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Sustainable Governance of Palm Oil Industrial Waste under Environmental Law

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Abstract

Purpose: This study analyzes the legal regulation of palm oil industrial waste management within sustainable environmental governance and examines corporate legal liability under Law No. 6 of 2023. It argues that industrial waste must be addressed as a legal governance issue requiring prevention, supervision, accountability, and ecological restoration.

Research Design and Methodology: Using normative legal research with statutory and conceptual approaches, this study examines environmental approvals, wastewater standards, administrative sanctions, and corporate liability under Indonesian law. Legal materials were analyzed qualitatively using grammatical, systematic, and teleological interpretations through principles of precautionary action, polluter-pays, and corporate accountability.

Findings and Discussion: Although Indonesia has established a regulatory framework including environmental approvals, waste standards, and sustainability certifications it emphasizes procedural compliance over measurable ecological outcomes, preventing fully integrated governance. Furthermore, legal liability spans administrative, civil, criminal, and corporate domains. Administrative measures act as early corrections, civil liability covers restoration, criminal sanctions address severe violations, and corporate liability holds decision-makers accountable for risk management systems.

Implications: Environmental law reform must align business licensing, waste monitoring, sanctions, public information access, and restoration obligations, treating waste governance as an integrated legal system. Future research should assess empirical enforcement, regional supervision, compliance behavior, and community access to remedies in palm oil-producing regions.

Introduction

The governance of palm oil industrial waste has become a central legal issue because the economic strength of the palm oil sector is accompanied by persistent ecological risks that cannot be resolved through technical treatment alone. Indonesia remains the largest global producer of palm oil, with national statistics recording extensive plantation area and production distribution across provinces, while independent market data also show that Indonesia produced around 47 million tonnes of crude palm oil in 2023 and accounted for more than half of global palm oil exports, (Benedict and Heilmayr 2024). This scale produces not only economic value, employment, and export revenue, but also large volumes of liquid and solid waste, including palm oil mill effluent, empty fruit bunches, shells, fibers, sludge, and residual organic materials that may burden water bodies, soil quality, air quality, and public health when regulatory control is weak, (Dashti, Fatehah, and Zahed 2022). The legal problem therefore lies not merely in the existence of environmental obligations, but in whether environmental law can build a sustainable governance model that integrates prevention, compliance, monitoring, accountability, restoration, and community protection in the operation of palm oil industries.

The practical urgency of this research is strengthened by the fact that palm oil industrial waste is produced continuously as part of the production chain, while legal enforcement often reacts only after pollution, community complaints, or visible ecological degradation occurs. Palm oil mill effluent is widely recognized as a high organic load wastewater that may generate methane and other environmental impacts when it is treated through conventional open pond systems without sufficient capture, reuse, or supervision. Recent technical studies emphasize that anaerobic digestion of palm oil mill effluent may produce biogas, yet the same effluent remains a pollution source when the treatment process is not governed by strict legal standards, performance indicators, and transparent monitoring, (Yong et al. 2023). This condition creates normative uncertainty because environmental law formally recognizes the principles of prevention, precaution, polluter pays, sustainable development, and public participation, but their translation into palm oil waste governance still depends heavily on the strength of licensing, inspection, administrative sanctions, corporate responsibility, and local institutional capacity.

Recent studies on palm oil industrial waste have generally developed along three main directions, namely technological treatment, circular economy utilization, and environmental policy evaluation. The technological strand focuses on how liquid and solid waste can be converted into biogas, biofertilizer, compost, animal feed, biochar, or other derivative products, thereby reducing environmental pressure and improving resource efficiency. For example, studies on biological processing and anaerobic digestion argue that palm oil mills generate substantial waste streams that can be treated and valorized through improved biological systems, but those studies are primarily concerned with engineering efficiency, energy recovery, and processing performance rather than legal accountability, (Dominic and Baidurah 2022). These studies provide an important scientific basis, yet they do not fully answer how environmental law should require, supervise, and evaluate the adoption of such technologies within binding governance obligations.

A second body of literature has examined palm oil waste within the discourse of sustainability, climate mitigation, and circular economy transition, (Ng et al. 2023). This research trend views palm oil waste not only as an environmental burden, but also as a renewable energy source and industrial input that can support low carbon development when managed through integrated systems, (Setiawan et al. 2025). Studies on biomethane production, effluent treatment optimization, and co digestion show that palm oil waste has considerable potential to support energy transition, especially when methane from effluent treatment is captured and converted into usable energy. However, the limitation of this strand is that sustainability is often framed as technical feasibility or economic opportunity, while the legal meaning of sustainable governance remains underdeveloped, particularly regarding enforceable

duties, public access to information, compliance reporting, sanction proportionality, and restoration of polluted environments.

A third strand of research has moved closer to law and public policy by evaluating government policies, regulatory frameworks, and institutional responses to palm oil waste pollution,(Z. Zainal et al. 2025). Recent policy oriented studies have begun to criticize the effectiveness of waste reduction policies, the fragmentation of implementation, and the need for more environmentally friendly palm oil industry governance,(Zainal et al. 2025). Some studies published in 2025, for instance, examine government policies to reduce palm oil waste pollution and assess the Indonesian regulatory framework for palm oil mill effluent and solid waste management, showing increasing scholarly attention to the relation between regulation, sustainability, and implementation. Nevertheless, these studies remain limited because they tend to evaluate policy effectiveness descriptively, while this research seeks to construct a legal governance framework that clarifies how environmental law should operate as a preventive, corrective, and transformative instrument in the palm oil waste sector.

The gap between previous studies and current empirical realities can be identified quantitatively from the disproportion between industrial scale, waste generation, and the depth of legal governance analysis. If Indonesia produces approximately 47 million tonnes of crude palm oil annually, and technical literature commonly estimates that each tonne of crude palm oil may generate several cubic meters of palm oil mill effluent, then the national waste burden reaches a scale that cannot be addressed through voluntary compliance or plant level treatment alone,(Meena R et al. 2023). At the same time, methane studies show that untreated or poorly managed palm oil mill effluent can contribute to greenhouse gas emissions, while climate oriented observations increasingly connect palm oil production systems with broader sustainability and legality concerns in domestic and international markets,(Murphy, Goggin, and Paterson 2021).

The conceptual gap also lies in the tendency of environmental law studies to discuss palm oil governance through land use, deforestation, licensing, and plantation legality, while industrial waste governance receives less systematic legal attention,(Hamzah et al. 2026). In practice, palm oil waste is regulated through environmental approval, waste water quality standards, hazardous and non hazardous waste management, administrative supervision, and corporate environmental responsibility, but those instruments are often examined separately rather than as one governance system. This separation weakens the ability of legal scholarship to explain whether existing norms create coherent duties from production planning to waste treatment, monitoring, disclosure, reuse, sanctioning, and environmental recovery. Therefore, this research challenges the view that environmental compliance in the palm oil industry can be measured only by the availability of permits or treatment facilities, and instead expands the analysis toward sustainability based governance that requires measurable outcomes, institutional coordination, and legal accountability.

Based on the above gap, the central research question of this article is how sustainable governance of palm oil industrial waste should be constructed under environmental law to ensure prevention of pollution, corporate accountability, institutional coordination, and protection of ecological and community interests. This study aims to analyze the adequacy of environmental law in governing palm oil industrial waste, to identify weaknesses in the relationship between regulatory norms and implementation, and to formulate a governance model that integrates legal compliance, sustainability principles, circular economy utilization, public participation, and enforceable environmental responsibility. The research is expected to show that palm oil waste governance cannot be reduced to end of pipe treatment, because sustainable governance requires a legal structure that connects industrial licensing, environmental impact control, waste utilization, monitoring technology, sanction mechanisms, community oversight, and restoration duties. The originality of this study lies in its attempt to shift the discourse from palm oil waste management as a technical or administrative matter

toward sustainable legal governance as an integrated framework for environmental justice, industrial responsibility, and ecological sustainability in the palm oil sector.

Literature Review

Environmental Law Governance and the Normative Basis of Sustainable Waste Control

The literature on environmental law governance generally agrees that industrial waste cannot be regulated only through post pollution sanctions, because environmental harm often becomes irreversible once contamination has entered water, soil, and community life. Scholars of environmental rule of law argue that sustainability requires clear norms, institutional integrity, access to information, public participation, and remedies that can be used before and after environmental damage occurs. Kreilhuber and Kariuki describe environmental rule of law as an important pillar of sustainable development, especially because it connects environmental principles with enforceable legal institutions,(Kreilhuber and Kariuki 2019). This literature is relevant to the present research because palm oil industrial waste governance must be assessed not only from the existence of legal rules, but also from the capacity of those rules to prevent pollution and secure accountability.

A major point of convergence in environmental law literature lies in the principles of prevention, precaution, sustainable development, and polluter pays. Prevention requires the state and business actors to avoid environmental harm before it occurs, while precaution justifies regulatory intervention even when scientific certainty is incomplete. The polluter pays principle shifts environmental costs from the public to the actor that causes pollution, and recent legal discussions continue to treat this doctrine as a core mechanism for internalizing the cost of environmental harm,(Xu, Zhang, and Han 2024). This doctrinal framework is relevant because palm oil industrial waste governance needs legal standards that require companies to bear the cost of waste treatment, monitoring, recovery, and ecological restoration.

The debate within environmental governance literature concerns whether legal control should rely mainly on command and control regulation or should move toward adaptive and collaborative governance. Command and control approaches emphasize permits, quality standards, inspections, administrative sanctions, civil liability, and criminal enforcement, while adaptive governance highlights coordination, learning, transparency, community participation, and technological responsiveness,(Zainal et al. 2025). In the palm oil sector, this debate becomes more complex because industrial waste is connected to production scale, market demand, local government capacity, and corporate investment in treatment technology,(David et al. 2023). This debate is relevant to the present research because sustainable governance of palm oil industrial waste requires a model that combines binding legal obligations with adaptive mechanisms capable of responding to ecological and technological change.

The theoretical urgency of environmental law governance is also shown by the gap between formal legality and substantive ecological outcomes. A company may hold environmental approval, waste water discharge permits, or sustainability certificates, but formal compliance does not always guarantee that effluent quality, waste reuse, methane capture, and community protection are achieved in practice. Therefore, environmental law must be read through the theory of environmental rule of law, because this theory evaluates the consistency between norms, institutions, enforcement, rights, and measurable ecological results. This theoretical position is relevant because the discussion section of this research will examine whether palm oil waste governance has moved beyond procedural licensing toward substantive environmental protection.

Sustainable Palm Oil Waste Management and the Circular Economy Debate

Recent literature on palm oil industrial waste increasingly frames waste as both an ecological risk and a resource that can be reused through circular economy strategies. Palm oil mill

effluent, empty fruit bunches, shells, fibers, and sludge are often studied as materials that can be converted into biogas, compost, biofertilizer, biomass energy, or other industrial inputs. A 2022 review on biological processing technologies shows that palm oil mills generate significant waste streams and that biological treatment can reduce pollution while supporting resource recovery,(Dominic and Baidurah 2022). This literature is relevant because the legal analysis in this research must consider whether environmental law already encourages waste reduction and recovery, or whether it still treats palm oil waste mainly as a disposal problem.

The technological literature has developed strongly in the last five years, especially on palm oil mill effluent treatment and biogas production. Studies on anaerobic digestion, biomethane optimization, and effluent treatment performance indicate that palm oil waste can support renewable energy and reduce methane emissions when managed through proper systems,(Yong et al. 2023). Yong and other researchers found that anaerobic digestion of palm oil mill effluent can produce biogas with methane content, while other studies emphasize optimization models for sustainable biomethane production,(Ng et al. 2023). This literature is relevant because it shows that the legal problem is not the absence of treatment options, but the absence of sufficiently strong governance to make appropriate treatment, monitoring, and utilization legally mandatory.

The main debate in this field concerns whether circular economy approaches can genuinely solve palm oil waste problems or merely transform environmental responsibility into an economic opportunity for industry. Supporters argue that waste valorization reduces disposal burdens, lowers greenhouse gas emissions, and increases energy efficiency, while critics warn that circular economy language may obscure continuing pollution if legal enforcement remains weak. Recent studies on wastewater treatment methods for palm oil mill effluent stress that the high organic load and nutrient content of POME continue to create environmental challenges even when treatment technologies are available,(Kacaribu et al. 2025). This debate is relevant because the present research will test whether sustainable governance can reconcile economic utilization of waste with enforceable environmental protection.

The circular economy literature also reveals a theoretical need to integrate environmental law with sustainable development theory. Sustainable development is not limited to balancing economy and ecology in abstract terms, but requires institutional rules that secure intergenerational equity, resource efficiency, pollution prevention, and social accountability. In the palm oil waste context, this means that waste reuse should not be assessed only by economic benefit, but also by its compliance with environmental quality standards, risk control, public information, and restoration duties,(Vogt and Weber 2019). This literature is relevant because the discussion section will argue that sustainable governance must transform palm oil waste management from voluntary innovation into a legally structured obligation.

Palm Oil Policy, Corporate Accountability, and Community Protection

Literature on palm oil governance shows that sustainability problems in the sector cannot be separated from institutional weakness, fragmented authority, and limited accountability. Putri and colleagues explain that Indonesian palm oil governance faces agrarian, environmental, and social challenges, and that sustainability policy is shaped by tensions among state regulation, market pressure, and local impacts,(Putri et al. 2022). More recent studies on sustainable palm oil policy also show that climate change, global market integration, and certification pressures increasingly influence domestic governance reforms,(Astari, Lovett, and Wasesa 2025). This literature is relevant because palm oil industrial waste cannot be analyzed as a factory level issue only, but must be placed within broader policy, institutional, and market governance structures.

The literature also identifies a debate between public regulation and private certification in achieving sustainable palm oil governance. Public regulation is grounded in state authority,

environmental law, administrative sanctions, and public accountability, while private certification such as RSPO and national certification systems seeks to improve market access and sustainability performance through standards and audits. Recent research on harmonizing RSPO and ISPO standards highlights the continuing challenge of aligning certification systems with credible sustainability outcomes in Indonesia, (Suhardjo and Suparman 2025). This literature is relevant because the present research will examine whether certification can support environmental law or whether it risks becoming a parallel mechanism that does not adequately address industrial waste accountability.

Corporate accountability literature emphasizes that environmental responsibility should include compliance, prevention, disclosure, compensation, restoration, and respect for affected communities. In the palm oil sector, corporate social responsibility is often discussed as a mechanism to manage social and environmental issues, but CSR remains limited if it is not connected to enforceable environmental obligations. Studies on government policies to reduce palm oil waste pollution in Indonesia show that inefficient waste management affects water, soil, air, and socio economic sustainability, thereby requiring stronger policy and institutional responses, (Z. Zainal et al. 2025). This literature is relevant because the article will argue that corporate accountability in palm oil waste governance must be legal, measurable, and enforceable rather than merely philanthropic or reputational.

Community protection literature adds an important rights based dimension to palm oil industrial waste governance. Environmental pollution from industrial activity may affect access to clean water, health, livelihood, and a healthy environment, which means that waste governance must include public participation, complaint mechanisms, access to environmental information, and remedies for affected communities. The emerging legality discourse in international markets, including analysis of the European Union Deforestation Regulation and Indonesian palm oil legality, shows that environmental compliance is increasingly connected to traceability, due diligence, and proof of lawful production, (Kwatrina, Santosa, and Purnamasari 2024). This literature is relevant because the research will develop an argument that sustainable governance of palm oil industrial waste must protect communities as rights holders, not merely treat them as passive recipients of corporate or administrative decisions.

Research Design and Methodology

This research uses normative legal research with a doctrinal design, because the main issue concerns the adequacy, coherence, and enforceability of environmental law in governing palm oil industrial waste. The doctrinal design is appropriate because the research does not primarily measure social behavior, but examines legal norms, principles, doctrines, and regulatory instruments that structure waste governance in the palm oil industry, (Christiawan and Limaho 2020). The study applies a statute approach to assess relevant environmental, plantation, waste management, licensing, and corporate responsibility regulations, and a conceptual approach to examine sustainable governance, environmental rule of law, polluter pays principle, precautionary principle, and sustainable development. This design is therefore suitable to answer how environmental law should construct a sustainable governance model for palm oil industrial waste.

The object of this research consists of legal materials related to palm oil industrial waste governance under environmental law. Primary legal materials include statutory provisions on environmental protection and management, waste water control, hazardous and non hazardous waste management, environmental approval, administrative sanctions, corporate liability, and sustainable palm oil policy. Secondary legal materials include journal articles, books, policy reports, legal commentaries, and previous studies published mainly within the last five years, especially those discussing palm oil waste, environmental governance, circular economy, corporate accountability, and sustainability regulation. The materials are selected purposively based on relevance, authority, recency, and their capacity to explain the relationship between legal norms, institutional duties, industrial

compliance, and ecological protection.

The data collection technique is conducted through systematic document study. First, the researcher identifies and inventories legal materials by tracing legislation, implementing regulations, official policy documents, and scholarly literature related to palm oil industrial waste and environmental governance. Second, the collected materials are classified into four categories, namely regulatory framework, environmental law principles, institutional governance, and corporate accountability mechanisms. Third, each material is examined using a document review instrument that records the source, legal issue, normative content, regulatory function, weakness, and relevance to the research question, so that the research process can be replicated.

The data analysis technique uses qualitative normative analysis with prescriptive legal reasoning. The collected legal materials are reduced, categorized, and interpreted by comparing the legal obligations contained in environmental regulations with the principles of sustainable governance, prevention, precaution, polluter pays, public participation, and ecological restoration. Legal interpretation is carried out through grammatical, systematic, and teleological methods to determine whether existing norms are coherent, enforceable, and capable of responding to the environmental risks of palm oil industrial waste. The final stage formulates a legal argument on the ideal governance model by identifying regulatory gaps, evaluating institutional responsibilities, and constructing recommendations for strengthening sustainable palm oil waste governance under environmental law.

Findings and Discussion

Legal Regulation of Palm Oil Industrial Waste Management within Sustainable Environmental Governance

Findings

The normative analysis shows that palm oil industrial waste management in Indonesia is regulated through a multi layered environmental law framework rather than through one single sectoral instrument. The legal construction begins from the constitutional right to a good and healthy environment, continues through Law No. 32 of 2009 on Environmental Protection and Management as amended by Law No. 6 of 2023, and is operationalized further through Government Regulation No. 22 of 2021,(Banulita and Utami 2021). Government Regulation No. 22 of 2021 provides the technical structure for environmental approval, environmental impact assessment, water quality protection, wastewater quality standards, hazardous and non hazardous waste management, and administrative sanctions,(Ningsih, Frinaldi, and Rembrandt 2024). This finding indicates that palm oil industrial waste governance is formally recognized within environmental law, but its sustainability depends on whether those instruments operate as an integrated system of prevention, control, supervision, and recovery.

Table 1.
Legal Framework and Implication for Palm Oil Industrial Waste Governance in Indonesia

Normative Aspect	Main Legal Instrument	Processed Legal Finding	Implication for Sustainable Governance
Environmental approval and business licensing	Law No. 32 of 2009 as amended by Law No. 6 of 2023, PP No. 22 of 2021	Environmental approval becomes integrated with risk based business licensing	Waste governance is linked to business legality, but environmental safeguards must remain substantive
Wastewater control	PP No. 22 of 2021, Minister of Environment Regulation No. 5 of 2014	Palm oil effluent must comply with wastewater quality standards before discharge	Compliance must be measured through objective environmental indicators
Hazardous and non hazardous waste management	PP No. 22 of 2021	Waste reduction, storage, utilization, treatment, and	Waste management must follow a life cycle approach, not merely final disposal

Normative Aspect	Main Legal Instrument	Processed Legal Finding	Implication for Sustainable Governance
Sustainability certification	ISPO framework, including Minister of Agriculture Regulation No. 38 of 2020	disposal are legally regulated Environmental management forms part of sustainable palm oil certification	Certification can support legal compliance, but cannot replace state supervision
Administrative control	PP No. 22 of 2021	Violations may trigger administrative sanctions and fines	Enforcement must connect non compliance with corrective and restorative obligations

Source: Processed by author based on Law No. 32 of 2009, Law No. 6 of 2023, Government Regulation No. 22 of 2021.

The table demonstrates that the regulation of palm oil industrial waste is not absent, but dispersed across environmental approval, wastewater standards, waste management obligations, sustainability certification, and administrative enforcement. This structure reflects a regulatory model that combines command and control instruments with sustainability oriented policy tools. However, the processed findings also show that the regulatory framework still emphasizes compliance with formal requirements, such as approval, reporting, and quality standards, more strongly than measurable ecological outcomes. This is relevant to the article because sustainable environmental governance requires the law to ensure that compliance produces actual pollution prevention, waste reduction, and environmental recovery.

The transformation of environmental permits into environmental approval within the business licensing framework after the Job Creation Law marks an important shift in Indonesia's environmental regulatory structure. This transformation is intended to simplify licensing and improve regulatory efficiency, but it also changes the position of environmental control from a relatively independent environmental permit into an element connected with business legality. From a governance perspective, this arrangement can strengthen compliance if environmental approval becomes a mandatory gate for business operation, supervision, and sanctioning. However, it may weaken environmental protection if licensing simplification is interpreted as administrative acceleration without rigorous assessment of palm oil mill effluent, solid waste, methane risk, and local ecological carrying capacity.

Government Regulation No. 22 of 2021 plays a central role as the operational framework for environmental protection and management. This regulation consolidates various environmental control regimes, including environmental documents, environmental approval, water pollution control, wastewater quality standards, hazardous waste, non hazardous waste, and administrative sanctions. Its annexes also regulate technical matters that are essential for implementation, including environmental quality standards and sanctions,(Aleluia et al. 2022). This is legally significant because palm oil industrial waste management must be evaluated not only by whether a company owns approval, but by whether each stage of waste handling complies with environmental quality and risk control standards.

Palm oil mill effluent remains the most prominent liquid waste problem in palm oil processing. Minister of Environment Regulation No. 5 of 2014 concerning Wastewater Quality Standards remains relevant because it provides wastewater quality standards applicable to industrial discharge, including palm oil related wastewater standards,(Karno et al. 2024). In legal terms, wastewater quality standards function as measurable thresholds that convert the general obligation to prevent pollution into operational indicators. This supports the argument that sustainable governance must be built on verifiable parameters, because without measurable effluent standards, the principles of prevention and polluter pays would remain abstract.

Waste management must be understood as a life cycle obligation rather than a final disposal activity. Palm oil industrial waste consists not only of liquid effluent, but also empty fruit bunches, fibers, shells, boiler ash, sludge, and other residual materials that require differentiated legal treatment. Government Regulation No. 22 of 2021 recognizes waste reduction, storage, collection, utilization, processing, disposal, emergency response, technical approval, and operational eligibility as part of environmental management (Wijayanti et al. 2024). This is important because sustainable governance requires legal control from the moment waste is generated until it is treated, reused, recovered, or safely disposed of.

The relationship between state regulation and sustainability certification also forms an important element of palm oil waste governance. The Indonesian Sustainable Palm Oil certification system is designed as a mandatory sustainability scheme and includes legality, environmental management, plantation management, and social responsibility criteria. In principle, certification can strengthen compliance by translating sustainability commitments into audit based criteria for palm oil business actors. However, certification remains insufficient if it is not connected to public supervision, transparent environmental data, enforceable sanctions, and state responsibility to protect affected communities.

Discussion

The discussion of these findings shows that the main legal problem is not regulatory vacuum, but regulatory fragmentation and uneven normative force. Environmental approval, wastewater standards, waste management, certification, and sanctions exist within the legal system, yet they do not always operate as one coherent governance chain. Sustainable governance requires legal norms to connect prevention, monitoring, corporate duty, administrative enforcement, community participation, and ecological recovery. Without such connection, palm oil waste regulation may become a set of separate obligations that are formally fulfilled but substantively weak in preventing pollution.

This condition occurs because environmental law in the palm oil waste sector still tends to use compliance as the main indicator of legal success. Compliance is necessary, but it is not sufficient when the activity produces continuous waste and carries risks for water quality, methane emissions, soil contamination, and community health. The doctrine of environmental rule of law requires a stronger relationship between legality and ecological outcome, so that law is assessed by its capacity to prevent damage, correct violations, and restore environmental functions. Therefore, the findings support the theoretical position that sustainable governance must move beyond procedural legality toward substantive environmental accountability.

The polluter pays principle also strengthens this interpretation because it requires business actors to internalize the cost of pollution prevention, waste treatment, monitoring, and recovery. In the palm oil sector, this principle means that the cost of managing effluent and solid waste should not be transferred to rivers, communities, local governments, or future generations. The principle becomes legally meaningful only when environmental approval, wastewater standards, waste treatment duties, and sanctions operate together as enforceable obligations. Thus, the findings confirm that sustainable governance must transform polluter pays from a general doctrine into a concrete regulatory mechanism.

The precautionary principle further explains why palm oil industrial waste should be governed preventively rather than reactively. Palm oil mill effluent and organic residues may create environmental harm even before damage becomes visible, especially when treatment facilities are inadequate or monitoring is irregular. Because scientific and technical uncertainty may exist in measuring long term ecological impact, environmental law must require early control, continuous monitoring, and risk based evaluation. This analysis shows that the legal regulation of palm oil industrial waste should prioritize anticipatory governance, not merely administrative response after pollution has occurred.

The overall finding is that Indonesia already possesses a legal basis for regulating palm oil industrial waste, but the sustainability quality of that framework depends on integration, enforceability, and outcome orientation. Law No. 6 of 2023 and Government Regulation No. 22 of 2021 provide a formal structure for environmental approval and environmental management, while wastewater standards and ISPO certification add technical and sustainability dimensions. Yet the regulatory model still needs stronger linkage between licensing, waste standards, public participation, monitoring technology, sanctions, and restoration duties. Therefore, the legal regulation of palm oil industrial waste within sustainable environmental governance should be understood as an integrated legal architecture that converts environmental principles into measurable, enforceable, and restorative obligations.

Legal Liability of Palm Oil Industry Business Actors for Non Compliance with Environmental Waste Management Obligations under Law No. 6 of 2023

Findings

The normative analysis shows that legal liability for palm oil industry business actors is constructed through administrative, civil, and criminal responsibility. This liability framework derives from Law No. 32 of 2009 on Environmental Protection and Management as amended by Law No. 6 of 2023, and is operationalized through Government Regulation No. 22 of 2021. Law No. 6 of 2023 does not remove environmental responsibility, but places environmental approval within the risk based business licensing system, thereby linking waste management compliance to the legality of business operations,(Prasetyo and Jaelani 2022). This construction is relevant because palm oil industrial waste governance depends on whether non compliance can trigger effective legal consequences, not merely formal correction.

The processed legal materials indicate that business actors may be held responsible when they fail to comply with environmental approval, wastewater quality standards, hazardous or non hazardous waste obligations, monitoring duties, and restoration requirements. Government Regulation No. 22 of 2021 defines key regulatory instruments, including environmental approval, wastewater quality standards, hazardous and toxic waste management, waste utilization, technical approval, operational feasibility, and administrative sanctions.

Table 2.
Forms of Legal Liability and Governance Functions in Palm Oil Industrial Waste Management

Form of Liability	Legal Basis	Trigger of Responsibility	Governance Function
Administrative liability	Law No. 32 of 2009 as amended by Law No. 6 of 2023, PP No. 22 of 2021	Violation of environmental approval, business licensing obligations, wastewater standards, or waste management duties	Correcting non-compliance and restoring regulatory control
Civil liability	Environmental protection and management law	Pollution, environmental damage, community loss, or failure to restore environmental quality	Providing compensation, recovery, and restoration
Criminal liability	Environmental criminal provisions under environmental law	Intentional or negligent pollution, serious environmental harm, or violation that fulfills criminal elements	Deterring unlawful conduct and punishing serious environmental violations
Corporate liability	Environmental law provisions on corporate responsibility	Violations committed by or for the benefit of the corporation	Ensuring responsibility is not shifted only to individual workers
Restorative responsibility	Environmental approval, sanctions, and restoration obligations	Degradation of water, soil, air, or ecological function caused by waste mismanagement	Returning environmental protection to substantive outcomes

Source: Processed by author based on Law No. 32 of 2009, Law No. 6 of 2023, and Government Regulation No. 22 of 2021.

The table shows that liability for palm oil waste mismanagement has a layered structure. Administrative liability occupies the earliest position because it can be imposed before environmental damage becomes wider, especially when business actors violate approval requirements, exceed quality standards, or fail to perform required waste management procedures. Civil liability becomes relevant when non compliance causes loss, pollution, or environmental degradation that requires compensation and restoration. Criminal liability functions as the final legal response when the violation contains intentional or negligent conduct that meets the elements of environmental crime.

Discussion

The transformation of environmental permits into environmental approval within the business licensing system affects the way liability is imposed on palm oil industry business actors. Under the post Job Creation framework, environmental approval becomes part of business licensing control, which means that environmental non compliance may affect the validity and continuity of business activities. This model can strengthen accountability if licensing supervision treats environmental obligations as substantive conditions for operating, expanding, and maintaining industrial activity. However, the model may weaken liability if environmental approval is treated only as an administrative document rather than as a binding instrument containing measurable waste management obligations.

Administrative liability is central because palm oil industrial waste is generated continuously and requires regular supervision. Government Regulation No. 22 of 2021 provides an operational framework for environmental approval, environmental standards, waste management, and administrative sanctions, including technical matters contained in its annexes, (Wijayanti et al. 2024). In the palm oil sector, administrative liability may arise when a company discharges wastewater beyond quality standards, fails to manage waste properly, neglects reporting duties, or operates without fulfilling technical approval and operational feasibility requirements. This supports the argument that sustainable governance must rely on early corrective sanctions before pollution becomes irreversible.

Civil liability reflects the corrective and restorative dimension of environmental law. When palm oil industrial waste causes pollution, damage, or loss to affected communities, legal responsibility should not stop at administrative sanction because ecological harm may require compensation, rehabilitation, and restoration, (Violetta, Mukhlis, and Tajudin 2025). The polluter pays principle justifies this form of liability because the cost of environmental damage must be borne by the business actor that creates the risk or causes the harm. This principle is relevant to palm oil industrial waste because effluent, sludge, and other residues can transfer environmental costs to rivers, land, local communities, and future generations if responsibility is not internalized.

Criminal liability must be understood as a legal instrument for serious violations, not as the only measure of enforcement success. Environmental criminal law is needed when non compliance involves intentional or negligent conduct, serious pollution, falsification of compliance, or disregard of legally required waste treatment obligations. In palm oil waste governance, criminal liability becomes important when administrative correction is ignored or when waste mismanagement produces significant environmental harm, (Torodji et al. 2023). This position is consistent with sustainable governance because criminal law should protect ecological interests while remaining tied to clear legal elements and proportional enforcement.

Corporate liability is especially important because palm oil industrial waste is produced through organized business activity rather than isolated individual conduct. Environmental law recognizes that responsibility may attach to corporations, management, or persons who order, control, or benefit from unlawful conduct. This prevents companies from shifting responsibility only to technical operators while decision making, budgeting, and compliance systems remain controlled at the corporate level. In

sustainable governance, corporate liability ensures that waste treatment facilities, monitoring systems, reporting accuracy, and restoration funds become managerial obligations rather than optional operational costs.

The main issue in the liability framework is the relationship between formal non compliance and substantive environmental harm. A company may violate environmental approval or wastewater standards before visible damage appears, and this should already justify administrative intervention because environmental law is preventive in character. At the same time, when pollution or ecological damage has occurred, liability must move beyond documentation and require compensation, restoration, and institutional correction. This layered logic shows that environmental responsibility under Law No. 6 of 2023 must be read together with the principles of prevention, precaution, polluter pays, and environmental restoration,(Yasser Basuwendro, Suhadi, and Rofi Wahanisa 2025).

The findings also show that liability becomes weak when supervision depends only on periodic reports submitted by business actors. Palm oil industrial waste management requires objective measurement, including wastewater testing, compliance audits, monitoring of treatment facilities, and verification of waste utilization or disposal. Without independent supervision and transparent environmental information, liability may become reactive and dependent on complaints after pollution has already affected communities. This explains why sustainable governance requires stronger connection between legal duties, monitoring instruments, public participation, and enforceable sanctions.

The discussion supports the theory of environmental rule of law because liability must connect legal norms with institutions, enforcement, remedies, and ecological outcomes. If environmental approval, wastewater standards, and waste management duties exist only as formal requirements, the legal system may appear complete while failing to prevent pollution. Conversely, when those obligations are tied to sanctions, compensation, restoration, and corporate accountability, environmental law becomes capable of governing industrial risk in a substantive manner. This theoretical position confirms that sustainable governance is achieved when legality produces measurable protection for water quality, land function, air quality, and affected communities.

The liability model under Law No. 6 of 2023 therefore presents both opportunity and risk. The opportunity lies in integrating environmental approval with business licensing, which can make environmental compliance a condition for the continuity of palm oil industrial operations. The risk lies in the possibility that licensing simplification reduces the intensity of environmental assessment, supervision, and enforcement if economic acceleration is prioritized over ecological protection. Therefore, legal liability for palm oil waste mismanagement must be interpreted as an integrated system of administrative correction, civil restoration, criminal deterrence, and corporate accountability within sustainable environmental governance.

Conclusion

This study concludes that the regulation of palm oil industrial waste management in Indonesia has been legally constructed through environmental approval, wastewater quality standards, waste management obligations, administrative supervision, and sustainability certification. However, these instruments have not yet fully formed an integrated model of sustainable environmental governance because their operation still tends to emphasize procedural compliance rather than ecological outcomes. Law No. 6 of 2023 strengthens the connection between environmental approval and business licensing, but this connection must be interpreted as a substantive safeguard for pollution prevention, not merely as a mechanism for licensing simplification. Therefore, palm oil industrial waste governance requires a coherent legal framework that links prevention, monitoring, technical compliance, public participation, sanctioning, and restoration within one enforceable system.

This study also concludes that legal liability for palm oil industry business actors is constructed through administrative, civil, criminal, and corporate responsibility. Administrative liability functions as an early corrective mechanism when business actors violate environmental approval, wastewater standards, reporting duties, or waste management obligations. Civil liability becomes relevant when waste mismanagement causes pollution, environmental damage, or community loss that requires compensation and ecological restoration, while criminal liability applies to serious violations involving intentional or negligent conduct. Corporate liability is essential because palm oil waste is generated through organized industrial activity, so responsibility must attach not only to technical operators but also to corporate decision makers who control compliance systems, financing, and environmental risk management.

The contribution of this study lies in its formulation of palm oil industrial waste as a legal governance issue rather than a purely technical or administrative problem. Theoretically, this research strengthens environmental law scholarship by integrating environmental rule of law, prevention, precaution, polluter pays, corporate accountability, and sustainable governance into one analytical framework. Practically, this study offers a basis for policymakers to strengthen the relationship between licensing, technical approval, compliance monitoring, sanctions, restoration duties, and community access to environmental information. The limitation of this study is its normative legal character, so future research should examine the empirical effectiveness of enforcement, regional supervision practices, corporate compliance behavior, wastewater monitoring, and community remedies in palm oil producing areas.

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Declaration of Generative AI Use

The author declares that generative AI tools were used solely to assist in preparing the initial writing framework, summarizing supporting literature, and improving language clarity and grammar. After using these tools, the author carefully reviewed, edited, and verified all factual, legal, and analytical content contained in this article. The author takes full responsibility for the accuracy, integrity, originality, and final form of the published content.

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