

Negative Externalities of Jeneponto Power Plant: Integrating Sustainable Policy Formulation Through Environmental Management Accounting (EMA)

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Abstract: The operation of coal-fired power plants in Punagaya Village, Jeneponto Regency, causes various negative externalities that are not yet fully reflected in the companies' cost structures. These impacts include air pollution, thermal pollution in coastal waters, heavy metal contamination from fly ash and bottom ash waste, declining productivity of seaweed farming, and increasing health risks for local communities. Using a qualitative approach that involves field observations, stakeholder interviews, and regulatory analysis, this study finds that existing Corporate Social Responsibility (CSR) programs remain largely philanthropic and do not address the root causes of environmental externalities. Therefore, this study recommends adopting Environmental Management Accounting (EMA) as a tool to internalize environmental costs and to develop more sustainable energy policies.

Keywords : PLTU; Pollution; Management; CSR, EMA

Abstrak: Operasi Pembangkit Listrik Tenaga Uap (PLTU) batu bara di Desa Punagaya, Kabupaten Jeneponto, menimbulkan berbagai eksternalitas negatif yang belum sepenuhnya tercermin dalam struktur biaya perusahaan. Dampak-dampak tersebut meliputi pencemaran udara, polusi termal di perairan pesisir, kontaminasi logam berat dari limbah fly ash dan bottom ash (FABA), penurunan produktivitas budidaya rumput laut, serta peningkatan risiko kesehatan bagi masyarakat lokal. Dengan menggunakan pendekatan kualitatif yang melibatkan observasi lapangan, wawancara pemangku kepentingan, dan analisis regulasi, studi ini menemukan bahwa program Tanggung Jawab Sosial Perusahaan atau Corporate Social Responsibility (CSR) yang ada saat ini sebagian besar masih bersifat filantropis dan belum mengatasi akar penyebab eksternalitas lingkungan tersebut. Oleh karena itu, studi ini merekomendasikan penerapan Akuntansi Manajemen Lingkungan atau Environmental Management Accounting (EMA) sebagai instrumen untuk menginternalisasi biaya lingkungan dan menyusun kebijakan energi yang lebih berkelanjutan.

Kata Kunci : PLTU; Polusi; Manajemen; CSR, EMA

INTRODUCTION

The global transition toward sustainable energy paradigms demands a fundamental reassessment of how industrialized nations account for corporate environmental degradation. In

developing economies like Indonesia, despite expanding renewable energy targets, coal-fired steam power plants (*Pembangkit Listrik Tenaga Uap* [PLTU]) remain the backbone of the national grid, operating at a high cost to local ecosystems (Pangerang et al., 2023). The core structural problem lies in the fact that these facilities generate severe, unpriced negative externalities that are routinely excluded from corporate financial statements and sustainability policies.

This systemic omission isolates corporate profitability from localized ecological and socio-economic collapses, placing the massive financial and structural burden of industrial pollution squarely on the shoulders of local communities (Elliott & Wither). While international benchmarks estimate that uninternalized health and environmental costs from coal can reach up to USD 84.19 per MWh, Indonesian corporations lack a standardized mechanism to internalize these figures, leaving a deep chasm between industrial activity and true economic accountability (Haq & Ihsanuddin., 2025).

This accountability vacuum is critically and uniquely exemplified in Punagaya Village, Bangkala District, Jeneponto Regency, South Sulawesi. This coastal region suffers from a compounding ecological strain that is rarely seen in standard environmental impact assessments due to the co-existence of two massive, adjacent power generation facilities managed by different operators: PLTU Jeneponto (PT Bosowa Energi, 2×135 MW) and PLTU Punagaya (PT PLN Persero, 2×100 MW). The dual operation of these plants creates a highly localized, high-density cluster of environmental degradation. Although comprehensive national legal frameworks such as Law No. 32 of 2009 on Environmental Protection and Management and Government Regulation No. 22 of 2021 mandate strict liability for environmental damages and hazardous waste (*B3*) management, regional enforcement remains heavily compromised (Ahmadi et al., 2025). The implementation of Environmental Management and Monitoring Plans (RKL-RPL) is largely superficial, primarily because regulatory bodies and corporations lack a localized, quantitative financial tool to transform physical ecological damage into enforceable corporate economic liabilities.

At the base of this regulatory failure lies a severe multidimensional crisis directly impacting the Punagaya community across ecological, economic, public health, and labor sectors. Contrary to commitments outlined in their Environmental Impact Assessments (AMDAL), the facilities discharge untreated thermal wastewater directly into coastal zones, raising sea temperatures up to 31.1°C, which breaches the optimal threshold for *Eucheuma cottonii* seaweed cultivation. This thermal contamination causes widespread seaweed bleaching, devastating the primary livelihood of local farmers who face catastrophic losses of around IDR 100 million per incident against a baseline seasonal harvest revenue of IDR 163 million (Kurniati et al., 2020).

Simultaneously, coal spills at the jetty contaminate marine sediments with heavy metals like mercury and copper, while stack emissions drive a severe escalation of acute respiratory infections (ARI) in nearby hamlets like Bungung Labuang, forcing underfunded public health centers (*Puskesmas Pembantu*) and poor households to bear the healthcare costs. This socio-economic instability reached a boiling point in mid-2025 with the abrupt termination of 185 workers from PLTU Punagaya and a structural shift toward precarious, non-contractual third-party vendors, openly violating Article 54(3) of the Indonesian Manpower Law and triggering intense localized social friction.

Previous research by Badrudin Kurniawan (2019) examined the regulatory supervision of hazardous waste management in Indonesia. Musalim Muttar et al. (2021) analyzed the social, economic, and environmental impacts of the Jeneponto coal power plant based on community perceptions. However, these studies did not systematically quantify environmental costs. Even the WALHI South Sulawesi report (2023), which provides extensive empirical data, has not integrated its analysis within an EMA framework (Syafaat et al., 2025). This gap motivates the present study, which aims to (1) identify the types of negative externalities arising from PLTU operations in Punagaya Village and estimate their environmental costs using the EMA approach; (2) examine how integrating EMA and CSR can provide a measurable tool for corporate accountability; and (3) formulate policy recommendations to reduce negative externalities and improve sustainable power plant governance. By addressing these objectives, this study advances the EMA literature in Indonesia and offers practical, evidence-based solutions for managing the environmental impacts of coal-fired power plants.

While existing literature recognizes the destructive nature of coal power, a distinct methodological and geographical gap persists. Previous academic assessments on the Jeneponto complex have focused almost exclusively on qualitative public perceptions of risk or institutional critiques of hazardous waste oversight, leaving the financial dimensions untouched. Even the extensive, data rich empirical reports published by civil society organizations like WALHI South Sulawesi remain strictly biophysical and descriptive. To date, no academic study has systematically translated these compounding ecological, health, and labor externalities into a structured corporate accounting framework. To bridge this regulatory and empirical divide, this study introduces Environmental Management Accounting (EMA) as an integrative, quantitative framework capable of tracing and converting physical environmental impacts into monetary corporate costs. Consequently, this research aims to systematically quantify the monetary value of these negative externalities using the EMA framework, examine how integrating EMA with Corporate Social Responsibility (CSR) can serve as an auditable tool for corporate accountability, and formulate data-driven sustainable policy recommendations to reform state-corporate energy governance in Indonesia.

RESEARCH METHOD

This study adopts a qualitative phenomenological approach to explore experiences and perceptions related to environmental management in the coal-fired power plant (PLTU) sector in Jeneponto Regency. Using data triangulation, including field observations, in-depth interviews with stakeholders, and regulatory document analysis, the research seeks to provide a more comprehensive understanding of environmental management practices within the energy industry. Environmental Management Accounting (EMA) helps companies accurately identify, measure, and assign costs to products or processes, enhancing managerial efficiency. EMA also supports executives in overseeing corporate environmental performance by providing information about business processes, including raw materials, energy resources, liquid inputs, and waste outputs.

This research primarily focuses on analyzing environmental law violations in coal-fired power plants and exploring how implementing Environmental Management Accounting (EMA) through Corporate Social Responsibility (CSR) can help create more effective policies. The EMA framework is used to identify and quantify negative externalities in economic terms, particularly costs associated with pollution and environmental impacts. The expected results include pinpointing environmental costs, developing more accurate measurement tools, and offering policy recommendations based on environmental-economic valuation to promote more sustainable management of coal power plants. This study adopts a qualitative phenomenological approach to explore experiences and perceptions related to environmental management in the coal-fired power plant (PLTU) sector in Jeneponto Regency. Using data triangulation, including field observations, in-depth interviews with stakeholders, and regulatory document analysis, the research seeks to provide a more comprehensive understanding of environmental management practices within the energy industry.

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This study utilizes three complementary categories of materials within a data triangulation framework. Primary data were collected through direct observations around the Bosowa Energi and PLN coal-fired power plants in Jeneponto Regency, South Sulawesi, focusing on surrounding

environmental conditions, the management of fly ash and bottom ash, and emission control infrastructure. In-depth interviews were also conducted with key stakeholders, including the Head of Punagaya Village and local community members, to capture their experiences and perceptions of corporate environmental management practices. The second category consists of regulatory and policy documents, including Law No. 32 of 2009, Government Regulation No. 22 of 2021, regulations on the B3 waste manifest system, as well as AMDAL, RKL, and RPL documents, which were reviewed to assess operational compliance. The third category includes academic literature and technical reports on Environmental Management Accounting (EMA), Corporate Social Responsibility (CSR) in the energy sector, and environmental impact reports on the Jeneponto coal-fired power plants, including reports from WALHI South Sulawesi. These materials were analyzed integratively to identify environmental externalities, evaluate regulatory compliance, and formulate solutions based on the EMA–CSR approach.

RESULTS AND DISCUSSIONS

Analyzing The Corporate Responsibility of Coal-Fired Power Plants in Jeneponto Regency Toward Local Communities

Electricity has become a necessity in modern life, supporting various sectors such as communication, transportation, healthcare, and education. This growing dependence has driven the development of energy infrastructure, including coal-fired power plants. However, the operation of such power plants often generates significant environmental and social externalities, thereby requiring the implementation of Corporate Social Responsibility (CSR) that goes beyond philanthropic activities and includes the mitigation of operational impacts on surrounding communities, as observed in the coal-fired power plants in Jeneponto Regency, South Sulawesi (Kamaruddin *et al.*, 2024).

Theoretically, corporate responsibility in this context can be explained through three main legal frameworks: Strict Liability, the Polluter Pays Principle (PPP), and the human right to a healthy environment. The principle of strict liability, as outlined in Article 88 of Law No. 32 of 2009, holds business actors responsible for environmental damage resulting from hazardous activities, without requiring proof of fault. Accordingly, the operation of the Jeneponto coal-fired power plants, which produces hazardous waste in the form of fly ash and bottom ash, legally entails responsibility for the ecological, economic, and health-related losses experienced by the residents of Punagaya Village. These impacts include increased sea temperatures that damage seaweed cultivation, heavy metal contamination in marine organisms, and a rising incidence of Acute Respiratory Infections (ARI) (BMKG., 2020).

The Polluter Pays Principle emphasizes that all costs of pollution should be borne by the polluting entity. In practice, however, the externality costs of coal-fired power plants are often borne by local communities through economic losses suffered by fishers and seaweed farmers, as well as healthcare expenses caused by pollution (Jayasinghe., 2024). This situation reflects a hidden subsidy for the coal industry and contradicts the principle of environmental justice. Meanwhile, Article 28H(1) of the 1945 Constitution affirms that the right to a healthy environment is a constitutional right that cannot be compromised by economic interests or national electrification targets.

Based on this framework, corporate responsibility should be holistic and encompass four main dimensions: (1) restorative, through environmental recovery measures such as coastal rehabilitation and monitoring of water and air quality; (2) compensatory, in the form of economic compensation for the losses experienced by fishers, seaweed farmers, and community health costs; (3) preventive, through investment in emission control technologies and continuous environmental monitoring systems; and (4) participatory, by involving affected communities in decision-making processes that influence their environment (Adiansyah., 2025).

In practice, CSR programs implemented by the Jeneponto coal-fired power plants are still largely dominated by philanthropic assistance, such as the distribution of basic food packages, sacrificial animals during religious holidays, or village infrastructure repairs (Irawan *et al.*, 2025). Based on Carroll's CSR Pyramid (1991), such forms of assistance remain at the level of philanthropic responsibility and do not yet fulfill the more fundamental ethical and legal

responsibilities (Asy'ari et al., 2023). Therefore, the compensation that should be provided needs to include measurable economic compensation, sustainable healthcare services, coastal ecosystem restoration, community economic empowerment, and a benefit-sharing scheme proportional to the scale of the impacts generated (Silitonga., 2024).

Moreover, CSR management that is currently dominated by unilateral corporate decision-making has the potential to create conflicts of interest. A more accountable model would involve the establishment of a multi-stakeholder CSR governance body that includes companies, local governments, affected communities, and independent organizations. This approach is consistent with Stakeholder Theory, which emphasizes the participation of all affected parties and enables more transparent oversight (KOMNAS HAM., 2016).

Thus, CSR in coal-fired power plants should not be understood merely as philanthropic activity but as a mechanism of corporate accountability that must adhere to the principles of proportionality, sustainability, and community participation. The integration of environmental legal frameworks with the Environmental Management Accounting (EMA) approach is therefore essential to objectively quantify externalities and determine fair, evidence-based forms of compensation (Dela et al., 2024).

Environmental Management Accounting (EMA) Analysis Through Corporate Social Responsibility (CSR) in Formulating Policy Solutions To Coal-Fired Power Plant Issues

Corporate Social Responsibility (CSR) is a corporate strategy that not only emphasizes moral considerations but is also designed to integrate economic, social, and environmental interests in pursuit of sustainable development. CSR has become an important instrument for companies particularly in the energy sector such as coal-fired power plants in strengthening social legitimacy and fostering harmonious relationships with surrounding communities (Mahlangeni et al., 2025). CSR implementation encompasses various forms, including community empowerment, environmental protection, and the provision of public infrastructure. It also involves environmental cost reporting, ranging from direct costs such as waste treatment and emission control to indirect costs associated with long-term impacts on ecosystems or local communities, including the assessment of potential environmental risks such as financial losses resulting from climate change induced natural disasters (Nugraha et al., 2025).

Common CSR practices adopted by businesses include reducing carbon emissions, providing training programs for local communities, offering educational grants, and developing infrastructure that benefits the public. CSR also promotes collaboration among businesses, governments, and non-profit organizations in addressing complex social issues. In the long term, this cooperation helps foster harmonious relationships between businesses and communities while supporting integrated and sustainable development.

In line with CSR, Environmental Management Accounting (EMA) is an accounting approach that integrates environmental information into corporate decision-making processes. EMA enables companies to identify, measure, and manage environmental costs arising from their activities, as well as to evaluate the effectiveness of implemented CSR programs. Environmental accounting serves as a mechanism for reporting organizational operations in relation to environmental aspects, aiming to provide information on corporate operational performance based on environmental protection principles. Technically, EMA combines cost accounting and financial accounting to reduce environmental impacts and risks, thereby minimizing environmental protection costs and supporting top management in making decisions to improve overall performance (Aqila & Sisdianto., 2025).

Environmental accounting is a reporting system that links organizational operational activities with their environmental impacts. Its objective is to provide information regarding corporate performance in environmental protection. One of the approaches used is Environmental Management Accounting (EMA), which integrates cost accounting and financial accounting to identify, measure, and control environmental costs. This integration supports managerial decision-making and enhances corporate performance in a sustainable manner (Maharani & Sudibijo., 2023).

In the coal-fired power plant sector, Environmental Management Accounting (EMA) integrates environmental considerations into economic and operational decision-making by

identifying, recording, and analyzing costs arising from plant activities. These costs include greenhouse gas emissions, water consumption, impacts on air, soil, and water quality, as well as the management of combustion residues such as fly ash and bottom ash. Through EMA, environmental costs can be grouped into direct costs, including transportation, storage, and waste treatment; indirect costs, such as economic losses experienced by fishers and community healthcare expenses caused by pollution; and contingency costs, including provisions for environmental remediation, administrative penalties, and compensation for environmental damage..

Through this system, companies can monitor and evaluate the environmental impacts of their operational activities in a more measurable manner. The results of EMA analysis can be used to formulate policies for emission reduction, energy efficiency, and the adoption of environmentally friendly technologies while maintaining the financial sustainability of the company (Odang & Sinambela., 2025). Consequently, the effective implementation of EMA will improve corporate environmental performance and encourage more ecologically responsible business decision-making (Kasmawati et al., 2021).

The design of EMA for environmental policy in coal-fired power plants aims to integrate environmental considerations into economic and operational decision-making in the energy sector. It focuses on recording and analyzing environmental costs arising from power plant operations, including greenhouse gas emissions, water usage, and impacts on air and soil quality. In the context of policy formulation, EMA can serve as an approach that supports evidence-based decision-making regarding the environmental and social impacts of industrial activities (Amelia & Sisdianto., 2024).

An interview with the Head of Punagaya Village, Mr. Andi Pangerang Mustamu, revealed the concrete role of PT Bosowa Energi in implementing CSR programs sustainably within its operational area. The village, which was previously categorized as underdeveloped, has gradually transformed into a self-reliant village following the provision of various forms of assistance, including basic food packages, sacrificial animals during religious celebrations, solar-powered street lighting, and the construction of a floating mosque. The company has also actively collaborated with the village government to design and implement community empowerment programs, such as seaweed cultivation and sewing training, symbolizing a synergy between the company and the local community. In addition, local residents have been directly involved in the power plant projects, with many villagers now working as security personnel, administrative staff, and technical workers according to their skills and training. Regarding social conflicts, the application of a “mutual benefit” (*ganti untung*) approach rather than simple compensation (*ganti rugi*) in the land acquisition process indicates that the company seeks to promote a more substantive form of CSR rather than merely symbolic initiatives.

From the perspective of Environmental Management Accounting (EMA), these contributions can be quantified in terms of socio-economic savings and measurable improvements in community welfare. EMA enables a more objective evaluation of CSR effectiveness, including the expansion of local employment opportunities, community participation in power plant projects, and the provision of public facilities that were previously unavailable. However, an honest EMA-based evaluation also reveals a significant gap: the value of existing CSR programs remains disproportionate to the total externality costs generated by the power plants. If the estimated health costs attributable to coal-fired power plants in Indonesia reach USD 84.19 per MWh, then with a total installed capacity of 470 MW operating in Jeneponto, the uninternalized externality costs are likely to far exceed the value of the CSR programs implemented. This represents a fundamental gap that must be addressed through a more serious integration of EMA and CSR.

In the context of coal-fired power plants, EMA implementation includes the identification and categorization of hazardous waste generated from the combustion process. Fly ash and bottom ash are classified as hazardous and toxic waste (B3) due to their heavy metal content and potential to contaminate the environment. EMA facilitates comprehensive recording of B3 waste management costs across three categories. First, direct costs, including the transportation of B3 waste using specialized vehicles, temporary storage in designated B3 facilities, and disposal at licensed hazardous waste treatment facilities. Second, indirect costs, related to economic impacts arising from heavy metal contamination in coastal waters that affects fishers' catch as well as public

health costs resulting from long-term exposure. Third, contingency costs, including reserves for potential environmental remediation, administrative penalties, and compensation in cases of pollution incidents.

Through this system, EMA enables companies to monitor and evaluate environmental impacts across operational activities, allowing them to identify areas requiring improvement to meet higher environmental standards. The more effectively EMA is implemented, the stronger the resulting environmental performance, and the more motivated business managers become to incorporate environmental considerations into their decision-making processes.

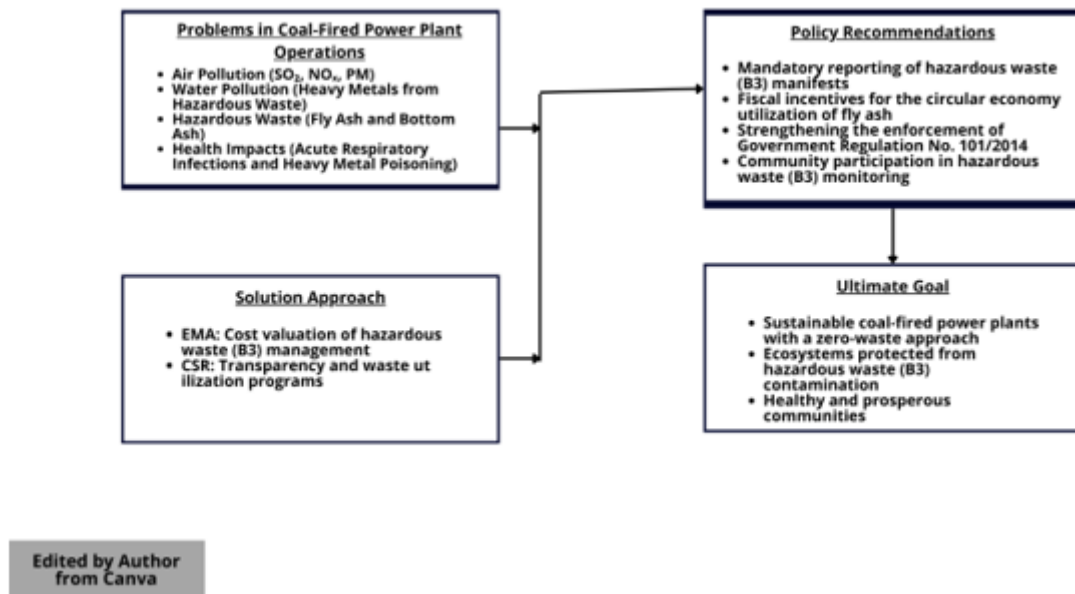


Figure 1. Integrated Policy Framework for B3 Waste Management in PLTU Through EMA-CSR Approach (Personal Documents)

The conceptual map titled “Policy Recommendations for the Jeneponto Coal-Fired Power Plants”, presented in a landscape format, is designed to visualize the analytical flow from problem identification to the formulation of data-driven and sustainability-oriented policy solutions. On the left side, the map highlights the main problems arising from the operation of coal-fired power plants, including air and water pollution, land degradation, and public health impacts. These issues represent the starting point that triggers the need for policy intervention. In the central section of the map, two primary solution approaches are presented: Environmental Management Accounting (EMA) and Corporate Social Responsibility (CSR). EMA functions as a quantitative tool to identify and measure environmental costs resulting from power plant activities, while CSR provides a social framework for returning benefits to communities through empowerment initiatives and environmental protection.

A fundamental issue identified in this study is that most externality costs associated with the Jeneponto coal-fired power plants are not included in any category within the companies’ cost structures. Losses experienced by seaweed farmers due to thermal pollution, rising healthcare expenses following the operation of the power plants, degradation of coastal ecosystems, and heavy metal contamination of marine sediments all represent real costs borne by other parties rather than by the companies generating them. From the perspective of EMA, this condition is referred to as unaccounted environmental cost, meaning environmental costs that are not recorded or recognized in accounting systems despite their tangible economic impacts on communities and ecosystems. The invisibility of these costs in corporate financial reports is not merely a technical accounting issue but also a fundamental issue of justice as companies receive the full benefits of their operations while communities bear costs they never consented to shoulder.

A comprehensive EMA-based solution for the challenges posed by the Jeneponto coal-fired power plants should be built upon four mutually reinforcing pillars. The first pillar is the full internalization of environmental costs into corporate cost structures. This requires companies to develop environmental accounting systems capable of identifying, measuring, and recording all categories of externality costs not only existing hazardous waste management costs but also community health expenses, ecosystem losses, reductions in agricultural and fisheries productivity, and social costs arising from community conflict and instability. These costs should be recognized in corporate financial statements as environmental liabilities, rather than being treated as voluntary disclosures or marginal notes. Such integration would provide management with comprehensive information on the total social costs associated with operational decisions, including those related to production technology, waste management systems, and CSR budget allocations.

The second pillar is the development of standardized and independently verifiable EMA measurement metrics. One of the primary weaknesses in EMA implementation in Indonesia is the absence of uniform and comparable measurement standards. For the Jeneponto coal-fired power plants, it is necessary to develop specific indicators such as periodic coastal water quality indices monitored at representative points, community health indicators based on epidemiological data that can be correlated with operational data from the power plants, economic valuation of degraded coastal ecosystem services, and estimates of the burden of disease epidemiologically associated with exposure to pollutants from coal-fired power plants. These metrics should be verified by independent environmental auditors and publicly disclosed to ensure transparency and credibility, thereby providing a reliable basis for compensation schemes and evaluations of mitigation program effectiveness. From a policy perspective, EMA-based analysis of CSR implementation also allows governments and companies to design more targeted interventions, such as assessing impacts on specific actors within the seaweed supply chain and developing more inclusive CSR schemes.

The third pillar involves the integration of EMA into mandatory and standardized sustainability reporting systems. Currently, sustainability reports in the Indonesian energy sector remain largely voluntary and non-standardized, limiting their comparability and accountability. Integrating environmental accounting with CSR represents a strategic step toward enhancing corporate sustainability performance. Such integration enables companies not only to manage environmental impacts more effectively but also to design CSR programs that are relevant and evidence-based by relying on accurate EMA data.

In the specific context of hazardous waste management in coal-fired power plants, the integration of CSR and environmental accounting should encompass three concrete programs. First, reporting transparency, including the public disclosure of hazardous waste manifests and waste management reports to communities and regulators. Second, circular economy-based waste utilization, through CSR programs that support research on the use of fly ash as a substitute material for cement or construction materials, thereby reducing the volume of waste requiring disposal. Third, community empowerment, including public awareness campaigns on the risks of hazardous waste and participatory monitoring programs that involve local communities in environmental oversight. International experiences show that coal-fired power plants in countries such as Germany and Japan have successfully integrated hazardous waste management into circular economy models, where up to 90% of fly ash is utilized in the construction industry. This practice not only reduces disposal costs but also creates additional revenue streams, although its implementation in Indonesia requires supportive fiscal incentives and the development of technical standards for coal waste utilization.

The fourth pillar is the strengthening of institutional capacity for EMA implementation and oversight. Effective EMA implementation cannot rely solely on corporate initiative without strong external monitoring mechanisms. Environmental agencies at the district and provincial levels should strengthen their capacity to understand and audit corporate EMA reports, enabling them to detect unrecorded or inaccurately quantified environmental costs. Universities and independent research institutions such as leading academic institutions in South Sulawesi can act as independent verification partners by developing measurement methodologies, conducting periodic environmental audits, and publicly disseminating findings. At the same time, local communities should be empowered to understand EMA data and use it as a basis for advocating their

environmental rights. This approach represents a form of community-based environmental monitoring, which in the long term can create a multilayered oversight system more effective than government supervision alone.

The policy recommendation concept map for the Jeneponto coal-fired power plants, illustrated in Figure 4, presents a structured analytical pathway from problem identification to the formulation of sustainable and evidence-based policy solutions. The left side of the diagram outlines key operational problems air and water pollution, land degradation, and public health impacts as the initial triggers for intervention. The central section highlights the two principal solution frameworks: EMA as a quantitative tool for identifying and measuring environmental costs, and CSR as a social framework for redistributing benefits through community empowerment and environmental protection. The right side presents concrete policy recommendations, including mandatory EMA-based environmental reporting, participatory and measurable CSR implementation, and strengthened sanctions through the application of the strict liability principle. All of these measures ultimately aim to achieve sustainable coal-fired power plant operations, protected environmental conditions, and socially empowered communities through evidence-based policy.

Overall, the EMA-based analysis demonstrates that the challenges associated with the Jeneponto coal-fired power plants are not merely technical operational issues but rather structural problems within corporate accounting and governance systems that fail to recognize social and environmental costs as integral components of production costs. As long as these costs remain unrecorded and unrecognized, there will be no systemic incentives for companies to invest in cleaner technologies, responsibly manage hazardous waste, or provide proportional compensation to affected communities. Consequently, the real solution does not lie in the addition of fragmented CSR initiatives, but rather in a fundamental transformation of corporate accounting systems through comprehensive, transparent, and verifiable EMA integration. Such transformation can only be achieved through synergy among corporate commitment, strong regulatory frameworks, and meaningful community participation. This approach ensures that CSR moves beyond charitable activities and contributes substantively to mitigating environmental and health risks associated with hazardous waste, thereby ensuring that energy development considers not only efficiency but also social justice and environmental sustainability.

CONCLUSION AND RECOMENDATION

The operation of the coal-fired power plant in Jeneponto generates significant negative externalities including air, thermal, and FABA waste pollution that degrade ecosystems, reduce seaweed farming productivity, and increase public health risks. Currently, these social and environmental costs are borne by the local community rather than being internalized into the company's cost structures. This study reveals that existing CSR practices are predominantly philanthropic and fail to address the structural impacts of the power plant. Consequently, CSR must evolve from mere charity into a strategic accountability mechanism focused on mitigation and community compensation. Integrating Environmental Management Accounting (EMA) with CSR offers a practical framework to identify, measure, and internalize these environmental costs into corporate decision-making. Supported by robust regulatory oversight, this integrated EMA–CSR approach enhances transparency, fosters sustainable energy governance, and balances energy production with environmental protection and social justice.

Based on the empirical findings, this study suggests that the Ministry of Environment and Forestry (KLHK) and regional agencies must transition from voluntary disclosures to mandating standardized Environmental Management Accounting (EMA) in corporate sustainability reporting, explicitly disclosing hazardous waste manifests and externalized socio-environmental costs. Industrial operators, specifically PT Bosowa Energi and PT PLN Persero, must urgently pivot from philanthropic Corporate Social Responsibility (CSR) toward proactive, EMA-data driven allocation that is proportional to estimated ecological and health externalities. Management should also invest in circular economy initiatives by utilizing generated fly ash and bottom ash as cement substitutes to mitigate hazardous accumulation. Finally, future academic research should transition toward

quantitative mixed-methods, deploying economic valuation models to precisely measure monetary losses from seaweed bleaching and localized healthcare crises.

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