

Strategic ESG Transformation To Enhance Funding Access: A Case Of PT Kilang Pertamina International

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Abstract

Environmental, Social, and Governance (ESG) principles are now at the heart of corporate competitiveness and long-term viability. This study assesses PT Kilang Pertamina Internasional's (PT KPI) current ESG practices and identifies areas for improvement that extend beyond regulatory compliance. Using a mixed-methods analysis, the author combined stakeholder analysis, resource-based and gap analyses, and a PESTLE review to assess internal capabilities and external analysis, then benchmarked the results against international standards using the Sustainability framework. The study identifies three priority areas for improvement: enhancing waste and water management (Beyond PROPER), revitalizing Process Safety Management (PSM), and strengthening ESG governance structures. These initiatives are expected to reduce operational risks, attract foreign investment, and support long-term financial resilience. Future research could examine how these initiatives influence financial performance, policy outcomes, and stakeholder perceptions.

Keywords: ESG implementation, regional bank, stakeholder engagement, sustainable finance, institutional transformation, green lending, ESG capability

A. INTRODUCTION

PT Kilang Pertamina Internasional (PT KPI) is a strategic subsidiary of PT Pertamina (Persero), responsible for overseeing Indonesia's national refining and petrochemical operations. As the Refining & Petrochemical Subholding within Pertamina's integrated energy structure, PT KPI plays a pivotal role in strengthening national energy security and driving industrial development. The company is currently managing several major infrastructure projects that are critical to supporting Indonesia's long-term energy transition. To realize these strategic initiatives, PT KPI requires an estimated capital investment of USD 40 billion. While internal reserves and project-based financing will partially cover this need, the requirement for sustainable external funding is becoming increasingly urgent. In this context, Environmental, Social, and Governance (ESG) performance has become a key determinant in accessing green finance, forming international partnerships, and maintaining global competitiveness. ESG is no longer merely a matter of regulatory compliance—it has become a strategic imperative for PT KPI.

Operating in one of the most carbon-intensive sectors globally, PT KPI is part of an industry responsible for nearly 6% of industrial greenhouse gas emissions worldwide. This places the company under heightened scrutiny from global climate frameworks such as the Paris Agreement and from investors prioritizing ESG-aligned portfolios. Furthermore, social and governance issues—including workplace safety, community engagement, and transparent decision-making—are increasingly becoming critical benchmarks for assessing long-term corporate resilience and ethical conduct. Refinery companies that fail to integrate ESG principles into their operations face mounting risks, including regulatory sanctions, reputational damage, and restricted access to capital markets. Therefore, advancing ESG maturity is essential for PT KPI to manage operational and financial risks, enhance stakeholder trust, and ensure long-term business resilience in a rapidly decarbonizing global economy.

This research is motivated by PT KPI's urgent need to strengthen its ESG implementation, not only to align with global sustainability frameworks but also to improve its attractiveness to foreign investors. The study aims to assess the company's current ESG performance, identify areas for strategic improvement, and propose actionable recommendations grounded in international best practices. Research by the World Bank (2021) demonstrates that firms with strong ESG performance gain access to lower-cost financing instruments such as green bonds and sustainability-linked loans (SLLs), which offer

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preferential terms for meeting sustainability goals. These financing mechanisms enhance investor confidence while reducing capital costs, thereby closely tying ESG commitment to long-term financial resilience. For PT KPI, embedding ESG-oriented financing into its capital strategy can broaden its investor base and enhance funding competitiveness. As global capital markets increasingly prioritize sustainability, aligning corporate finance with ESG principles is no longer optional—it is essential for securing future investments and reinforcing the company's leadership in the energy transition.

Effectively managing ESG risks requires PT KPI to adopt globally recognized frameworks tailored to the specific challenges of the refining industry. Among the most widely referenced, Sustainalytics offers a risk-based approach to assessing material ESG exposures, providing critical insights into reputational and operational risks—particularly valuable for investors in high-risk sectors such as oil refining. However, the Sustainalytics framework offers limited operational guidance compared to frameworks such as the Task Force on Climate-related Financial Disclosures (TCFD) or the Global Reporting Initiative (GRI), which focus more on disclosure, climate scenario analysis, and long-term strategic integration. TCFD, in particular, helps companies align financial disclosures with climate risks and stress-test strategies under various transition scenarios—essential for firms pursuing decarbonization. Nonetheless, adoption of TCFD remains limited among state-owned enterprises (SOEs), largely due to structural governance barriers and weak reporting cultures.

Additionally, Process Safety Management (PSM)—typically viewed as an internal risk control mechanism—has yet to be fully explored in academic literature as part of integrated ESG practices, especially in Southeast Asian contexts. This study contributes to the existing literature by applying a hybrid model that combines the ESG risk visibility of Sustainalytics, the strategic and scenario-planning strengths of TCFD, and operational risk management from PSM to evaluate ESG implementation at PT KPI. This integrated approach addresses a significant gap in current research: the limited application of ESG frameworks in a practical, context-sensitive manner within state-owned refining enterprises in emerging economies.

As ESG performance becomes increasingly linked to the ability to attract international investment, institutional investors and global financial institutions are directing capital toward companies with strong ESG credentials. Weak ESG ratings, by contrast, can deter investors due to concerns over financial risks, regulatory compliance, and reputational exposure. To secure sustainable financing and forge global partnerships, PT KPI must enhance its ESG execution across multiple dimensions. These include improving transparency by aligning its disclosures with global standards such as GRI, TCFD, and SASB; adopting clean energy initiatives and carbon capture technologies; and strengthening corporate governance through anti-corruption measures, transparent decision-making, and active engagement in global ESG forums.

In line with PT KPI's strategic direction, this research seeks to answer three core questions: 1) How is ESG currently implemented at PT KPI in alignment with global frameworks such as Sustainalytics?; 2) What are the strategic and operational gaps in PT KPI's ESG practices that affect investor confidence and sustainability outcomes?; 3) What improvement strategies and governance reforms can be proposed to optimize ESG performance and meet international benchmarks? To address these questions, the study pursues three main objectives: first, to assess current ESG practices at PT KPI using internal tools such as the Resource-Based View (RBV) and stakeholder analysis, alongside external tools including PESTLE and ESG ratings; second, to identify key weaknesses and strategic misalignments in areas such as environmental risk, safety governance, and investor perception; and third, to develop a tailored ESG improvement roadmap that integrates global frameworks (Sustainalytics, TCFD) and supports PT KPI's access to sustainable finance and long-term global competitiveness.

B. METHODS

This study employs a mixed-methods approach, combining qualitative and quantitative methodologies to investigate the implementation of Environmental, Social, and Governance (ESG) practices at PT Kilang Pertamina Internasional (PT KPI) and their impact on corporate performance. The research began with a review of the company's strategic orientation—its vision, mission, organizational structure, and flagship projects—which served to contextualize the study, define the core problem, and refine the research questions. To analyze both the internal and external environments influencing ESG

execution, the study employed several analytical frameworks, including Stakeholder Analysis, the Resource-Based View (RBV), and PESTLE analysis. These models were chosen to capture the dynamic interplay between PT KPI's internal capabilities and external institutional and environmental pressures affecting its ESG performance. Beyond document analysis, the research gathered qualitative data through in-depth interviews and focused group discussions (FGDs) with key internal stakeholders directly involved in ESG implementation. These engagements aimed to uncover practical challenges, gather internal perspectives, and assess how ESG principles are interpreted and operationalized within PT KPI's management systems. Complementing the qualitative data, quantitative metrics were drawn from ESG ratings, environmental performance indicators, and financial outcomes to provide a more holistic assessment.

To ensure methodological robustness, the study integrated both qualitative and quantitative data collection techniques. Six internal stakeholders were purposively selected for interviews and FGDs, representing the ESG management unit, process safety division, and corporate strategy team—departments central to ESG decision-making and execution. Two FGDs were conducted, each lasting approximately 90 minutes, focused on identifying challenges, exploring strategic alignment, and evaluating the operational integration of ESG frameworks. Quantitative data were extracted from PT KPI's publicly available documents, including annual reports, sustainability disclosures, and PROPER environmental ratings from 2021 to 2023. Supplementary data—such as emissions figures, energy consumption, water treatment performance, and capital expenditure—were sourced from anonymized internal records, reviewed and approved under the company's NDA policy for academic use.

Thematic analysis, following (Braun and Clarke, 2006) six-phase model, was applied to the qualitative data. This involved data familiarization, initial coding, pattern identification, thematic grouping, coherence review, and final interpretation. Manual coding was employed to identify recurring themes, including governance gaps, stakeholder resistance, regulatory compliance challenges, and key success factors in ESG implementation. To enhance validity and analytical depth, triangulation was used by cross-referencing qualitative insights with quantitative performance metrics. These included trends in PT KPI's PROPER rating, ESG risk categories as assessed by Sustainalytics, financial performance indicators, and progress toward regulatory compliance. This triangulation approach enabled the study to link operational realities with strategic ESG outcomes, ensuring that the findings are both empirically grounded and actionable.

C. RESULTS AND DISCUSSION

Overview of Current ESG Implementation of PT KPI

PT Kilang Pertamina Internasional (PT KPI) integrates its Social and Environmental Responsibility policies into the Community Involvement Development – Corporate Social Responsibility (CID-CSR) program, which applies across all of the company's operational activities. This initiative is directly aligned with PT KPI's vision of becoming a world-class oil refinery and petrochemical company, as well as its mission to manage refinery and petrochemical operations professionally, under international standards, economic prudence, and environmental stewardship. Based on these guiding principles, PT KPI is committed to three key objectives: first, to mitigate the operational impacts of its business through full regulatory compliance while simultaneously generating added value for both society and the environment; second, to deliver tangible social, economic, and environmental benefits to communities, particularly in areas surrounding its operations; and third, to enhance corporate reputation, operational efficiency, business growth, and implement proactive risk mitigation strategies.

As a major player in the energy sector, PT KPI recognizes its deep interconnection with social and environmental responsibilities (Tanggung Jawab Sosial Lingkungan/TJSL), particularly in areas such as energy and water consumption, as well as the management of hazardous (B3) and non-hazardous waste. The company also addresses critical issues, including renewable energy development, oil spill prevention, fire safety management, and climate change adaptation. A testament to its environmental commitment is PT KPI's active participation in the Climate Village Program, which in 2022 supported the development of 15 Climate Villages near its refinery operations. These efforts, conducted in collaboration with the Environmental Service Office and supported by stakeholder engagement throughout planning,

implementation, verification, and monitoring phases, led to the company being honored as a "Proklim Support Company" by the Indonesian Ministry of Environment and Forestry. This recognition, granted to PT KPI's refinery units in Plaju, Sei Pakning, and Kasim, underscores the company's ongoing efforts to align industrial operations with sustainable environmental practices.

Stakeholder Analysis

The stakeholder landscape for PT Kilang Pertamina Internasional (PT KPI) was analyzed using a power–influence matrix to categorize key actors based on their level of influence over ESG outcomes and their institutional power within the company's operating environment. Stakeholders with high influence and high power include government regulators, energy ministries, safety and environmental authorities, and international ESG rating bodies. These actors possess both decision-making authority and the ability to shape regulatory and reputational outcomes, making them central to PT KPI's ESG strategy. Moderate power and influence stakeholders comprise financial institutions, local community groups, regional emergency services, and academic or research organizations. These entities hold relevant interests and the capacity to affect or support ESG initiatives through partnerships, funding, or technical input. Meanwhile, stakeholders with low influence and power—such as suppliers, neighboring industrial actors, labor unions, and media representatives—have a limited ability to affect ESG policies directly, but remain important for broader communication and alignment.

Based on this stakeholder mapping, PT KPI's engagement strategies must be differentiated accordingly. High-power stakeholders warrant active and continuous collaboration, including joint planning, compliance dialogues, and alignment with global sustainability standards. Stakeholders in the moderate category should be engaged through strategic partnerships, consultation forums, and capacity-building programs, especially in the context of community development and safety initiatives. For stakeholders with lower influence, informative outreach, transparency, and periodic updates are essential to maintain trust and prevent misinformation, while promoting inclusive participation in ESG communication efforts.

Resource-Based View (RBV) Evaluation

The Resource-Based View (RBV) analysis, conducted using the VRIO framework—Value, Rarity, Imitability, and Organization—reveals that PT Kilang Pertamina Internasional (PT KPI) holds several internally valuable resources, including a well-established corporate reputation, robust infrastructure, and skilled human capital. These assets enhance the company's operational efficiency and ensure compliance with relevant regulations. However, when assessed through the lens of sustained competitive advantage, certain limitations emerge. While these resources are valuable, many are not rare, nor are they structured in a way that maximizes their strategic potential. For instance, PT KPI's financial capacity and access to advanced technology—though substantial—have yet to be fully optimized or uniquely configured to drive ESG differentiation. Moreover, the organization lacks a consistently integrated ESG strategy that could turn these resources into a source of long-term advantage. As such, PT KPI's current resource configuration offers temporary parity, but not a sustained competitive edge in the ESG domain, particularly when benchmarked against international leaders in sustainable refining.

PESTLE Analysis

A PESTLE analysis was conducted to contextualize PT Kilang Pertamina Internasional's (PT KPI) ESG implementation within Indonesia's dynamic regulatory, economic, and socio-environmental landscape. Politically, the Indonesian government has signaled strong support for energy transition policies, including the national target of achieving 23% renewable energy in the energy mix by 2025. However, state-owned enterprises, such as PT KPI, continue to operate within a highly regulated and often bureaucratic approval environment, which can hinder their agility in ESG implementation. Economically, steady national GDP growth (approximately 5.3% in 2022) and rising domestic energy demand provide a supportive backdrop for long-term investment. Nevertheless, global oil price volatility remains a significant risk factor, complicating financial planning and ESG investment decisions. Socially, heightened public awareness regarding pollution, environmental justice, and equitable energy access is pressuring companies like PT KPI to adopt more inclusive, community-oriented ESG strategies.

On the technological front, the drive toward Industry 4.0—particularly digitalization, carbon-reduction technologies, and clean energy innovations—is intensifying. However, the adoption of these technologies across PT KPI's facilities remains inconsistent, revealing gaps in capability and resource allocation. Legally, the company faces increasing compliance obligations stemming from Environmental Impact Assessments (AMDAL), stricter emissions standards, and local content requirements, all of which raise operational complexity and regulatory risk. From an environmental standpoint, Indonesia's alignment with global climate frameworks, rising biodiversity conservation standards, and a growing market shift toward green fuels and low-carbon products necessitate rapid organizational adaptation and environmental responsiveness. Taken together, the PESTLE findings suggest that PT KPI's ESG implementation is situated in an external environment characterized by accelerating legal and environmental demands. These evolving pressures underscore the need for enhanced internal alignment, improved ESG governance mechanisms, and greater strategic responsiveness to sustain competitiveness in a transitioning global energy landscape.

Competitor Gap Analysis

Repsol was selected as a strategic benchmark for PT Kilang Pertamina Internasional (PT KPI) due to its leading ESG execution and significantly higher global sustainability ranking in 2022. Repsol has demonstrated strong governance, high transparency, and a sustained commitment to renewable energy investment and carbon capture technologies. These initiatives have not only strengthened investor confidence but also enhanced the company's access to ESG-aligned financing, positioning Repsol as a leader in global sustainability within the energy sector. In comparison, PT KPI currently trails behind in several critical areas, particularly in the integration of renewable energy, carbon emissions management, and comprehensive ESG disclosure practices. Repsol's proactive approach—characterized by early adoption of clean energy projects and adherence to international ESG reporting standards—has directly contributed to its improved ESG ratings and broader investment appeal. For PT KPI, narrowing this performance gap will require a strategic shift toward renewable energy transitions, more robust carbon reduction initiatives, and enhanced risk disclosure aligned with global frameworks. Emulating Repsol's ESG playbook could not only improve PT KPI's sustainability credentials but also increase its competitiveness in securing green financing and attracting long-term institutional investors.

Root Cause Analysis

PT Kilang Pertamina Internasional (PT KPI) faces several core challenges in its pursuit of effective ESG implementation. Key issues include limited alignment with globally recognized ESG standards, weak cross-functional coordination in ESG governance, and inadequate preparedness to meet the criteria set by international ESG rating agencies. These internal limitations are particularly critical given PT KPI's capital structure, which targets approximately 54% of funding from external or project-based financing sources—making robust and credible ESG disclosures a prerequisite for attracting investors, especially those with sustainability mandates. Furthermore, the company operates within an increasingly stringent regulatory environment, where evolving environmental policies demand rapid adaptation and full compliance with new standards. As illustrated in Figure 1, these challenges stem from systemic gaps in ESG strategy integration, internal governance fragmentation, and a lack of standardized reporting practices.

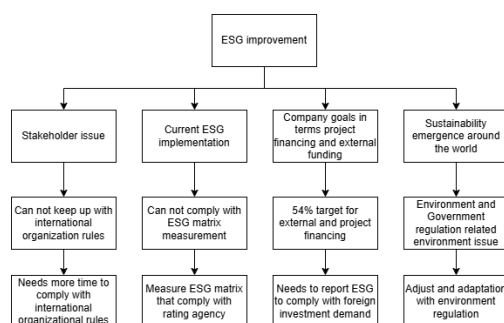


Figure 1. Root Cause Analysis

Source: Research data, 2025

Addressing these root causes through a strategic and organization-wide ESG integration approach is essential. Doing so is expected to enhance PT KPI's regulatory compliance, reinforce stakeholder trust, and strengthen its position in accessing sustainable financing—particularly from foreign institutional investors who prioritize ESG alignment in their portfolio decisions. Building internal ESG capacity, fostering interdepartmental collaboration, and aligning disclosures with global benchmarks, such as the TCFD, GRI, and Sustainalytics, will be critical steps in closing these gaps and ensuring PT KPI's long-term resilience in a transitioning global energy landscape.

ESG Integration as a Strategic Imperative

The convergence of internal diagnostics, external environmental factors, stakeholder expectations, and competitor benchmarking underscores the urgency for PT Kilang Pertamina Internasional (PT KPI) to integrate Environmental, Social, and Governance (ESG) principles as a core element of its corporate strategy. A key component of this integration involves embedding ESG risk ratings—such as those provided by the Sustainalytics framework—into the company's strategic planning and performance management systems. Notably, PT KPI demonstrated measurable progress in 2022, improving its Sustainalytics ESG Risk Rating from 41.6 (Severe Risk) to 28.1 (Medium Risk). While this improvement signals positive momentum, maintaining and advancing this trajectory will require a more structured, long-term ESG roadmap aligned with both investor expectations and global sustainability standards.

Proactive utilization of ESG ratings can serve not only as a benchmarking tool but also as a strategic guide for setting and monitoring key performance targets—particularly in areas such as greenhouse gas emissions reduction, water resource efficiency, supply chain transparency, and corporate governance reform. By aligning its ESG initiatives with quantifiable risk metrics, PT KPI can enhance its credibility, improve stakeholder trust, and strengthen its positioning in sustainable financing markets. Furthermore, such integration will support the company's ability to demonstrate regulatory compliance, mitigate reputational risks, and unlock access to preferential financing instruments, including green bonds and sustainability-linked loans.

ESG and Financial Performance Correlation

A correlation analysis between PT Kilang Pertamina Internasional's (PT KPI) ESG performance and key financial indicators reveals a meaningful relationship between improvements in sustainability practices and enhanced financial outcomes. According to Sustainalytics' ESG Risk Rating (on a 0–100 scale, where lower scores indicate better ESG performance), PT KPI maintained a consistent score of 41.6 from 2019 to 2021, placing the company within the "Severe Risk" category. However, in 2022, the ESG score improved significantly to 28.1, representing a notable shift to the "Medium Risk" category (see Figure 2). This suggests that strategic ESG initiatives—particularly in governance, environmental compliance, and social impact—were more effectively implemented in 2022, contributing to reduced sustainability-related risks in the company's operations.

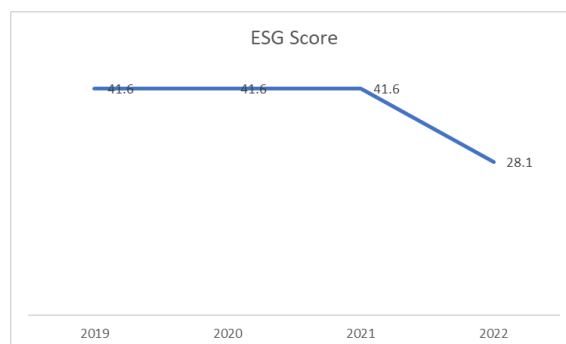


Figure 2. ESG Score

Source: Research data, 2025

This ESG improvement coincides with a positive trend in PT KPI's financial performance, as illustrated in the Net Profit Margin graph (Figure 3). Starting from a modest 0.08% in 2019, the margin declined slightly to 0.07% in 2020, potentially reflecting external shocks such as the COVID-19 pandemic and the introduction of new sustainability regulations. However, PT KPI began to recover in 2021 with a

margin increase to 0.64%, followed by a further rise to 0.95% in 2022. This upward trend indicates a growing ability to translate revenues into actual profits—an essential indicator of improving operational efficiency and financial health. Additionally, Figure 4 depicts PT KPI's Current Ratio over the same period, which shows an extreme value of 466,652.23 in 2019, dropping sharply to 108.79 in 2020. An extraordinary corporate event or a temporary accounting irregularity may have caused the 2019 anomaly. Nevertheless, the downward normalization suggests increasing financial stability in the years to come.

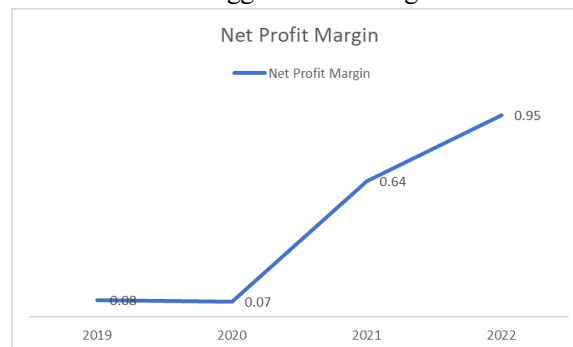


Figure 3. Net Profit Margin

Source: Research data, 2025

Taken together, the data suggest that improvements in ESG performance may have contributed to increased investor confidence, operational discipline, and financial efficiency. PT KPI's ability to translate ESG gains into financial returns demonstrates that sustainability can act not only as a compliance mechanism but also as a driver of value creation. These insights enable PT KPI to identify which financial dimensions are most sensitive to ESG performance, guiding the prioritization of future investments that offer both sustainable and profitable returns. Furthermore, the analysis supports more transparent reporting to stakeholders and reinforces the strategic case for deepening ESG integration across business units.

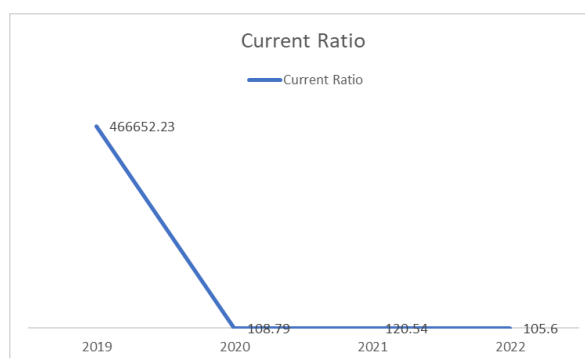


Figure 4. PT KPI's Current Ratio

Source: Research data, 2025

Strategic Funding Matrix Across Time Horizons

PT Kilang Pertamina Internasional (PT KPI) has identified an estimated USD 40 billion in funding requirements to support its ESG-oriented transformation, spanning short-, medium-, and long-term investment horizons. In contrast to traditional models that rely heavily on internal reserves for short-term needs, PT KPI adopts a phased and diversified funding strategy that incorporates sustainability-linked financing mechanisms across all timeframes. This approach not only enhances capital flexibility but also aligns with evolving global financial market trends that increasingly prioritize ESG performance as a condition for capital access.

Table 1. PT KPI's ESG-Driven Strategic Funding Matrix Across Time Horizons

Timeline	Project Type	Funding Source	Strategic Rationale
Short-Term (0–3 years)	Compliance upgrades, emission reduction systems, ESG reporting	External Bonds / ESG-Linked Loans	Enables immediate liquidity access without disrupting core OPEX/CAPEX. Early ESG actions help improve ESG ratings and

Timeline	Project Type	Funding Source	Strategic Rationale
	infrastructure, FEED & EPC for Green Refinery		creditworthiness, unlocking cheaper capital in the future.
Mid-Term (3–7 years)	Execution of GRR Plaju and Cilacap, biofuel production infrastructure, workforce transition	Project Financing + Partial Internal Funding	Targets high CAPEX projects with long payback periods; optimized for cash flow-based repayments. Internal funds are used selectively to minimize leverage and financial risk.
Long-Term (7–15 years)	CCS technology, hydrogen blending, ESG-aligned supply chains, Net-Zero infrastructure	Internal Funds + Value Unlock Strategy (divestment, restructuring, partnerships)	Focuses on strategic, high-ROI investments. Suitable for sustainability-linked instruments or equity monetization (e.g., green IPOs, joint ventures). Less time-sensitive, allowing for long-term internal capitalization and sustainable value creation.

Source: Research data, 2025

As summarized in Table 1, PT KPI's ESG funding roadmap is structured across three timeframes. In the short term, the focus is on securing external ESG-linked loans, which improve immediate liquidity while also contributing to better ESG ratings and investor perception. Midterm projects, typically characterized by high capital expenditure (CAPEX) requirements—such as refinery upgrades and the integration of low-carbon technologies—are financed through blended models, which combine project financing, syndicated loans, and support from development finance institutions (DFIs). In the long term, PT KPI aims to shift its focus toward internally generated funds and strategic partnerships to finance projects with measurable ROI and long-lasting sustainability impacts, such as renewable energy assets and circular economy infrastructure. This strategic, time-phased matrix allows PT KPI to balance sustainability objectives, funding competitiveness, and operational risk mitigation, thereby reinforcing its long-term financial resilience and ESG credibility.

Business Transformation through ESG-Driven Operational Focus

Insights gathered from internal meetings and Focus Group Discussions (FGDs) at PT Kilang Pertamina Internasional (PT KPI) reveal persistent gaps across three critical ESG dimensions: environmental compliance, process safety, and governance structure. While the company has made notable progress in embedding ESG principles into its strategic framework, operational bottlenecks—particularly in aligning day-to-day practices with broader sustainability objectives—remain a key challenge. These qualitative findings are corroborated by PT KPI's historical ESG risk ratings from Sustainalytics, which remained static at 41.6 (Severe Risk) from 2019 through 2021, signaling persistent exposure to environmental and governance-related risks. The substantial improvement in 2022, with the score dropping to 28.1 (Medium Risk), can be attributed to a strategic shift in operational focus, including the strengthening of waste management systems and the formalization of governance mechanisms.

This alignment between internal concerns and quantitative performance improvements highlights the need to translate high-level ESG strategies into actionable, operational initiatives. In response, this study proposes three ESG-focused transformation pathways:

1. Beyond PROPER: Advancing waste and water management practices beyond regulatory compliance to achieve measurable environmental performance gains.
2. Revitalizing Process Safety Management (PSM): Embedding ESG-aligned risk controls into operational workflows to reduce safety-related incidents and enhance ESG accountability.
3. Improving PSM Governance: Establishing formalized accountability mechanisms, strengthening leadership engagement, and ensuring cross-functional oversight of safety governance systems.

To support implementation, each solution pathway is mapped into a dedicated sustainability matrix, detailing specific goals, strategic descriptions, and concrete action steps. These matrices are designed not only as planning tools but also as performance management frameworks, enabling PT KPI to monitor progress, allocate resources, and align ESG operationalization with its long-term sustainability vision. Collectively, these initiatives are expected to transform ESG from a compliance requirement into a core driver of operational excellence and long-term value creation.

Beyond PROPER: Enhancing Waste and Water Management

To address persistent risks in environmental compliance, this solution pathway focuses on strengthening PT Kilang Pertamina Internasional's (PT KPI) waste and water management practices across its refinery operations. This initiative is aligned with internationally recognized standards, including ISO 14001:2015 (Environmental Management Systems), GRI 303: Water and Effluents, and the Sustainalytics ESG Risk Rating framework. Together, these guidelines emphasize proactive stakeholder engagement, risk mitigation, operational transparency, and measurable environmental performance—core elements of PT KPI's broader ESG agenda. Qualitative findings from internal interviews and Focus Group Discussions (FGDs) revealed several critical water-related challenges, including resource scarcity, aging infrastructure, and regulatory compliance gaps. These internal concerns are reinforced by stagnant environmental performance indicators and the absence of meaningful improvement in ESG scores between 2019 and 2021, particularly in the environmental risk subcategory evaluated by Sustainalytics. The evidence suggests the need for targeted, data-driven interventions in water and waste management operations.

Risk Assessment of Water and Waste Operations

The table below (Table 2) outlines four key risk categories related to water and waste, along with their potential impacts on PT KPI's operational and ESG performance. This assessment draws upon ISO 14001 principles of environmental aspect identification and prioritization.

Table 2. Water and Waste Risk Assessment

Risk Category	Potential ESG impact
Water resource scarcity	Reduced production capacity; heightened ESG exposure
Infrastructure degradation	Increased risk of operational failure; potential environmental non-compliance
Non-compliant effluent	Reputational damage; risk of legal or regulatory sanctions
Inefficient water usage	Elevated operational costs; unsustainable resource utilization

Source: Research data, 2025

This analysis confirms that water availability, infrastructure integrity, and effluent management are key factors in PT KPI's ESG vulnerability. Each factor carries implications for both operational continuity and reputational standing, highlighting the need for a structured, goal-oriented improvement roadmap.

Sustainability Goals and KPI Matrix

To translate these risks into actionable outcomes, a Sustainability Goals and KPI Matrix was developed, integrating stakeholder feedback with best-practice indicators from GRI, Sustainalytics, and ISO 46001 (Water Efficiency Management Systems). The matrix outlines six operational focus areas where PT KPI can leverage measurable improvements in water and waste performance.

Table 3. Sustainability Goals and KPI Matrix

Sustainability Goals	Goals Measurement	Key Performance Indicators (KPIs)
Water Conservation	• Reduce water use per production unit • Implement water-efficient technologies	• Water Use Efficiency (WUE) • Water Use Intensity
Wastewater Reduction & Treatment	• Set volume reduction targets • Improve treatment to meet stricter standards	• Wastewater Reduction Target Achievement
Recycling and Reuse	• Increase internal water reuse • Utilize treated wastewater for non-potable applications	• Recycled Water Percentage • Water Recycling Efficiency
Pollution Prevention	• Reduce pollutant discharge • Minimize hazardous chemical releases	• Pollutant Reduction Achievement • Chemical Release Reduction • Environmental Permit Compliance
Energy Efficiency	• Improve energy use in water treatment systems • Reduce energy-related water costs	• Operational Cost Savings • Energy Efficiency Ratio (EER)
Environmental Impact Reduction	• Reduce habitat disruption and aquatic harm • Set carbon targets for water-related processes	• Carbon Emission Reduction Achievement • Carbon Intensity

Source: Research data, 2025

This matrix demonstrates how PT KPI's operational initiatives can be quantified and aligned with international sustainability standards, providing a clear framework for both internal improvement and

external reporting. Indicators such as Water Use Efficiency and Recycled Water Percentage are particularly relevant under ISO 46001, while pollution prevention and compliance metrics directly support PROPER program targets and GRI disclosures. By embedding these KPIs into day-to-day operations, PT KPI not only ensures regulatory alignment and cost efficiency but also enhances its ESG disclosure credibility, thereby increasing its attractiveness to sustainability-conscious investors. This structured and standards-driven approach will also support PT KPI in securing sustainability-linked financing and improving long-term resilience in a resource-constrained operating environment.

Revitalize Process Safety Management (PSM)

This solution focuses on strengthening PT Kilang Pertamina Internasional's (PT KPI) operational resilience and safety performance by revitalizing its Process Safety Management (PSM) framework. Anchored in ISO 45001:2018, the initiative emphasizes enhanced employee participation, structured risk identification, and leadership accountability, aligning with international standards for occupational health and safety. Specifically, Clause 5.4 on Participation and Consultation guides the introduction of leadership training programs designed to equip frontline supervisors and managers with the skills necessary to recognize hazards, respond effectively to incidents, and communicate safety priorities across teams. This initiative is further embedded into daily operations through the integration of proactive hazard identification routines, targeting critical risk areas such as chemical exposure, mechanical integrity failures, and process-related disruptions.

Moreover, the program draws from Clause 6.1 (Actions to Address Risks and Opportunities) to establish a more structured risk assessment methodology, including the use of hazard mapping and likelihood-consequence analysis. These tools are supported by enhanced safety monitoring systems, including daily reporting mechanisms, peer reviews, and transparent communication channels that encourage the reporting of near misses and operational anomalies. Together, these components aim to foster a culture of safety, ownership, and continuous improvement throughout PT KPI's workforce. By embedding these PSM elements within the broader ESG framework, PT KPI not only improves compliance with occupational safety regulations but also directly contributes to enhancing its ESG risk ratings—particularly in the areas of governance, operational transparency, and risk mitigation. Ultimately, revitalizing PSM strengthens both operational safety and sustainability credentials, supporting PT KPI's strategic positioning in ESG-driven performance evaluations and investor assessments.

Safety Leadership and Culture

Qualitative insights from internal discussions emphasize the need for stronger safety leadership and a shift toward a proactive safety culture. Key improvement areas include the implementation of targeted leadership training for supervisors and managers, focusing on risk awareness, emergency preparedness, and effective decision-making, as reflected in Clause 5.4 of ISO 45001 (Participation and Consultation). In parallel, PT KPI is encouraged to cultivate a "no-blame" culture that promotes the reporting of near misses and early hazard detection, thereby fostering a learning-oriented environment. Embedding safety accountability into team routines ensures that safety is shared across all levels of the organization, rather than confined to specific departments.

Risk Identification and Hazard Mapping

Effective risk identification is at the heart of PSM. Using the principles of ISO 31000:2018 (Risk Management) and GRI 403, PT KPI has prioritized four core risk categories in its operations. These categories form the basis of an operational hazard mapping strategy designed to reduce incident frequency and severity.

Table 4. Risk Categories in PSM Operations

Risk Category	Examples and Potential Impact
Chemical Hazards	Leakage of flammable or toxic substances, potentially causing fire, explosions, or health risks.
Process Hazards	Overpressure, equipment malfunctions, or containment failures leading to production shutdowns.
Fire & Explosion Hazards	Ignition of volatile materials due to containment failure or poor maintenance.
Equipment Failures	Malfunctioning valves, pumps, or instrumentation threatening system integrity and operator safety.

This categorization supports a likelihood–consequence analysis approach, enabling better prioritization of interventions and integration of safety considerations into day-to-day operations.

Alignment with Sustainability Goals

Revitalized PSM not only improves safety outcomes but also reinforces PT KPI's overall ESG performance. Specifically, it contributes to emissions reduction, operational transparency, and enhanced regulatory compliance—critical components in improving ESG scores and maintaining the company's social license to operate. To ensure strategic alignment and performance monitoring, a Sustainability Goals and KPI Matrix has been developed, drawing on frameworks from Sustainalytics, ISO 45001, and GRI 403.

Table 5. PSM Sustainability Goals and KPI Matrix

Sustainability Goals	Description	Action
Zero harm to people and environment	Achieve and sustain zero incidents or environmental harm	Implement safety protocols; invest in safety tech; conduct drills; strengthen leadership
Continuous safety performance improvement	Foster a culture of learning and ongoing enhancement of safety practices	Review protocols; promote near-miss reporting; feedback loops; leadership in improvement culture
Reducing environmental impact	Minimize emissions, waste, and ecological disruption from PSM activities	Adopt green technologies; reduce hazardous outputs; integrate eco-conscious leadership
Resource efficiency	Optimize energy and water use in PSM operations.	Utilize renewable energy, enhance water reuse, and develop technical skills focused on efficiency.
Community engagement and communication	Maintain trust through transparency and dialogue.	Run awareness programs, engage local communities, and improve stakeholder communication.
Compliance with regulatory standards	Maintain full compliance with evolving safety and environmental regulations.	Align procedures with laws; conduct internal audits; provide training on regulatory frameworks.
Innovation in safety technology	Advance the use of smart systems for risk prediction and control	Invest in AI monitoring; adopt modern safety systems; promote technological openness
Emergency response and preparedness	Enhance PT KPI's ability to respond to incidents swiftly and effectively	Run drills; update emergency plans; collaborate with local authorities; train crisis leaders

Source: Research data, 2025

This matrix reflects a comprehensive safety transformation model, balancing technical, human, and environmental dimensions of operational risk management. Through continuous monitoring of these KPIs, PT KPI can ensure that its PSM initiatives not only reduce incidents but also serve as a key contributor to long-term ESG value creation. By integrating strong safety leadership, rigorous hazard assessment, and aligned sustainability objectives, PT KPI can turn Process Safety Management into a strategic ESG enabler. This approach supports compliance, strengthens organizational accountability, and enhances credibility with ESG rating agencies and sustainability-minded investors.

Improving PSM Governance

Strengthening Process Safety Management (PSM) governance is crucial for PT Kilang Pertamina Internasional (PT KPI) to transition from reactive compliance to proactive, ESG-aligned operational excellence. This solution pathway focuses on institutionalizing structured, risk-based approaches such as HAZOP (Hazard and Operability Study), FMEA (Failure Mode and Effects Analysis), and JSA (Job Safety Analysis) across the entire refinery lifecycle—from design and processing to distribution. Anchored in global standards such as ISO 31010 (Risk Assessment Techniques), ISO 45001:2018, and GRI 403, this approach enables comprehensive identification, evaluation, and mitigation of critical safety and sustainability risks.

Structured Risk-Based Governance

PSM governance begins with a foundation of rigorous, standardized risk assessments. PT KPI integrates methodologies aligned with ISO 31010 to uncover systemic weaknesses, assess equipment

reliability, and evaluate task-level exposures. Specifically: 1) HAZOP is applied to detect potential design flaws, process deviations, and operational inefficiencies; 2) FMEA is used to identify and prioritize potential failure modes based on severity, likelihood, and detection; and 3) JSA helps break down hazardous tasks to manage procedural risks at the frontline level. These frameworks support a proactive, prevention-oriented culture by allowing teams to anticipate and address failure scenarios such as chemical releases, mechanical breakdowns, and human errors before they escalate.

Integration of HAZOP in Design and Operations

Under the HAZOP methodology, PT KPI conducts systematic assessments across multiple operational domains. The table below outlines high-risk areas commonly encountered in refinery operations, along with the implications of governance lapses.

Table 6. HAZOP Risk Domains and Key Implications

Risk Domain	Key Examples and Implications
Process Design	Inadequate process specifications or layout can lead to overpressure events or containment failure.
Equipment Reliability	Malfunctioning pumps, valves, or vessels can trigger cascading failures in interconnected systems.
Human Error	Ambiguities in standard operating procedures (SOPs) or insufficient training increase the risk of accidents.

Source: Research data, 2025

These assessments not only inform safer design but also drive improvements in standardization, operating discipline, and emergency preparedness.

FMEA for Equipment and System Reliability

Failure Mode and Effects Analysis (FMEA) provides a framework for evaluating the vulnerability of critical systems and components. PT KPI applies this method to assess high-risk scenarios, such as: 1) Hydrocarbon Releases caused by faulty containment systems or pressure anomalies; 2) Control System Failures that compromise alarms, interlocks, or automation safeguards; 3) Training Gaps that result in inadequate response to abnormal operating conditions. By assigning Risk Priority Numbers (RPN) based on severity, occurrence, and detection, FMEA enables targeted mitigation plans and informed maintenance strategies.

Job Safety Analysis (JSA) for Task-Level Risk Control

Job Safety Analysis (JSA) focuses on task-level controls by identifying specific points of hazard exposure during high-risk activities. For instance: 1) Confined Space Entry in hydroprocessing units requires attention to toxic exposure and ventilation reliability; 2) Pipeline Maintenance presents risks related to pressure surges, ergonomic strain, and mechanical fatigue; and 3) JSA supports frontline risk ownership and strengthens procedural compliance across operational teams.

Governance Integration with ESG and Sustainability Goals

The integration of PSM governance with sustainability objectives ensures that safety management becomes a driver of PT KPI's broader ESG transformation. Table 7 outlines key sustainability-aligned goals and the specific actions required to achieve them. The framework draws from Sustainability, GRI 403, ISO 45001, and ISO 14001 standards.

Table 7. Sustainability Goals and Governance Alignment

Sustainability Goals	Objective	Action
Integrated Risk Management	Embed environmental and social risk into hazard studies	Incorporate ESG criteria in HAZOP and FMEA reviews
Sustainable Design Principles	Promote resource-efficient and low-impact engineering	Develop sustainable design guidelines for process engineers
Energy and Emissions Reduction	Implement measurable targets for energy and GHG reduction	Establish reduction roadmaps with defined milestones
Continuous Improvement	Build adaptive systems for ongoing safety and sustainability enhancement	Conduct regular reviews, integrate lessons learned, update roadmaps
Accountability for Sustainability	Assign clear roles for ESG performance governance	Update RASCI matrices with ESG roles, improve performance tracking

Sustainability Goals	Objective	Action
Stakeholder Engagement	Incorporate external input into PSM decision-making	Formalize stakeholder dialogue, integrate feedback into sustainability planning
Competency Development	Build ESG-related technical and leadership skills	Launch targeted training on environmental, social, and safety integration
Diversity and Inclusion	Address social sustainability within organizational culture	Promote inclusive leadership and representation in safety governance
Performance Monitoring	Track ESG and PSM indicators systematically	Define KPIs and report progress internally and to investors
Regulatory Compliance Leadership	Move beyond compliance toward industry-leading ESG performance	Benchmark against international best practices and exceed baseline regulatory requirements

Source: Research data, 2025

By institutionalizing these governance practices, PT KPI ensures that process safety becomes a vehicle for ESG integration, enabling the organization to meet and exceed regulatory expectations while demonstrating leadership in operational sustainability. The structured use of tools such as HAZOP, FMEA, and JSA ensures alignment between engineering safety and environmental stewardship. Additionally, governance mechanisms, including the updated RASCI matrix, regular performance reviews, and stakeholder engagement protocols, offer clear accountability and measurable impact. Ultimately, improving PSM governance positions PT KPI to enhance transparency, resilience, and long-term value creation—core expectations of ESG-conscious investors, regulators, and communities.

ESG Implementation Plan for PT KPI Operational Units

To operationalize the ESG Matrix across PT Kilang Pertamina Internasional (PT KPI) 's operational units, this study adopts the Six Phases of Project Management framework developed by (Baars, 2006). This structured approach breaks down complex sustainability initiatives into manageable, measurable, and controllable phases, enabling clarity in execution and accountability in outcomes. The implementation plan focuses on the deployment of three core ESG programs: Revitalization of Process Safety Management (PSM), Strengthening of PSM Governance, and Optimization of Beyond PROPER Waste Management. These initiatives are embedded within PT KPI's broader sustainability strategy and are critical for improving ESG performance across the organization.

Initiation Phase (Q1 2025)

In the initiation phase, PT KPI will focus on securing executive alignment and establishing a unified ESG vision across business units. This includes conducting high-level strategy sessions, engaging with key stakeholders, and initiating resource planning for cross-departmental integration. The objective is to ensure that ESG becomes an organizational priority from the top down. 1) Key Output: ESG Strategic Blueprint; and 2) Indicator: Formal endorsement of ESG objectives by executive leadership and formation of a multi-functional ESG Steering Committee.

Definition Phase (Q2 2025)

During this phase, PT KPI will define key project parameters, including ESG performance targets, risk priorities, and baseline Key Performance Indicators (KPIs). Sustainability indicators will be tailored to operational realities, and structured risk management frameworks—such as FMEA (Failure Mode and Effects Analysis) and JSA (Job Safety Analysis)—will be integrated into the revised PSM roadmap. Sample KPIs: 1) Percentage of high-priority risks identified and mitigated; and 2) Percentage of operational units with ESG-aligned Standard Operating Procedures (SOPs).

Design Phase (Q3 2025)

This phase involves designing the operational mechanisms, infrastructure, and digital tools necessary to support the deployment of ESG. Key activities include the implementation of Risk-Based Process Safety (RBPS) principles, the development of a comprehensive RASCI Matrix (defining accountability), and the digitization of SOPs for emissions control, waste treatment, and near-miss reporting. Key Outputs: 1) Digitized SOP repository; 2) Finalized RASCI accountability matrix; and 3) ESG technology deployment plan (e.g., emission sensors, monitoring dashboards).

Development Phase (Q4 2025 – Q1 2026)

At this stage, PT KPI will commit its technical, human, and financial resources to executing the ESG design. Workforce development becomes central, with extensive training and certification in ESG safety and environmental practices. Smart technologies, such as waste tracking systems and emission monitoring devices, will be deployed across pilot units. Sample KPIs: 1) Percentage of staff trained and certified in ESG operational safety; and 2) Number of operational units equipped with digital monitoring tools.

Implementation Phase (Q2–Q3 2026)

This phase marks the full-scale implementation of the ESG programs across selected operational units. ESG-based performance evaluations will monitor compliance, safety behaviors, and environmental improvements in real time. A centralized dashboard will aggregate performance data and support routine ESG audits, as well as corrective action tracking. Key Evaluation Metrics: 1) ESG audit compliance scores; 2) Percentage reduction in emissions from baseline; and 3) Cultural Safety Index (measured via internal staff perception surveys).

Follow-Up Phase (Q4 2026 and Ongoing)

The final phase emphasizes continuity, integration, and performance improvement. PT KPI will shift responsibility for ESG initiatives to operational units to ensure ownership and long-term sustainability. Annual ESG performance reports will be produced, and ongoing improvement actions will be tracked through a feedback loop system. Key Deliverables: 1) Annual ESG Performance Report; 2) Percentage of sustainability targets achieved; and 3) Number of post-review corrective actions successfully implemented.

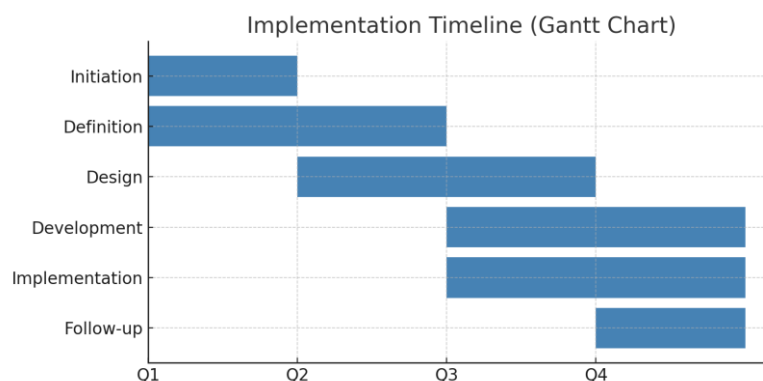


Figure 5. Implementation Timeline

Source: Research data, 2025

Through this phased approach (see Figure 5), PT KPI ensures a systematic and scalable transformation of its ESG operational practices. The implementation plan not only addresses immediate compliance and risk issues but also supports the long-term integration of sustainability into core business processes, positioning PT KPI as a proactive, ESG-aligned industry leader in Indonesia's energy sector.

D. CONCLUSION

This study concludes that sustainability goals must function as a strategic framework for embedding responsible environmental, social, and economic practices across PT Kilang Pertamina Internasional's (PT KPI) operations. The implementation roadmap centers on three interrelated ESG priorities: Revitalizing Process Safety Management (PSM), Strengthening PSM Governance, and advancing Beyond PROPER environmental initiatives. Together, these efforts emphasize proactive risk identification, structured mitigation strategies, and cross-functional ESG integration—key to operationalizing sustainability in a complex, high-risk industrial environment.

PT KPI's long-term success will depend on its ability to measure, monitor, and manage sustainability-related risks, particularly those associated with process safety vulnerabilities, governance

accountability, and environmental impact. A mature ESG framework will not only reinforce compliance with evolving global standards but also foster internal resilience, mitigate reputational risk, and enhance stakeholder perception.

Strategic Implications

The findings of this study suggest several key strategic implications for PT KPI:

1. **Operational Resilience:** By minimizing the likelihood and impact of safety or environmental incidents, ESG-driven systems can significantly enhance business continuity and risk preparedness.
2. **Regulatory Compliance:** Structured ESG implementation helps ensure compliance with both national regulations and international sustainability frameworks, reducing the risk of penalties and license-related delays.
3. **Stakeholder Trust:** Strong ESG performance fosters greater trust from investors, regulatory authorities, and surrounding communities—enhancing PT KPI's social license to operate.

Aligning ESG metrics with globally recognized frameworks such as Sustainalytics, GRI, and ISO standards may further improve PT KPI's eligibility for sustainability-linked financing, including green bonds and international institutional investments.

Future Research Directions

While this study focuses on ESG implementation at the operational level, future research should explore the financial implications of ESG maturity. Areas of interest include the correlation between ESG performance and profitability, investor confidence, and long-term valuation. Moreover, analyzing how sustainability performance is perceived in capital markets can help quantify the return on investment (ROI) of ESG initiatives. Such studies will further clarify how integrated ESG frameworks contribute to both corporate stability and competitive advantage in the global energy sector.

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