

ESG Best Practices in Indonesian Geothermal Industry: Comparative Study

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Keywords: ESG, Best Practices, Geothermal, Renewable Energy, Indonesia

ABSTRACT

The geothermal industry in Indonesia plays a strategic role in supporting the transition to clean energy at the national level. Implementation of Environmental, Social, and Governance (ESG) principles become a key element to ensure the sustainability of this sector. In addition, ESG aspects have also become a focus for investors and capital owners who are committed to contributing to sustainable development. Geothermal company initiatives towards ESG implementation through best practices are consistently implemented. This research aims to assess ESG best practices in Indonesia's geothermal industry through a comparative study between two companies, PT A and PT B. This research method uses a qualitative approach through a literature study on each company's sustainability report, journal articles, books, institutional publications, and websites. ESG assessment refers to the Global Reporting Initiative (GRI) 2021 standard and ESG Risk Rating data from Sustainalytics. The results of the analysis show that PT A has a powerful ESG performance, with an ESG Risk Rating value of 7.1, which puts it in the "Negligible Risk" category and as the first rank in the global utility sector. PT A is also active in green ecosystem development through various Corporate Social Responsibility (CSR) programs, such as biodiversity conservation and local community empowerment. On the other hand, PT B has an ESG Risk Rating of 21.3, which puts it in the "Medium Risk" category, with an emphasis on energy efficiency and environmental governance at project. While not as advanced as PT A in the global rating, PT B shows progress in ESG reporting and implementation of community-based social programs. This comparison shows that effective ESG practices in Indonesia's geothermal industry can be achieved through sustainable environmental management, inclusive social responsibility, and active stakeholder engagement. This is also supported by the adoption of various strategic initiatives and transparency in public reporting. Strategic recommendations in improving ESG performance can be done through strengthening community, SROI-based impact measurement, and public participation.

1 INTRODUCTION

The geothermal sector in Indonesia holds a pivotal position in the country's energy landscape, contributing significantly to the national agenda of clean and sustainable energy transition. Geothermal energy, particularly in direct heating applications, can substantially reduce CO₂ emissions and decrease dependence on fossil fuels, thereby improving energy security through a stable, weather-independent renewable resources (Arcuri et al., 2025). As global sustainability imperatives gain momentum, Environmental, Social, and Governance (ESG) principles have emerged as critical pillars for ensuring long-term sectoral sustainability, risk management, and enhanced investor confidence (Lee and Koh, 2024). The adoption of ESG frameworks aligns operational performance with environmental stewardship, social inclusivity, and sound governance practices, which collectively bolster corporate accountability and transparency. In a broader context, ESG disclosure has been shown to have a positive impact on energy and manufacturing sectors by improving transparency, accountability, and operational efficiency, which in turn strengthens stakeholder trust and supports responsible business practices.

Recent research underscores the strategic role of ESG in promoting not only compliance but also sustainable value creation within renewable energy industries (Liu, H., 2024). In Indonesia's geothermal industry, leading companies such as PT A and PT B exemplify this trend through their progressive implementation of ESG best practices embedded within their corporate sustainability agendas. These practices are increasingly benchmarked against globally recognized frameworks like the Global Reporting Initiative (GRI) 2021 standards, which emphasize comprehensive disclosures on material environmental and social impacts, governance mechanisms, and stakeholder engagement processes (Global Reporting Initiative, 2021).

The Environmental, Social, and Governance (ESG) framework emphasizes that companies should address not only financial performance but also environmental and social responsibilities, as well as governance practices. ESG has evolved into a broad sustainability indicator that transcends the pursuit of profit alone. The integration of ESG has been demonstrated to enhance both financial performance and corporate reputation through sustainability policies, community engagement, and transparent governance structures (Padantya, 2024). This paradigm reflects the principles of the Triple Bottom Line, which advocates for balanced consideration of environmental, social, and economic dimensions in evaluating corporate success.

The Triple Bottom Line (TBL) concept was first introduced by John Elkington in 1994 and elaborated further in his book *Cannibals with Forks* (Elkington, 1998, p. ix). TBL comprises three pillars: economic prosperity, environmental quality, and social justice. According to Andrew Savitz, as cited in Slaper and Hall (2011), TBL "captures the essence of sustainability by measuring the impact of an organization's activities on the world, including both its profitability and shareholder values and its social, human, and environmental capital." Smith and Sharicz (2011) add that TBL reflects "the result of the activities of an organization—voluntary or governed by law—that demonstrate the ability of the organization to maintain viable its business operations (including financial viability as appropriate) whilst not negatively impacting any social or ecological systems." These definitions emphasize that TBL provides a multidimensional performance measurement framework that considers financial, social, and environmental outcomes (Nurfatimah, 2024).

Renewable energy sources, such as geothermal energy, possess significant potential in supporting sustainable development goals. Through the ESG and TBL lenses, geothermal projects are evaluated based on their contributions to economic, social, and

environmental targets. Review studies have shown that properly designed geothermal energy projects can create economic value (e.g., job creation, reliable energy supply), deliver social benefits (e.g., community acceptance, local infrastructure), and contribute to environmental protection (e.g., reduced emissions, conservation) (Sitompul, 2024).

At present, the Global Reporting Initiative (GRI) guideline are the most widely adopted standards for sustainability reporting. In the context of geothermal energy, sustainability assessments incorporate environmental indicators (e.g., emissions, water and land use), social metrics (e.g., community acceptance, employment opportunities), and economic factors (e.g., cost, efficiency, revenue) (Shortall, 2015). As a form of renewable energy, the geothermal sector plays a crucial role in the global energy transition agenda. Despite its classification as a low-carbon energy source, the long-term sustainability of geothermal operations is not solely determined by environmentally friendly technologies. Instead, social performance and corporate governance are also critical. Hence, ESG emerges as a fundamental approach for evaluating sustainability and investment feasibility in geothermal projects.

Morningstar utilizes Sustainalytics' ESG Risk Ratings to evaluate the sustainability of funds. These ratings award "globes," with a greater number of globes signifying lower ESG risk. Sustainalytics' ESG Risk Ratings provide a framework for assessing financially material ESG risks at both the security and portfolio levels, offering insights into their potential implications for the long-term performance of equity and fixed income investments. Sustainalytics defines ESG Risk as "the degree to which a company's economic value is at risk" due to ESG factors. This rating system supports investment decisions by quantifying exposure to unmanaged ESG risks and has become a widely accepted metric in ESG performance evaluation across various industries, including geothermal energy.

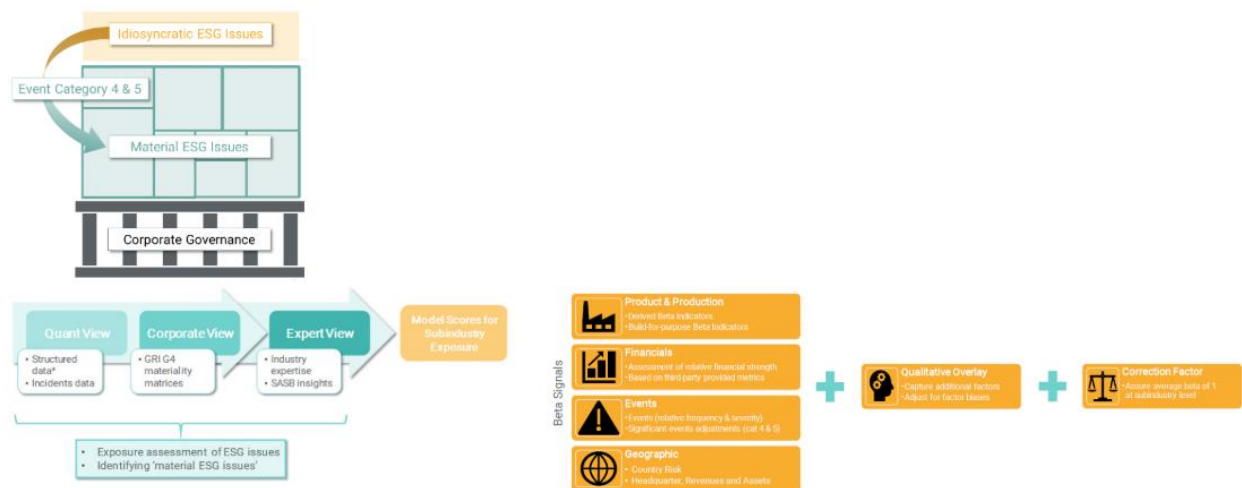


Figure 1: Sustainalytics Concept

Environmental, Social, and Governance (ESG) ratings have transcended their original role as symbolic indicators of corporate reputation, becoming critical determinants in the allocation of sustainable capital. In Southeast Asia, Sustainalytics has emerged as a dominant and trusted third-party verifier, providing robust due diligence for financing geothermal projects. Consequently, Indonesian geothermal companies face heightened market discipline, compelling them to continuously elevate environmental stewardship, deepen community engagement, and fortify governance structures to maintain competitiveness and secure capital inflows.

Within this evolving landscape, ESG ratings offer a standardized, objective, and forward-looking framework for evaluating corporate exposure to sustainability-related risks. Sustainalytics' methodology is anchored in the identification of Material ESG Issues (MEIs), each representing a specific, high-impact domain such as emissions management, biodiversity conservation, occupational health and safety, and stakeholder governance. The rating system employs a two-dimensional analytical model—*Exposure* and *Management*. The exposure dimension evaluates the inherent ESG risks associated with a company's operational model, geographical footprint, financial robustness, and historical incidents. The management dimension, in turn, assesses the company's capacity to mitigate those risks through policies, programs, and operational controls, while dynamically incorporating the severity of controversies into scoring. This dual-lens approach enables a granular and comparative analysis of corporate resilience across sectors, expressed through a unified "single-currency-of-risk" metric that facilitates investor benchmarking.

For Indonesia's geothermal sector, the implications of ESG ratings are both strategic and operational. High ESG performance not only enhances reputational capital but also directly influences financing costs, project bankability, and long-term social license to operate. Companies that effectively manage their MEIs—through transparent sustainability reporting, stakeholder-inclusive governance, and proactive environmental risk mitigation—can leverage ESG leadership as a competitive advantage in both domestic and global markets. Conversely, insufficient ESG performance can elevate perceived investment risk, reduce access to green finance, and erode stakeholder trust, particularly in a sector where environmental and community interfaces are inherent to project operations.

The Global Reporting Initiative (GRI) is the most widely adopted sustainability reporting framework globally since its inception in 1997. GRI Standards offer a systematic structure for measuring and disclosing an organization's economic, environmental, and social impacts in a consistent and comparable format across industries. The GRI framework is divided into Universal Standards (GRI 101 to GRI 103) and Topic Standards, which include detailed indicators tailored to specific economic, environmental, and social aspects relevant to particular sectors (Mougenot & Doussoulin, 2023).

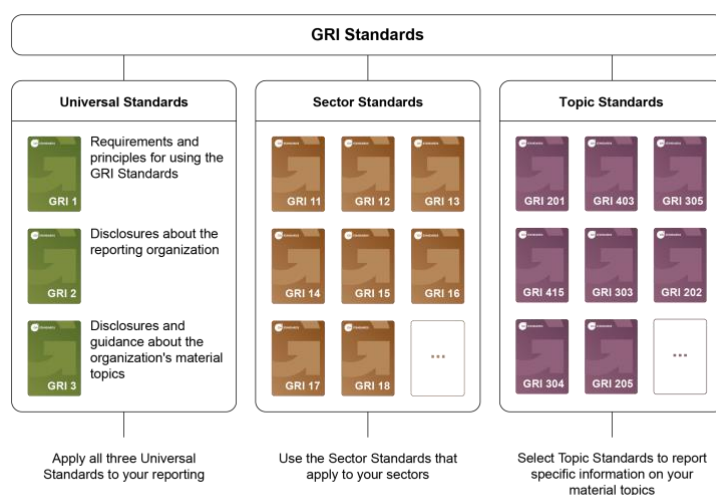


Figure 2: GRI Standard

In practice, the Global Reporting Initiative (GRI) emphasizes four key principles for sustainability reporting: stakeholder inclusiveness, materiality, sustainability context, and completeness. Among these, the principle of *materiality* or the identification of material issues is central in determining which topics should be disclosed, based on their impact on both the organization and its external stakeholders. This aligns with the concept of double materiality, which requires the identification of issues that are significant not only financially but also from a broader societal and environmental perspective. The process typically involves identifying material topics, engaging with stakeholders, and transparently reporting selected issues with accountability.

The adoption of GRI standards has major implications for both corporate credibility and access to finance. Companies that consistently implement GRI standards demonstrate enhanced transparency and accountability, which in turn strengthens their reputation among investors and facilitates access to green finance instruments, such as green bonds or sustainability-linked loans. Nevertheless, some studies, including those in the extractive and energy sectors, caution against the risks of greenwashing and selective reporting if third-party assurance is not applied (Rashed, 2021).

2 METHODOLOGIES

This study employs a qualitative content analysis methodology to examine corporate disclosure practices regarding Environmental, Social, and Governance (ESG) activities. Data sources include publicly available ESG Reports such as Sustainability Reports and official corporate websites. These sources were selected because they represent the most common channels through which companies communicate ESG initiatives to stakeholders. The research process involved systematically identifying and collecting documents and web-based disclosures from the selected companies. A coding framework was developed to extract data on the type, scope, and frequency of ESG activities reported, as well as the medium of disclosure. The extracted data were categorized according to established ESG disclosure guidelines and best practices.

The underlying rationale for this methodology is that transparent disclosure of ESG activities enables potential investors, financial institutions, and bondholders to assess a company's preparedness in managing uncontrollable ESG-related risks that may influence financial performance. By analyzing the depth and breadth of disclosed information, this study aims to determine the extent to which companies demonstrate readiness and resilience in the face of ESG challenges.

ESG quality assessments can be approached in two ways: industry-relative or absolute quality. The industry-relative approach evaluates a company's ESG performance in comparison to its peers within the same sector, highlighting its relative position in the industry. On the other hand, the absolute quality approach assesses a company against defined sustainability standards regardless of industry context, making the results more universal. In this regard, Sustainability applies an absolute approach, where its ESG Risk Ratings focus on a company's exposure to ESG risks and how well those risks are managed in absolute terms, rather than relative to industry peers.

Table 3.1 Determination of ESG (Environmental Social Governance) Aspect Rating Requirements

Topic	Requirements
Environmental Aspects	
Emission	Performance management in emissions management—excluding GHG—encompasses the implementation of an environmental management system, quantitative monitoring of emissions to air, water, and land, and the adoption of policies addressing environmental impacts.
Green Building	The company's investment in the sustainable building portfolio and the company's contribution to the procurement of green buildings
Environmental Impact of Products	This indicator assesses how a company identifies and manages environmental issues from its products and services through product stewardship practices, participation in relevant industry initiatives, and processes to review hazardous products with defined targets for improvement.
Regional Stress Water	A company's exposure to water risks and how it evaluates resource use risk management, including water management programs, water risk management, and water intensity trends.

Topic	Requirements
Carbon Impact of Products	Management of energy efficiency and/or GHG emissions from its services and products. This includes carbon reduction programs to improve performance and efficiency, as well as efforts to diversify or introduce sustainable alternatives.
Environmental Policy	An environmental management system must encompass defined roles and responsibilities, compliance with regulations, corrective actions for continuous improvement, documented performance records, targeted programs, external and internal audits, identification of significant environmental impacts, internal and external communication, board-level accountability, monitoring and measurement, clear goals with deadlines, and employee training and awareness initiatives.
Environmental Management System	An environmental management system should include assigned roles and responsibilities, regulatory compliance, corrective actions for continuous improvement, performance records, environmental programs, external and internal audits, identification of significant impacts, internal and external communication, board-level responsibility for environmental issues, monitoring and measurement, defined goals and deadlines, and employee training and awareness programs.
Environmental Management System Certification	Companies must have an environmental management system that has been certified with ISO 14001 Management or equivalent.
Social Aspects	
Occupational Health and Safety	Companies must have a health and safety management system in place and whether they are certified to international standards. Lost-time injury and for proof of repair
Relationship with the Workforce	Companies in managing freedom of association and diversity issues, as well as working hours and minimum wages.
Product Safety and Quality	The product and service safety and quality program should cover incident investigation with corrective actions, managerial accountability, performance monitoring, policy commitments, objectives and targets, risk assessments, public reporting of safety issues, regular employee training, external audits, and tested emergency response procedures, while ensuring marketing practices are managed responsibly to prevent false advertising or misleading statements.
Social Impact of Products	Companies in managing the social impact of a product or service consisting of the inherent characteristics of the input material, both positive and negative, and the impact during use, disposal and recycling.
Human Rights	Companies in managing and respecting fundamental human rights in their supply chains, with issues ranging from forced labor and child labor to poor working conditions (i.e. wage issues, discrimination, harassment) and occupational health and safety.
Diversity Program	Companies should implement programs to enhance workplace experiences and outcomes for disadvantaged groups, including diversity monitoring, employee affinity or networking groups, workforce diversity initiatives, targeted recruitment, board-level responsibility for diversity, and mentorship programs.
Freedom of Association Policy	Companies need to have policies that respect and respect a person's right to freely unionize, including within the union of their choice, without experiencing discrimination, intimidation, harassment or retaliation from personnel from the company.
Social Supplier Standards Policy	Companies should establish supplier guidelines that ensure ethical and socially responsible conduct, covering minimum living wage, prohibition of child labor, adherence to health and safety standards, non-discrimination, and respect for freedom of association and collective bargaining rights.
Resident Satisfaction Survey	How the company's system conducts a resident satisfaction survey
Governance Aspect	
Board Skills and Diversity	Companies should promote gender diversity on their boards by ensuring women comprise at least one-third of members and adopting a robust diversity policy with clear commitments and measurable targets to further increase board diversity.
Independence of the Council	Board independence is assessed based on the presence of independent members, the influence of controlling shareholders, the existence of an audit committee or non-executive board of commissioners, alignment with industry best practices, and whether the board follows a single-tier structure with executive representation or a two-tier structure with a non-executive board of commissioners.
Ethics in doing business	The company needs to ascertain the factors related to the company's business ethics.
Anti-corruption and bribery	Companies should implement an anti-bribery and corruption program that clearly defines and prohibits facilitation payments, bribery, and corruption; establishes a definition and mitigation commitment for conflicts of interest; provides clear guidelines on acceptable behavior; and enforces a strict prohibition against all forms of bribery.
Anti-Competitive Practices	Companies need to disclose how the company manages to compete fairly among its competitors
Whistleblower	Companies should maintain a whistleblower program that proactively communicates to employees, is accessible to suppliers, customers, and third parties, enforces non-retaliation policies, has established structures for handling reports, provides a 24/7 independent hotline in local languages, discloses report statistics and actions taken, and offers anonymous and confidential reporting options.
ESG Governance	Companies need to ensure that the board is accountable for all Environmental, Social and Governance (ESG) issues

This assessment focuses on identifying gaps between actual corporate performance and the requirements set by Sustainalytics' ESG Risk Rating framework. Sustainalytics evaluates a company's exposure to industry-specific material ESG risks and the effectiveness of its management in mitigating those risks. The rating is built upon key building blocks that contribute to a company's overall ESG score, with corporate governance serving as a foundational element. A lower ESG Risk Rating score indicates reduced potential for ESG-related risks to adversely affect the company's operational and financial performance. This framework provides a standardized, comparable measure of ESG performance across industries, enabling stakeholders to assess both risk exposure and the robustness of management systems.

Central to the Sustainalytics methodology is the concept of *Material ESG Issues* (MEIs) and *idiosyncratic ESG issues*, which capture the specific environmental, social, and governance factors most relevant to a company's sector and operating context. The materiality concept helps companies concentrate efforts on the issues most critical to long-term business success, incorporating both risks and opportunities. This process requires active involvement from both the board of directors and executive management to ensure alignment between corporate strategy and ESG priorities. While material ESG risks focus on potential negative impacts, materiality assessments also identify opportunities for value creation, making it a strategic tool not only for risk mitigation but also for enhancing corporate competitiveness in sustainability performance.

3 RESULTS AND DISCUSSIONS

3.1 Analysis Of Performance Gap Between PT A and PT B

The selection of the two companies in this study is based on their relatively high ESG Risk Ratings as reported by Sustainalytics, positioning them as notable benchmarks within Indonesia's geothermal industry. It is important to acknowledge that differences in methodology among ESG rating providers can lead to significant variations in scoring outcomes, underscoring the need for a consistent reference framework in comparative assessments. In this context, Sustainalytics offers a sector-specific, materiality-driven approach that enables a nuanced evaluation of ESG performance.

The analytical approach adopted in this study applies a gap analysis framework, which compares actual performance against established best practices. This method aims to identify gaps or deficiencies that may hinder optimal ESG outcomes, thereby informing the development of targeted strategies for improvement. As defined by Forbes Advisor (2024), gap analysis serves as a diagnostic tool to bridge the divide between current practices and desired performance standards, ultimately supporting the enhancement of operational effectiveness, risk management, and long-term sustainability. The following sections present a detailed analysis of the identified performance gaps and their implications for ESG best practices in the geothermal sector.

Table 2. Comparison in ESG Requirements Between PT A and PT B

Aspect	PT A	PT B
Environmental		
Emission	✓	✓
Green Building	-	-
Environmental Impact of Products	✓	✓
Regional Stress Water	✓	✓
Carbon Impact of Products	✓	✓
Environmental Policy	✓	✓
Environmental Management System	✓	✓
Environmental Management System Certification	✓	✓
Social		
Occupational Health and Safety	✓	✓
Relationship with the Workforce	✓	✓
Product Safety and Quality	✓	-
Social Impact of Products	✓	✓
Human Rights	✓	✓
Diversity Program	✓	✓
Freedom of Association Policy	-	-
Social Supplier Standards Policy	✓	✓
Resident Satisfaction Survey	✓	-
Governance		
Board Skills and Diversity	✓	✓
Independence of the Council	✓	✓
Ethics in doing business	✓	✓
Anti-corruption and bribery	✓	✓
Anti-Competitive Practices	-	-
Whistleblower	✓	✓
ESG Governance	✓	✓

Source: Author's Analysis (2025)

PT A is one of State-Owned Enterprise (SOE) focuses on the exploration, exploitation, and management of geothermal power plants. The company operates 13 Geothermal Working Areas (*Wilayah Kerja Panas Bumi/WKPB*) with a total installed capacity of 1,877 MW—representing approximately 80% of Indonesia's total geothermal capacity. PT A was founded in 1974 with the aim of meeting national energy demand while reducing greenhouse gas emissions. Since its inception, it has grown rapidly to become a major player in the global geothermal energy sector. PT A is currently the largest geothermal operator in Indonesia, contributing 82% of the nation's installed geothermal energy capacity (Padantya, 2024).

PT A has achieved several significant milestones, including going public, issuing green bonds, and becoming the pioneering supplier of carbon credits on the Indonesian Carbon Exchange. PT. A has received numerous awards and certifications, including 13 consecutive years of the PROPER Gold rating for its Kamojang site and a “Negligible Risk” ESG rating from Sustainalytics. The company has also been externally recognized for its robust Environmental, Social, and Governance (ESG) risk management practices (Padantya, 2024).

Thereafter, PT B operates major geothermal projects including Wayang Windu (230.5 MW), Salak (201 MW), and Darajat II (219.5 MW). PT. A is well-regarded for its ESG and governance practices, having received multiple accolades such as the PROPER Gold rating and ISO 14001:2015 environmental management certification. The company has also received environmental and safety management recognition from Indonesia’s Ministry of Environment (SR PT B, 2023).

In terms of international ESG ratings, PT. A is assessed under its parent company and currently holds an ESG Risk Score of approximately 21.3, categorized as “Medium Risk” by Sustainalytics. The company’s key challenges lie in community relations and emission management and continues to strengthen its sustainability strategy through environmental initiatives, community engagement, and operational efficiency programs (Company Website, 2025).

The gap analysis differentiates two actionable shortfalls: initiative gaps—concrete programs, metrics, or systems that a company has not yet implemented—and disclosure gaps—the absence or insufficiency of transparent, verifiable reporting of implemented measures. For environmental performance, PT A exhibits relatively few initiative gaps but identifiable disclosure gaps: strong operational metrics (e.g., low emissions intensity, extensive biodiversity programs) are sometimes reported without sufficiently granular, time-bound KPIs and independent third-party verification that rating agencies and investors require for bankability. Conversely, PT presents structured environmental initiatives (e.g., IGOMS, ISO-aligned management, habitat restoration) but shows initiative gaps in the quantification and aggregation of avoided emissions, target setting for emissions intensity, and demonstrable biodiversity outcomes. These patterns map cleanly onto Sustainalytics’ two-lens framework: PT B’s *Exposure* is reduced modestly by its on-site conservation work, but its *Management* score is constrained where policy, implementation, verified outcome linkages are weak or unreported. Closing disclosure gaps (better GRI-aligned topic disclosures, independent assurance statements, and MEI-linked KPIs) and closing initiative gaps (time-bound targets, monitoring protocols, third-party verification) are both necessary to lower rating exposure and to raise management scores in a durable way.

4 Initiative and Disclosure Maturity in PT A and PT B Practices

The environmental dimension reveals clear differences between PT A and PT B in both initiative and disclosure maturity. PT A leads the sector with a Sustainalytics ESG Risk Rating of 7.1 (Negligible Risk), ranked 1st globally among utility companies. This position is supported by a fully integrated set of environmental programs including biodiversity conservation across 19 conservation areas protecting 1,335 species, innovative use of small-scale hydropower (PLTMH) for auxiliary power, and digital waste management systems aligned with the 4R principle (reuse, recycle, reduce, recovery). PT A also reports over 4 million tons CO₂eq avoided annually and maintains an exceptionally low emissions intensity of 41 g CO₂eq/kWh, far below fossil-fuel benchmarks. Furthermore, 94% of operational energy use comes from renewable sources, significantly reducing Scope 1 and Scope 2 emissions exposure. Despite this strong performance, the gap analysis identifies disclosure gaps—notably, the absence of consistent third-party assurance for biodiversity impact metrics, limited time-bound KPIs for emissions reduction beyond avoided CO₂eq, and insufficient disclosure of environmental event contingencies (e.g., spill, habitat disruption). Addressing these would strengthen Sustainalytics’ *Management* score by linking program execution to verifiable outcomes.

PT B records an ESG Risk Rating of 21.3 (Medium Risk), ranked 95th of 635 global utility companies. Operationally, it applies the Integrated Geothermal Operations Management System (IGOMS) aligned with ISO 14001:2015, supporting biodiversity programs within Mount Halimun-Salak National Park. Flagship initiatives include the *Eye on the Forest* program for endangered species (e.g., Javan eagle, Javan leopard, surili monkey) and endemic tree planting to restore ecosystem services. However, initiative gaps exist in the quantification of avoided emissions and emissions intensity benchmarking. In addition, PT B’s biodiversity programs lack comprehensive, published baselines and year-over-year progress metrics, creating a disclosure gap that constrains comparability and investor confidence. This contrast reflects literature findings that geothermal operators with rigorous environmental KPI disclosure and third-party verification outperform peers in ESG ratings and financing access (Azhgaliyeva, D, et al, 2020). Both companies would benefit from aligning environmental reporting fully with GRI 302 (Energy), GRI 304 (Biodiversity), and GRI 305 (Emissions), with PT B needing a stronger initiative base and PT A requiring deeper disclosure integrity.

Social programs in PT A and PT B are both locally impactful but differ in scale, integration, and measurability. PT A’s CSR portfolio (*Tanggung Jawab Sosial dan Lingkungan*/TJSL) includes the GEMAH KARSA program, which leverages geothermal heat for sustainable agriculture benefiting 2,674 individuals, and Eloc Bestari, which combines forest conservation with alternative livelihood generation. In 2024, PT A reported 67 training hours per employee on average, focusing on technical, safety, and sustainability topics. Social engagement also includes infrastructure development, healthcare access, and education support for local communities. These initiatives align with *Material ESG Issues* such as community relations, occupational health and safety, and human capital development. However, the disclosure gap lies in the absence of quantified social return on investment (SROI) or longitudinal tracking of beneficiary outcomes.

PT B demonstrates strong alignment between social and environmental education, particularly through the Taman Pamekar Library, which provides integrated literacy, environmental awareness, and economic empowerment services to Sukabumi villagers. While these initiatives reflect meaningful intent, the initiative gap involves integrating measurable social KPIs into program design such as household income change, job creation sustainability, and educational attainment levels. Without this, Sustainalytics’ *Management* assessment for social MEIs remains moderate despite qualitative program strengths.

Recent studies indicate that transparent measurement of social outcomes is critical for sustaining stakeholder trust and social license to operate in energy projects. The absence of outcome-level indicators can limit access to sustainability-linked loans (SLLs), where interest rate benefits are tied to meeting verifiable ESG-linked social performance targets (Rashed, 2021).

Governance is the strongest pillar for PT A, with a 121.84 ACGS score in the “Leadership in Corporate Governance” category, implementation of an Anti-Bribery Management System (SMAP) since 2021, and an operational whistleblowing mechanism accessible to employees and third parties. Governance structures embed ESG considerations at the board level, directly linking sustainability to corporate strategy. However, the disclosure gap is evident in limited public documentation of board-level ESG target integration into executive remuneration frameworks.

PT B maintains governance standards consistent with ISO 14001 and anti-bribery norms, but its ESG governance disclosures are less comprehensive, particularly in board independence ratios, gender diversity targets, and explicit ESG oversight structures. Sustainalytics’ methodology integrates Corporate Governance and Stakeholder Governance in its risk model; thus, PT B’s initiative gap involves formalizing ESG oversight at the board level and implementing board diversity targets, while the disclosure gap relates to reporting these governance mechanisms with clarity and comparability.

Literature shows that governance transparency and the integration of ESG metrics into corporate decision-making are significant predictors of both ESG ratings and access to green bonds (Azhgaliyeva, D, et al, 2020). Investors increasingly expect evidence that governance systems are not only compliant but strategically committed to long-term ESG performance. Integrating soft controls such as leadership accountability, culture, and behavioral norms alongside hard controls enables governance systems to drive strategic alignment, enhance ESG performance, and build long-term resilience (Hoos *et al*, 2025).

5 Strategic Pathways for ESG Enhancement

The comparative ESG assessment of PT A and PT B highlights a dual-pathway for improvement: closing initiative gaps to strengthen operational integration and addressing disclosure gaps to enhance transparency and comparability. Sustainalytics’ ESG Risk Rating framework and GRI Standards provide a robust basis for targeted interventions. To ensure these strategic measures are implemented effectively, the involvement of an independent third-party consultancy becomes critical—not only to serve as a check-and-balance mechanism, but also to safeguard against potential greenwashing and to align corporate practices with international benchmarks. In this context, PT Mitra Rekayasa Berkelanjutan (MIREKEL), with its proven track record in ESG, ESIA, and sustainability consulting, can serve as a strategic implementation partner.

For PT A, the priority lies in enhancing disclosure integrity. This includes securing independent third-party assurance for biodiversity metrics, publishing time-bound emission reduction targets beyond avoided CO₂e figures, and integrating environmental event contingency reporting. Leveraging its Negligible Risk rating, PT A should expand the scope of its renewable energy integration to supply chain operations and pilot nature-based carbon offset projects to maintain global leadership. MIREKEL’s experience in facilitating participatory stakeholder engagement—as demonstrated in the JGC Indonesia Akatara Gas Processing Facility project, where local community involvement mitigated land conflict risks—provides a transferable model for PT A’s upstream–downstream ESG integration. PT B, by contrast, must address initiative gaps through quantifying avoided emissions, benchmarking emissions intensity against industry leaders, and formalizing biodiversity baselines with measurable, annual progress targets. Jointly, both companies could collaborate to establish a geothermal-specific environmental KPI framework, harmonized with GRI 302, 304, and 305, to serve as an industry reference standard, supported by MIREKEL’s technical expertise in developing sectoral ESG metrics.

From a social perspective, PT A’s social responsibility programs demonstrate high integration with sustainability objectives; however, the absence of quantified Social Return on Investment (SROI) limits the ability to assess long-term community impact. Incorporating SROI metrics and publishing longitudinal community outcome reports would strengthen stakeholder trust. MIREKEL’s capability in designing SROI-based CSR monitoring frameworks can address this gap, ensuring that programs like GEMAH KARSA or Eloc Bestari are reported with measurable economic and social multipliers. PT B should address *initiative gaps* by embedding community needs assessments into CSR planning, integrating educational and economic empowerment programs with measurable outputs, and linking program results to corporate ESG targets. MIREKEL can directly support these processes through CSR program design, SROI-based impact measurement, and public participation facilitation aligned with IFC Performance Standards, ensuring that social initiatives are both inclusive and evidence-based. Both entities would benefit from establishing shared social impact dashboards, enabling cross-company benchmarking and the development of geothermal-specific community engagement standards under GRI 413 (Local Communities).

PT A’s governance framework is a sector benchmark, yet disclosure gaps remain in explicitly linking ESG performance to executive remuneration and in reporting gender diversity targets at the board level. PT B should prioritize initiative development by formalizing ESG oversight at the board, adopting measurable board diversity policies, and enhancing whistleblowing mechanisms with expanded stakeholder accessibility. MIREKEL’s advisory work with academic–policy partnerships, such as ESG integration discussions with School of Government and Public Policy (SGPP) Indonesia, reflects its capacity to support corporate governance reforms in line with GRI 102 and Sustainalytics’ governance MEIs. At the industry level, both companies could advocate for voluntary ESG governance codes tailored to Indonesia’s renewable energy sector, ensuring alignment with GRI 102 (Governance) and Sustainalytics’ governance MEIs.

Strategically, PT A can leverage its high ESG score to secure diversified green financing instruments—such as sustainability-linked loans and green bonds—tied to verifiable MEI performance, while PT B can target ESG score improvement by aligning disclosure fully with Sustainalytics and GRI requirements. Joint industry leadership could be demonstrated by co-developing geothermal-specific ESG taxonomies with regulators, launching public knowledge-sharing platforms on ESG best practices, and participating in cross-border ESG research collaborations with ASEAN geothermal operators. With an independent, sector-specialized partner such as MIREKEL providing third-party validation, structured ESG roadmaps, and assurance for disclosures, these measures would not only elevate Indonesia’s geothermal sector in global ESG rankings but also reinforce its position as a model of environmentally sustainable, socially inclusive, and transparently governed renewable energy development. These measures would not only elevate Indonesia’s geothermal sector in global ESG rankings but also strengthen its role as a model for sustainable, socially inclusive, and transparently governed renewable energy development.

6 CONCLUSIONS

The comparative ESG assessment of PT A and PT B reveals a dual-pathway for improvement: addressing initiative gaps to strengthen operational ESG integration, and closing disclosure gaps to enhance transparency and comparability. In the environmental dimension, PT A leads with a Sustainalytics ESG Risk Rating of 7.1 (Negligible Risk), ranking first globally among utilities. This leadership is underpinned by the avoidance of over 4 million tCO₂e, a remarkably low emissions intensity of ~41 gCO₂e/kWh (far below fossil benchmarks), biodiversity conservation across 19 areas encompassing over 1,300 species, adoption of the 4R waste management principle, and 94% renewable energy use in operations. However, PT A must enhance disclosure integrity by introducing time-bound emission reduction targets, expanding third-party assurance for biodiversity metrics, and embedding environmental contingency reporting. PT B, with a Medium Risk rating of 21.3 (95th of 635 utilities globally), demonstrates environmental commitment through its ISO 14001:2015-aligned IGOMS and conservation initiatives in Gunung Halimun-Salak National Park, including the “Eye on the Forest” program for Javan eagle protection and endemic tree reforestation. Nonetheless, PT B should quantify avoided emissions, benchmark emissions intensity against sector leaders, and formalize biodiversity baselines with measurable annual progress targets. Both companies would benefit from jointly developing a geothermal-specific KPI framework aligned with GRI 302, 304, and 305 to standardize, audit, and benchmark environmental performance across the industry.

In the social dimension, PT A’s CSR programs, such as GEMAH KARSA and Eloc Bestari, directly benefit 2,674 people. Yet, the absence of quantified Social Return on Investment (SROI) metrics limits the assessment of long-term impacts. PT B focuses on workforce capacity building through StarLEAD, StarTECH, and StarFAST, and on community support via the Taman Pamekar Library, integrating education, health, and environmental awareness. Both companies should conduct community needs assessments before CSR planning, integrate measurable program indicators, and establish shared social impact dashboards aligned with GRI 413 for inter-company benchmarking. Effective risk communication became a crucial role to addressing social acceptance issues in geothermal projects (Arcuri et al., 2025). In governance, PT A sets the sector benchmark with its Anti-Bribery Management System (SMAP), whistleblowing mechanisms, and an ACGS score of 121.84, but needs to explicitly link ESG performance to executive remuneration and set measurable board diversity targets. PT B should institutionalize ESG oversight at the board level, implement measurable diversity policies, and expand whistleblowing access to all stakeholders. Given global investors’ rising expectations for verifiable ESG performance, both companies would benefit from independent third-party involvement to validate and verify disclosures, ensuring credibility and mitigating greenwashing risks. MIREKEL, with expertise in ESG validation, green finance documentation, SROI-based CSR planning, public participation facilitation, and ESIA preparation, can serve as a strategic partner to deliver rigorous check-and-balance functions, enhance disclosure quality, and strengthen market confidence.

Strategically, PT A should leverage its high ESG score to secure diversified green financing instruments—such as sustainability-linked loans and green bonds—tied to verifiable MEI performance, while PT B should prioritize score improvement through full alignment with Sustainalytics and GRI disclosure requirements, particularly in emission targets, social impact indicators, and governance transparency. Both companies could jointly demonstrate industry leadership by (i) co-developing a geothermal-specific ESG taxonomy with regulators, (ii) launching public knowledge-sharing platforms on ESG best practices, and (iii) engaging in cross-border research collaborations with ASEAN geothermal operators. To reinforce transparency and elevate sector-wide performance, it is recommended that other Indonesian geothermal operators, notably Supreme Energy and its project entities SERD and SEMI, adopt Sustainalytics ESG ratings and publicly disclose their results. This would expand the comparative baseline, drive collective improvement, and enhance access to sustainable finance. Best practices for geothermal operators involve integrating ESG risk assessment into corporate strategy, institutionalizing adaptive management systems, and aligning disclosure practices with international frameworks such as the Global Reporting Initiative (GRI) Standards to ensure credibility and comparability. Ultimately, integrating operational ESG excellence with high-integrity, independently verified disclosure and embedding these practices across the sector will position Indonesia’s geothermal industry not only as a regional leader but as a global model for environmentally sustainable, socially inclusive, and transparently governed renewable energy development.

7 LIMITATIONS

This study is subject to certain limitations. First, the **majority of the data used are derived from secondary sources**, which may not fully capture project-specific nuances. Also, the study **does not focus on a single case study**; instead, it draws from multiple cases to identify general patterns and insights. While this approach allows for broader applicability, it may limit the depth of contextual analysis for any one specific project. Nonetheless, these practice-based perspectives are intended to enrich the discussion and bridge the gap between theory and real-world implementation.

8 ACKNOWLEDGEMENTS

The author gratefully acknowledges PT Mitra Rekayasa Keberlanjutan (MIREKEL), the organization where the authors are employed, for its support and facilitation throughout the preparation of this journal article. MIREKEL actively encourages its team members to contribute to knowledge development, particularly by producing publications that reflect the company's portfolio and expertise in the geothermal sector.

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