financial officers. The findings reveal that while operational waste management practices are generally implemented in compliance with regulatory requirements, environmental accounting remains partial, fragmented, and predominantly administrative. Environmental costs are recognized and measured but not systematically classified or disclosed as distinct accounts, resulting in limited cost visibility and weak support for decision-making. Furthermore, the cost structure is predominantly reactive, characterized by internal failure costs, with minimal integration of prevention and detection mechanisms. This research demonstrates that environmental accounting practices in non-inpatient primary healthcare facilities are not merely underdeveloped but structurally distinct, shaped by limited institutional capacity and relatively low external pressures. Consequently, accounting practices remain cash-based, administrative, and weakly integrated into strategic management. These findings highlight the need for more integrated, transparent, and proactive environmental accounting frameworks to support sustainability in primary healthcare settings.

Keywords: Community Health Center, Environmental Accounting, Medical Waste Management, Sustainability

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INTRODUCTION

Environmental pollution remains a persistent and increasingly complex issue in Indonesia, requiring sustained attention from policymakers and public service institutions. Human activities across households, industries, markets, service facilities, and health institutions generate substantial volumes of solid and liquid waste that threaten air, soil, and water quality. In the Bangka Belitung Islands Province, particularly in Pangkalpinang City,

pressure from waste generation continues to intensify. Data from the Ministry of Environment and Forestry indicate that more than 50 % of waste entering final disposal sites originates from household activities, reflecting structural challenges in local waste management systems (Aprionis & Sambas, 2025).

As the provincial capital and urban growth center, Pangkalpinang faces distinct environmental management challenges due to population concentration and increased economic activity. During 2024-2025, daily waste generation reached approximately 105.87 tons, with food waste dominating municipal solid waste composition. This condition underscores the urgency of strengthening integrated waste management strategies. Although the Regional Statistics of Pangkalpinang City 2025 provides a general overview of environmental conditions, detailed data on waste generated by public service institutions, particularly healthcare facilities, remain limited, indicating insufficient attention to environmental governance within the health sector (Susanti et al., 2025; BPS Kota Pangkalpinang, 2025).

The municipal government has initiated several measures, including environmental campaigns, improvements in waste collection systems, and the establishment of TPS 3R (Reduce, Reuse, Recycle) facilities. While these initiatives reflect progress, they largely focus on household waste, with relatively limited attention given to waste generated by public service institutions, including healthcare facilities (Mulyadi et al., 2024). Healthcare facilities play a dual role in public service and environmental sustainability. While contributing to improved health outcomes, their activities generate both hazardous and non-hazardous waste that may pose serious environmental and public health risks if not properly managed. Facilities such as Pangkalbalam Health Center routinely produce waste from clinical, laboratory, and supporting activities, which, if inadequately handled, may lead to soil contamination, water pollution, and air quality degradation (Amir et al., 2025).

At the global level, inadequate medical waste management has become a significant concern. More than half of the world's population is at risk of exposure to improperly treated medical waste, contributing to environmental degradation, occupational hazards, and disease transmission. Vallée (2024) highlights that ineffective waste management systems compromise both environmental integrity and human health, reinforcing the need for accountable and environmentally responsible practices. In Indonesia, medical waste management is regulated under Minister of Health Regulation No. 18 of 2020, which mandates systematic, accountable, and environmentally sound practices. This regulation provides a normative benchmark for health service facilities, including Pangkalbalam Health Center, to align operational activities with environmental protection principles and public accountability standards (Barokah et al., 2022).

Effective waste management also involves financial considerations, emphasizing the importance of identifying and reporting environmental costs. Environmental costs represent both financial and non-financial impacts arising from organizational activities affecting environmental quality. This has led to the development of environmental accounting, which integrates environmental responsibility into financial systems (Samsiar et al., 2020). Environmental accounting enables organizations to evaluate environmental performance, improve resource allocation, and enhance transparency. In this research, Hansen and Mowen's framework is used to classify environmental costs into prevention, detection, internal failure, and external failure costs, while Statement of Financial Accounting Standards No. 1 serves as a reference for assessing financial disclosure practices (Anam & Ramlah, 2020; Dahlia et al., 2021).

Previous studies reveal that although environmental management practices exist in healthcare facilities, their accounting treatment remains suboptimal. At the Mamajang Makassar Health Center, environmental costs were incurred but not separately identified or disclosed (Barokah et al., 2022). Similarly, research at Dr. Pirngadi Hospital in Medan found that accounting practices did not fully comply with financial reporting standards, and environmental costs were not explicitly disclosed (Darsani et al., 2023). These findings indicate a gap between normative standards and actual practices.

Existing literature largely focuses on hospitals in major urban areas, with limited attention to primary healthcare facilities in medium-sized cities. Moreover, studies often examine waste management or accounting practices separately rather than integrating both aspects. However, beyond differences in waste volume, non-inpatient community health centers exhibit fundamentally different accounting dynamics compared to large hospitals. These differences are shaped by variations in institutional capacity, organizational complexity, and governance pressures. Large hospitals typically operate with more advanced accounting systems, dedicated environmental management units, and stronger external pressures from regulators, accreditation bodies, and public scrutiny.

In contrast, community health centers in medium-sized cities such as Pangkalpinang operate with limited financial resources, simpler organizational structures, and minimal specialized personnel, resulting in accounting practices that are more administrative, cash-based, and less integrated into strategic decision-making. Additionally, lower levels of external scrutiny reduce incentives for transparent environmental reporting, further reinforcing these differences. Therefore, this research does not only address an empirical gap but also proposes that environmental accounting dynamics in primary healthcare facilities are structurally shaped by institutional capacity and governance context, leading to distinct patterns that differ from those observed in large hospital settings.

Accordingly, this research examines the implementation of environmental accounting in medical waste management at Pangkalbalam Health Center, focusing on the identification, measurement, treatment, and disclosure of environmental costs, as well as the organizational and operational factors influencing its implementation. This research aims to contribute to improved transparency, accountability, and effectiveness of waste management in public primary healthcare facilities.

LITERATURE REVIEWS

Legitimacy Theory

Legitimacy theory, as introduced by Dowling and Pfeffer (1975), explains how organizations operate within the boundaries of societal norms, values, and expectations in order to secure social acceptance. The theory posits that organizational survival depends on the extent to which an organization's actions are perceived as congruent with the broader social system in which it operates. When organizational activities align with prevailing societal expectations, legitimacy is maintained; conversely, deviation from these expectations may threaten organizational continuity (Nurhidayat et al., 2020).

From an environmental perspective, legitimacy theory emphasizes that organizations are expected to demonstrate responsible behavior toward environmental protection. Environmental degradation, pollution, or failure to manage waste properly may create a legitimacy gap between organizational practices and societal expectations. As a result, organizations are encouraged to adopt environmentally responsible policies and disclose relevant information as a means of restoring or maintaining legitimacy (Natasya et al., 2024).

Environmental disclosure plays a crucial role in legitimacy management. By transparently reporting environmental practices, costs, and impacts, organizations seek to justify their existence and operations to stakeholders. Such disclosures function as a communication mechanism that signals compliance with social and regulatory expectations. In this context, environmental accounting becomes an important instrument for legitimacy, as it provides measurable evidence of an organization's commitment to environmental responsibility (Nurhidayat et al., 2020).

In public sector institutions, including health service facilities, legitimacy theory is particularly relevant because these organizations operate under public scrutiny and rely heavily on societal trust. The disclosure of environmental management practices, especially those related to waste handling and environmental costs, helps public health centers demonstrate accountability and align their operations with community expectations, thereby reinforcing institutional legitimacy (Natasya et al., 2024).

Environmental Accounting

Environmental accounting is a concept with broad application that complements financial, management, and corporate accounting by incorporating environmental considerations into organizational decision-making processes. Arfan (2009), as cited in Nuwa et al. (2023), defines environmental accounting as an accounting approach that integrates environmental costs and benefits into financial information systems, with a strong emphasis on internal managerial communication and decision making.

The primary objective of environmental accounting is to support organizations in identifying, measuring, and reporting environmental costs arising from operational activities. By recognizing environmental costs explicitly, organizations can better evaluate the financial implications of environmental management and pollution prevention efforts. Environmental accounting thus serves not only as a reporting tool but also as a strategic management instrument that promotes sustainable operational practices (Saraswati & Musmini, 2024).

Furthermore, environmental accounting facilitates the prevention, reduction, and mitigation of negative environmental impacts. The accounting process begins by identifying opportunities to reduce environmental harm and extends to recording events related to environmental restoration and damage control. This comprehensive approach allows organizations to assess environmental performance alongside financial performance, fostering a more holistic evaluation of organizational effectiveness (Saraswati & Musmini, 2024).

In the context of public sector organizations such as community health centers, environmental accounting plays a vital role in strengthening accountability and transparency. By systematically documenting environmental management activities and associated costs, health institutions can demonstrate compliance with environmental regulations and reinforce their commitment to sustainable public service delivery (Nuwa et al., 2023).

Environmental Costs

Environmental costs, according to Hansen & Mowen (2009), are costs incurred as a consequence of poor environmental quality or environmental damage resulting from organizational activities. These costs include expenditures related to the development, detection, prevention, and remediation of environmental impacts. Environmental costs reflect the economic consequences of environmental degradation and the efforts undertaken to manage or prevent such damage (Samsiar et al., 2020).

Hansen & Mowen (2009) classify environmental costs into four main categories: environmental prevention

costs, environmental detection costs, internal environmental failure costs, and external environmental failure costs. Environmental prevention costs are associated with activities aimed at avoiding environmental damage, while detection costs relate to monitoring and measuring environmental conditions. Internal failure costs arise from environmental damage that occurs but is contained within the organization, whereas external failure costs occur when environmental damage affects external parties or the surrounding environment (Saputra et al., 2019).

The classification of environmental costs provides a structured framework for organizations to analyze and control environmental expenditures. By understanding the composition of environmental costs, organizations can shift their focus from reactive measures such as remediation and compensation toward preventive strategies that are often more cost-effective and environmentally sustainable (Samsiar et al., 2020).

For health service institutions, environmental costs primarily arise from waste management activities, including segregation, treatment, storage, transportation, and disposal of medical waste. Failure to manage these costs effectively can result in environmental pollution, legal sanctions, and reputational damage. Therefore, proper identification and accounting of environmental costs are essential for improving environmental performance and ensuring compliance with regulatory standards (Saputra et al., 2019).

Waste

Waste in health service facilities encompasses both medical and non-medical waste generated from daily operational activities. According to the Indonesian Ministry of Health (2004), as cited in Nuwa et al. (2023), waste in community health centers includes liquid and solid waste originating from various service units, such as inpatient wards, general polyclinics, dental clinics, maternal and child health units, pharmacies, and laboratories.

Medical waste is of particular concern due to its hazardous characteristics. Solid medical waste may contain infectious agents, sharp objects, toxic chemicals, and radioactive substances, while liquid medical waste often contains pathogenic microorganisms and chemical residues. These hazardous properties pose significant risks to environmental quality and public health if waste is not properly segregated, treated, and disposed of (Barokah et al., 2022).

The management of medical waste in health centers is therefore a critical environmental and public health issue. Inadequate waste handling practices can lead to contamination of soil, water, and air, as well as increased risks of disease transmission. Effective waste management systems are necessary to minimize these risks and ensure that hazardous materials do not enter the surrounding environment (Nuwa et al., 2023).

In community health centers such as Puskesmas, waste management practices must be supported by clear operational procedures and adequate financial resources. Integrating waste management with environmental accounting enables health institutions to monitor waste-related costs systematically, evaluate the efficiency of waste handling processes, and strengthen accountability in environmental management (Barokah et al., 2022).

METHODS

This research employs a qualitative research design using a case study approach. Qualitative research is particularly appropriate for exploring complex social and organizational phenomena within their real-life contexts, especially when the boundaries between the phenomenon and context are not clearly evident (Creswell & Poth, 2021; Yin, 2024). The case study approach enables an in-depth examination of processes, practices, and meanings embedded in a specific institutional setting, allowing researchers to capture rich and contextualized insights.

The focus of this research is the management costs of solid waste at the Pangkalbalam Community Health Center and the manner in which these costs are recognized, recorded, and reported in the health center's financial statements. This research adopts an applied qualitative perspective to investigate existing practices in a natural organizational environment rather than under controlled experimental conditions, aligning with the purpose of understanding actual accounting and waste management implementation in public health institutions (Vipul & Jaya, 2023).

The research participants consist of eight informants from the Pangkalbalam Community Health Center who are directly involved in waste management, financial administration, and operational decision-making. These informants include: (1) the Head of the Community Health Center, (2) the Treasurer/Financial Administration Officer, (3) the Environmental Health Officer (sanitarian), (4) a waste management staff member, (5) a laboratory staff member, (6) a nurse representative, and (7-8) two administrative staff involved in budgeting and reporting processes. Informants were selected using purposive sampling based on specific criteria: (a) having direct involvement in waste generation, handling, or management processes; (b) possessing responsibility in financial recording, budgeting, or reporting; and (c) having a minimum of one year of work experience to ensure adequate understanding of institutional practices. This purposive selection ensures that the data obtained represent information-rich cases and accurately reflect organizational practices (Creswell & Poth, 2021).

Data collection techniques in this research include direct observation, in-depth interviews, and documentation analysis. Observations were conducted to understand waste handling procedures and operational practices, while interviews were carried out to obtain detailed explanations regarding cost allocation, accounting treatment, and reporting mechanisms related to waste management. Documentation, particularly financial and

budgetary records, was used to validate and enrich the findings derived from observations and interviews. The primary data in this research consist of firsthand information obtained directly from the research site through these methods.

To ensure data credibility and rigor, this research applies triangulation techniques, including method triangulation and source triangulation. Method triangulation was conducted by comparing findings from interviews, observations, and documentation, while source triangulation involved collecting information from multiple informants with different roles and responsibilities within the organization. Triangulation enhances the trustworthiness of qualitative findings by reducing potential bias and increasing analytical depth (Flick, 2018; Yin, 2024).

The data analysis process involved organizing, categorizing, and interpreting qualitative data obtained from the field. The researcher analyzed the *BLUD* budget and financial reports prepared by the Pangkalbalam Community Health Center to identify how environmental and waste management costs are allocated and reported. These findings were then interpreted in relation to the types of waste generated, applicable waste management regulations, and the accounting treatment of environmental costs within the *BLUD* reporting framework. This analytical process enables a comprehensive understanding of the alignment between waste management practices and environmental accounting principles in the health center.

RESULTS AND DISCUSSION

Results

Based on direct observations and in-depth interviews with key informants, including sanitation officers and the treasurer at Pangkalbalam Community Health Center, it was found that all health service activities consistently generate both medical and non-medical waste. This finding aligns with prior studies indicating that primary healthcare facilities are significant sources of heterogeneous waste streams due to routine clinical and administrative operations (Cook et al., 2023; Kaposi et al., 2024; Alrabiah et al., 2025).

Medical waste at the Pangkalbalam Community Health Center is predominantly composed of solid waste generated from routine service activities, including general clinical services, dental care, pharmacy operations, and laboratory examinations. The observed waste stream consists of used syringes, expired pharmaceuticals, medicine containers, bandages, cotton, gloves, and diagnostic devices, reflecting the typical composition of healthcare waste in primary care settings. This empirical finding is consistent with global evidence indicating that infectious and sharp waste constitute the largest proportion of healthcare waste generated in such facilities (Karpinska et al., 2023; Mohammadinia et al., 2024; Cirstea et al., 2026). The pattern is further supported by the results of interviews with sanitation officers who stated that medical waste is generated daily, primarily from general services and laboratory activities, with syringes, cotton, and gloves being the most frequently encountered items, thus confirming the dominance and routine nature of this type of waste in daily healthcare operations.

Meanwhile, liquid medical waste was found to be minimal, as the health center does not provide inpatient services. Informants confirmed that the liquid waste generated is non-infectious and primarily originates from washing and cleaning activities. This finding is supported by studies noting that non-hospital primary care facilities typically produce lower volumes of hazardous liquid waste (Bayusunuputro & Sari, 2022; Nematollahi et al., 2025). Non-medical waste is also generated daily from administrative and visitor activities, consisting of food waste, plastic packaging, bottles, and paper. Observations revealed that this waste stream is continuous and influenced by service intensity. This is in line with previous research highlighting that non-medical waste in healthcare facilities often resembles municipal solid waste but still requires systematic management (Fitriani et al., 2022).

In terms of waste management practices, the Pangkalbalam Community Health Center collaborates with a licensed third-party company for the treatment of solid medical waste. Prior to collection, waste is systematically segregated in accordance with regulatory standards using color-coded containers, specifically yellow bags for infectious waste and black bags for non-infectious waste. This practice indicates alignment with international guidelines on healthcare waste segregation, which emphasize the importance of proper classification at the source to minimize environmental and health risks (Lelyana, 2024). This implementation is increasingly supported by field evidence, as a sanitation staff explained that waste is segregated in accordance with established regulations using yellow bags for infectious materials, and once the containers are full, the waste is temporarily stored before being collected by third-party service providers. This demonstrates consistency between standard procedures and actual operational practices.

However, observations indicate that temporary storage facilities, although enclosed and restricted, are not equipped with cooling systems. This condition deviates from best practices recommending cold storage to prevent decomposition and contamination risks (Rahmawati et al., 2024). Additionally, waste collection is conducted every three to six months, depending on volume, which is relatively infrequent compared to recommended standards (Zhang et al., 2024). Liquid waste management is not supported by a Wastewater Treatment Plant (WWTP). Instead, wastewater is discharged through conventional drainage systems due to its perceived low risk. While this reflects local operational constraints, studies suggest that even low-risk wastewater may carry

contaminants and requires monitoring (Willy & Mukono, 2023; Kato & Kansha, 2024; Shamshad & Rehman, 2024).

Non-medical waste management is conducted in collaboration with local environmental authorities, where waste is transported to public disposal sites. This reflects a common integration model between healthcare facilities and municipal waste systems (Alrabiah et al., 2025; Nurlina et al., 2025). From an environmental accounting perspective, documentation analysis and interviews reveal that waste management costs are recognized but not explicitly separated in financial reporting. At the identification stage, costs are only associated with solid medical waste management through third-party services, while liquid waste costs are not budgeted due to their perceived insignificance. This finding is consistent with previous studies indicating partial recognition of environmental costs in healthcare institutions (Latifah & Soewarno, 2023).

At the recognition stage, waste management costs are recorded on a cash basis, meaning they are recognized when invoices from third-party service providers are received and payments are made. These costs are then classified under goods and services expenditures as well as operational expenses. This practice is consistent with prevailing public sector accounting systems; however, it limits the ability to implement accrual-based environmental cost tracking and comprehensive cost allocation (Mustika et al., 2023). This is further reinforced by the results of the interview with the Treasurer, where the treasurer explained that waste management costs are recorded upon receiving invoices from third parties and are directly categorized as service expenses, thereby demonstrating alignment between formal accounting procedures and actual financial practices.

At the measurement stage, costs are determined based on actual payments and historical budgets, reflecting variable cost behavior depending on the volume of waste. This approach aligns with findings that healthcare waste costs are often volume-dependent and lack standardized costing frameworks (Sepetis et al., 2022; Carandi et al., 2024). Subsequently, at the presentation stage, environmental costs are not disclosed as separate accounts but are integrated into general expenditure categories. Although internal coding exists, no specific environmental cost reports are prepared. This underscores prior evidence regarding the limited visibility of environmental costs in financial statements (Sultan et al., 2024; Ayinla et al., 2024).

Furthermore, at the disclosure stage, waste management information is reported internally to the Health Office and local government but is not made publicly accessible, indicating that environmental accountability remains largely administrative rather than transparent. This condition is consistent with findings in the public sector literature, where environmental disclosure practices are still developing and are often limited in scope (Brusca et al., 2024). Further observational evidence supports this assessment, as the practice of waste separation was generally found to be consistent with established procedures, however monitoring documentation was limited and no public reporting mechanisms were evident within the facility, highlighting a gap between operational practices and transparency in environmental reporting.

Overall, these findings demonstrate that while operational waste management practices are relatively functional, the implementation of environmental accounting remains partial and not yet aligned with comprehensive reporting standards. This reflects broader challenges identified in recent literature regarding the integration of environmental management and accounting systems in public healthcare institutions (Tommasetti et al., 2023).

Discussion

The findings of this research indicate that medical waste management practices at the Pangkalbalam Community Health Center have been formally implemented in accordance with prevailing regulatory requirements, particularly through collaboration with licensed third-party waste management providers. This operational compliance reflects an institutional effort to align with external regulatory expectations, as mandated by the Pangkalpinang City Environmental Agency and the Minister of Health Regulation No. 18 of 2020. From the perspective of legitimacy theory, such alignment represents an attempt to secure organizational legitimacy by conforming to socially accepted rules and institutional pressures (Nurhidayat et al., 2020). In this context, legitimacy is not only shaped by regulatory compliance but also by the organization's ability to balance economic, environmental, and social responsibilities, as emphasized in the Triple Bottom Line (TBL) framework.

However, a closer examination of the empirical findings reveals a critical gap between formal compliance and substantive environmental management practices. Specifically, the observed storage of hazardous medical waste (B3) at ambient temperature for extended periods without refrigeration facilities indicates non-compliance with technical standards outlined in the Minister of Environment and Forestry Regulation No. 56 of 2015. This discrepancy suggests that legitimacy in this context is largely symbolic rather than substantive, where procedural adherence is prioritized over full technical implementation. Such symbolic legitimacy is commonly observed in public sector organizations operating under resource constraints and limited environmental management capacity (Deegan, 2020).

This gap between compliance and practice is further reinforced by financial and infrastructural limitations identified in the Results section. The relatively infrequent waste collection cycle and the absence of cold storage facilities indicate that environmental considerations are subordinated to budgetary efficiency. If the health center

were required to fully comply with the technical standards set forth in the Minister of Environment and Forestry Regulation No. 56 of 2015, significant financial implications would arise. These would include increased capital expenditures for cold storage facilities and wastewater treatment systems, as well as higher operational costs due to more frequent waste collection and maintenance requirements. From an environmental accounting perspective, this condition reflects the limited role of accounting systems in supporting environmentally informed decision-making. As emphasized in environmental management accounting literature, accounting should function not only as a recording mechanism but also as a strategic tool for identifying environmental risks and guiding resource allocation (Burritt et al., 2023).

A more detailed analysis across the stages of environmental accounting reveals a consistent pattern of partial implementation. At the identification stage, environmental costs are only recognized for solid medical waste managed through third-party services, while other cost components, particularly those related to liquid waste, remain unaccounted for. This selective identification indicates a narrow interpretation of environmental costs. At the recognition and measurement stages, the use of cash-based accounting reflects compliance with public sector financial practices; however, it constrains the ability to capture the full economic implications of environmental activities and limits the application of accrual-based environmental cost tracking.

At the presentation and disclosure stages, environmental costs are not reported as distinct accounts but are embedded within general expenditure categories. This aggregation reduces cost visibility and weakens the informational value of financial reports for decision-making purposes. Furthermore, the absence of publicly accessible environmental disclosures indicates that accountability mechanisms remain internally oriented rather than stakeholder-driven. Taken together, these findings demonstrate that environmental accounting practices at the Pangkalbalam Community Health Center remain operational and administrative, rather than strategic and transparent.

From a cost structure perspective, the dominance of expenditures related to waste handling after generation suggests that environmental costs are primarily classified as internal failure costs, as conceptualized by Hansen and Mowen. The absence of prevention and detection costs such as investments in waste minimization, staff training, monitoring systems, or infrastructure development indicates a reactive approach to environmental management. This reactive orientation limits the organization's ability to reduce environmental risks proactively and achieve long-term cost efficiency.

The lack of explicit environmental cost disclosure further reflects a constrained interpretation of public sector accountability. Although waste management information is reported internally to the Health Office and local government, it is not made available to the broader public. This finding implies that accountability is primarily administrative, focusing on compliance with hierarchical reporting requirements rather than transparency toward external stakeholders. From a legitimacy theory perspective, limited disclosure restricts the organization's ability to achieve substantive legitimacy, as stakeholders are unable to evaluate environmental performance (Adyaksana et al., 2022; Wahyuningrum et al., 2025).

Importantly, these findings should not be interpreted solely at the organizational level but must be situated within the broader urban governance context. The limitations observed such as infrastructure gaps, financial constraints, and limited reporting practices reflect systemic challenges in urban waste management systems in Indonesia, including institutional capacity and inter-agency coordination issues. This indicates that the environmental accounting practices observed are embedded within a wider structural environment rather than being isolated organizational deficiencies.

Comparative analysis with prior studies confirms that this pattern is not unique. Similar findings have been reported in the Indonesian healthcare sector, where environmental costs are recognized but not strategically managed or transparently disclosed. However, this research extends the literature by demonstrating that such limitations are also evident in non-inpatient primary healthcare facilities. Unlike large hospitals in metropolitan areas, which typically have more advanced accounting systems, dedicated environmental units, and stronger external pressures from regulators and accreditation bodies, community health centers in medium-sized cities operate with more limited financial resources, simpler organizational structures, and lower public scrutiny. These differences result in distinct accounting dynamics, where environmental accounting practices tend to be cash-based, fragmented, and administratively oriented rather than strategic. This highlights that the challenges of environmental accounting are not only technical but also institutional, shaped by organizational capacity and governance context. This confirms that the limitations observed are not incidental but systemic, reflecting a distinct environmental accounting configuration in primary healthcare settings that differs structurally from hospital-based models.

From a Triple Bottom Line perspective, the findings reveal an imbalance in the integration of economic, environmental, and social dimensions. Economic considerations particularly cost efficiency remain dominant in decision-making processes, while environmental and social dimensions receive comparatively less attention. This imbalance reinforces the tendency toward symbolic legitimacy and limits the organization's ability to achieve sustainable performance. In this sense, the TBL framework complements legitimacy theory by illustrating how imbalances across these three dimensions can undermine the achievement of substantive legitimacy.

Overall, this research identifies a structural disconnect between operational waste management practices, environmental accounting systems, and public accountability mechanisms. While technical waste management activities are relatively functional, they are not supported by comprehensive accounting and reporting systems that enable transparency and strategic decision-making. This fragmentation indicates that the transition toward sustainable healthcare management remains incomplete.

This research contributes to the literature by demonstrating that environmental accounting in primary healthcare settings tends to be implemented in a fragmented and stage-incomplete manner. Unlike prior research focusing predominantly on hospital settings, this research shows that community health centers exhibit a reactive environmental cost structure dominated by internal failure costs, with limited integration of preventive and strategic accounting practices. This finding extends the applicability of environmental accounting frameworks to lower-tier healthcare institutions and highlights the need for more inclusive models that account for resource constraints and institutional capacity.

Finally, the findings underscore the strategic importance of strengthening environmental accounting practices as a bridge between environmental policy and operational implementation. Enhancing cost classification, adopting accrual-based environmental accounting approaches, improving disclosure practices, and investing in preventive environmental measures are essential steps toward achieving substantive legitimacy and long-term sustainability. Without such improvements, environmental management efforts will remain compliance-oriented and administratively driven, limiting their effectiveness in addressing increasingly complex environmental challenges in the healthcare sector.

CONCLUSIONS AND SUGGESTION

Conclusions

This research concludes that while medical waste management practices at the Pangkalbalam Community Health Center have been operationally implemented in accordance with regulatory requirements, their integration with environmental accounting remains partial and predominantly administrative. The findings reveal a structural gap between technical waste management practices and the accounting systems intended to support environmental decision-making and accountability.

From an environmental accounting perspective, the implementation across the five stages identification, recognition, measurement, presentation, and disclosure remains incomplete and uneven. Environmental costs are selectively identified, primarily limited to solid medical waste managed through third-party services, while other cost components, particularly liquid waste, are not systematically accounted for. Although costs are recognized and measured in monetary terms, their classification within general expenditure categories reduces cost visibility and limits their analytical value.

At the presentation and disclosure stages, environmental costs are not reported as distinct accounts and remain embedded within general operational expenditures, constraining transparency and weakening the role of accounting information in environmental performance evaluation. Furthermore, environmental reporting is confined to internal administrative channels and is not publicly disclosed. In addition, the environmental cost structure is predominantly reactive, characterized by internal failure costs associated with post-generation waste handling, while preventive and detection-oriented costs remain minimal. This indicates that environmental accounting has not yet functioned as a strategic instrument for risk mitigation and sustainability planning.

From a theoretical perspective, these findings indicate the presence of symbolic legitimacy, where compliance with regulatory requirements is achieved at a procedural level but not fully realized in substantive environmental practices. The imbalance observed from a Triple Bottom Line perspective where economic considerations dominate over environmental and social dimensions further limits the contribution of primary healthcare facilities to sustainable development.

This research contributes to the literature by demonstrating that environmental accounting implementation in non-inpatient primary healthcare facilities is not merely underdeveloped but structurally distinct. These differences are shaped by limited institutional capacity, simplified organizational structures, and relatively low external legitimacy pressures, resulting in accounting practices that are administrative, cash-based, and reactive. Consequently, environmental costs are predominantly classified as internal failure costs, with minimal integration of prevention and detection mechanisms. This finding highlights that improving environmental accounting requires not only technical adjustments but also systemic institutional strengthening. Theoretically, this research extends environmental accounting literature by demonstrating that cost structure classifications and accounting practices are contingent upon institutional context, particularly in lower-tier public healthcare organizations.

Suggestion

Based on the findings and conclusions, several strategic recommendations are proposed to strengthen the integration of environmental accounting and medical waste management in primary healthcare facilities. First, healthcare facilities should adopt a comprehensive environmental cost classification system based on Hansen and

Mowen's framework, explicitly distinguishing between prevention, detection, internal failure, and external failure costs. This would enable a transition from a reactive cost structure toward a preventive and strategic environmental management approach.

Second, environmental costs should be presented and disclosed as separate accounts within financial statements in accordance with applicable accounting standards. The development of dedicated environmental cost reporting, including supplementary disclosures, would enhance transparency, improve accountability, and increase the usefulness of accounting information for both managerial and stakeholder decision-making. Third, institutional capacity should be strengthened through continuous training and technical support in environmental accounting and sustainable waste management. Improving the competencies of financial and operational staff is essential to ensure that environmental considerations are systematically integrated into budgeting, accounting, and performance evaluation processes.

Fourth, local government agencies, particularly the Health Department and Environmental Agency, should establish clearer technical guidelines and standardized frameworks for environmental cost reporting in public healthcare institutions. Strengthened monitoring systems and inter-agency coordination are necessary to ensure consistent implementation and to position environmental accounting as a policy-supporting instrument rather than merely an administrative requirement. Finally, future research should expand the scope of analysis by conducting comparative and multi-site studies across different levels of healthcare facilities, as well as incorporating quantitative approaches to measure environmental costs and impacts more precisely. Such research would contribute to the development of more robust and context-sensitive environmental accounting models in the public healthcare sector.

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