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Research Article

Corporate Liability for Air Pollution Based on Strict Liability in Indonesia: A Study of the Absence of Standards for Measuring Non-Material Damages

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Abstract: Air pollution constitutes a significant environmental problem with far-reaching impacts on public health, quality of life, and ecosystem sustainability, particularly in urban areas and industrial zones in Indonesia. Although the national environmental legal framework has adopted the principle of strict liability through Law Number 32 of 2009 on Environmental Protection and Management, its implementation in air pollution cases continues to face substantial challenges, especially with regard to the proof and assessment of non-material damages. Non-material damages such as disturbances to living comfort, deterioration of environmental quality, psychological stress, and health-related anxiety are intangible in nature and lack clear measurement standards, resulting in their frequent exclusion or inadequate consideration in environmental civil litigation. This study aims to analyze the legal basis for the application of the strict liability principle to air pollution cases in Indonesia, identify relevant forms of non-material damage, and examine the implications of the absence of standardized methods for assessing such damages on legal certainty and the effectiveness of corporate liability enforcement. The research employs a normative legal research method with a library-based approach, incorporating statutory, conceptual, and case approaches. Legal materials are analyzed qualitatively using a descriptive-analytical method, drawing upon legislation, court decisions, and scholarly literature on environmental law and environmental damage valuation. The findings indicate that the absence of standardized criteria for assessing non-material damages leads to evidentiary difficulties, inconsistent court decisions, and a weakened deterrent effect on polluting corporations, thereby preventing the full realization of victims' rights to effective remedies. This study underscores the urgency of developing an integrated national technical guideline for the assessment of non-material environmental damages based on scientifically grounded valuation methods, as well as the need for cross-institutional policy harmonization to strengthen legal certainty, access to justice for affected communities, and corporate accountability in controlling air pollution.

Keywords: Air Pollution; Environmental Compensation; Environmental Law; Non-Material Damages; Strict Liability.

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1. Introduction

Air pollution is one of the global environmental issues that demands serious attention from the international community and national governments. Air pollution occurs when harmful substances or particles enter the atmosphere in quantities that can cause damage to health, ecosystems, and climate balance (World Health Organization, 2021). From an environmental law perspective, air pollution is not only understood as a technical-ecological problem, but also as a form of environmental damage that has the potential to violate the public's right to a good and healthy environment (Tatyana & Putra, 2022). In Indonesia, industrial development, urbanization, and increased use of motor vehicles are the main

factors worsening air quality. This condition poses a major challenge for environmental protection and community welfare (Nisa & Suharno, 2020).

The increase in air pollution cases in Indonesia has a direct impact on public health, especially in urban areas and industrial areas. Studies by Adilasari (Adilasari et al., 2025) and Zahara (Zahara et al., 2025) show that in large cities and areas with heavy traffic, increases in $PM_{2.5}$, PM_{10}, and NO_2 concentrations correlates with an increase in hospital visits and admissions for acute respiratory infections (ARI), asthma, and cardiovascular disease. A policy note on the impact of air pollution from transportation also estimates the burden of premature deaths and diseases due to exposure to ambient air pollution in urban areas of Indonesia, confirming that residents of cities and industrial areas bear the highest health risks (Syahputri et al., 2023). In addition to medical impacts, pollution also reduces the quality of life of the community by disrupting environmental comfort and social activities (Abidin et al., 2025). Declining air quality even threatens the carrying capacity of ecosystems and causes prolonged ecological stress.

Corporations as business entities play an important role in the main causes of air pollution. Industrial activities that produce toxic gas emissions and hazardous particles are often carried out without adequate emission controls. To ensure accountability, Indonesia's environmental legal system has adopted the principle of strict liability through Law No. 32 of 2009 and several derivative regulations. These regulations discuss absolute liability for polluters, which is intended so that the burden of proof does not fall on the victim, but rather automatic liability for the perpetrator who causes environmental damage. However, even though the principle of strict liability has been regulated in several environmental law provisions, its application to air pollution cases has not been optimal (Rokhim, 2022). This is due to the limited understanding of law enforcement officials and the lack of clarity in the instruments of proof for non-physical types of pollution, such as air pollution. In practice, air pollution cases are often difficult to prosecute due to limited standards for measuring impact and lack of strong evidence. As a result, many victims suffer losses without obtaining adequate legal redress (Nurlaily & Supriyo, 2022).

One of the main problems in applying strict liability to air pollution is proving non-material damages. Non-material damages include conditions such as disruption to quality of life, deterioration of environmental quality, loss of aesthetic value, and psychological stress due to ecological stress. Unlike material damages, which can be calculated economically, non-material damages are subjective and do not have a clear quantitative measure. The absence of such standards poses a major challenge in the process of proving damages in court. The lack of standards for assessing non-material damages leads to legal uncertainty in the application of the strict liability principle. Courts often face difficulties in determining fair compensation for victims of air pollution. Differences in understanding among judges can lead to disparities in verdicts, which ultimately have the potential to weaken the deterrent effect on business actors. Without certainty of measurement, corporate responsibility tends to be symbolic and does not create substantive ecological justice.

Several regulations, such as Law No. 32 of 2009, have accommodated the principle of strict liability, but still place more emphasis on water and soil pollution than air pollution. Its implementation is more directed at pollution that causes real and measurable damage. Air pollution, which is diffuse and invisible, is often treated as a secondary issue in law enforcement. This situation indicates a normative gap in the legal system that should protect all components of the environment.

Several studies, such as those conducted by Anam (Anam, 2020); Karindradevi (Karindradevi et al., 2025) and Suriansyah (Suriansyah et al., 2025) in Indonesia, on strict liability in environmental law generally still focus on conceptual studies or its application in cases of water and soil pollution that have physical damage characteristics and loss indicators that are relatively easier to measure. This condition emphasizes the proof of causality and the responsibility of business actors in real and localized environmental damage. However, studies that specifically focus on air pollution as the main object of analysis are still very limited, especially those that relate it to the issue of measuring non-material losses. The aspect of air pollution as a form of non-physical environmental damage that causes immaterial losses has not received adequate attention in environmental law literature in Indonesia.

The absence of standards for assessing non-material damages in air pollution cases not only raises normative issues, but also has a direct impact on the effectiveness of applying the principle of strict liability. The lack of clarity regarding the extent of damages leads to uncertainty in law enforcement, opens up room for disparities in court decisions, and weakens

the deterrent effect of the law on polluting corporations. Although these impacts are often mentioned in environmental law discourse, there has been no systematic analysis of how the absence of standards for measuring non-material damages affects corporate accountability and the effectiveness of strict liability in the context of air pollution. This analytical gap is the focus of this study and underlies its urgency.

Based on these conditions, this study aims to analyze the basis for applying the principle of strict liability to air pollution in Indonesia, identify the types of non-material losses relevant to air pollution, examine the lack of measurement standards, and how this lack impacts legal certainty and the effectiveness of enforcing corporate responsibility. This study is expected to contribute to the development of environmental law towards a system that is more equitable, responsive, and supportive of ecological sustainability.

2. Preliminaries or Related Work or Literature Review

Corporate Environmental Liability and Strict Liability in Global Scholarship

Research on corporate liability for environmental harm has been widely developed in international legal scholarship. Early foundational works, such as those by Faure and Hartlief (1996), establish that strict liability is commonly applied in environmental law to address the inherent difficulties of proving fault and causation in pollution cases. These studies demonstrate that strict liability serves as a corrective mechanism to ensure that corporations internalize environmental risks and externalities. Subsequent literature, including the analyses of Gilles (2010) and Bodansky (2012), expands this framework by assessing how strict liability enhances deterrence and allocates the burden of proof more equitably in environmental disputes. In the Southeast Asian context, research by Lye and Ong (2018) highlights how developing countries adopt strict liability to strengthen environmental governance amid rapid industrialization. However, these studies focus primarily on water pollution and hazardous waste management, leaving limited discussions on corporate liability for air pollution, especially regarding the intangible and long-term nature of its impacts. This gap underscores the need for a more focused analysis of air pollution liability mechanisms in Indonesia.

Indonesian Environmental Law and the Application of Strict Liability

Within Indonesia, academic studies generally affirm that Law No. 32/2009 incorporates strict liability as a central mechanism for holding corporations accountable for environmental harm. Works by Siti Sundari (2015), Rasjidi (2018), and A'yunin (2020) demonstrate that strict liability is intended to overcome evidentiary barriers often encountered in environmental litigation. These scholars also emphasize that strict liability is crucial for addressing large-scale ecological harms such as forest fires and industrial emissions. However, literature addressing the implementation of strict liability reveals major inconsistencies. Research by Fitriyana (2021) and Pratiwi (2022) finds that Indonesian courts tend to apply strict liability unevenly, due in part to inadequate expert testimony, methodological gaps, and judges' limited familiarity with environmental valuation. Most studies focus on material losses such as economic costs, healthcare expenses, and environmental restoration fees. Only a few works, such as those by Putri (2023), briefly address non-material damages yet they offer no detailed methodology for quantification. This indicates a clear absence of standardized valuation frameworks in cases involving intangible harms like psychological distress, loss of enjoyment of life, and ecological spiritual values.

The Challenge of Measuring Non-Material Environmental Damages

Scholarship on environmental valuation provides theoretical models for quantifying intangible harms. Environmental economists such as Freeman (2003) and Bockstael & McConnell (2007) propose frameworks including willingness-to-pay (WTP), contingent valuation (CVM), and hedonic pricing as tools for estimating non-use values. In legal scholarship, Robinson (2019) argues that non-material damages must be recognized to reflect the holistic nature of environmental harm. Yet, despite the availability of these models, courts in developing countries rarely adopt them due to methodological complexity, lack of institutional capacity, and absence of regulatory standards. In Indonesia, the discussion on non-material environmental damages remains particularly underdeveloped. Studies by Nugroho (2020) and Larasati (2022) highlight conceptual confusion among legal practitioners regarding the boundaries between non-material, immaterial, and ecological losses.

Furthermore, there is no official guidance from the Ministry of Environment or the judiciary on valuation procedures. As a result, judicial decisions tend to rely on discretionary judgment rather than standardized calculations, leading to unpredictable outcomes.

3. Materials and Method

This study employs a normative legal research method (juridical-normative) with a library research approach. The normative method is chosen because the focus of the inquiry lies in analyzing legal norms, legal principles, and juridical concepts governing corporate liability for air pollution, particularly the application of the strict liability doctrine and the legal challenges in assessing non-material damages within Indonesia's environmental law framework. The study does not rely on empirical data such as interviews or field observations; instead, it is entirely grounded in legal sources and relevant scholarly literature. The research adopts three approaches: the statute approach, the conceptual approach, and the case approach. The statute approach is conducted by examining legal provisions related to air pollution and environmental liability, especially Law No. 32 of 2009 on Environmental Protection and Management along with its implementing regulations, including Government Regulation No. 22 of 2021. The conceptual approach is employed to explore the doctrines of strict liability, non-material damages, ecological justice, and environmental valuation theories as developed in legal and environmental economic scholarship. Meanwhile, the case approach is applied in a limited manner by referring to judicial decisions and relevant jurisprudential analyses to observe how strict liability and the assessment of non-material damages have been implemented in judicial practice.

The sources of legal materials in this research consist of primary, secondary, and tertiary legal materials. Primary legal materials include environmental legislation and court decisions relating to environmental pollution cases. Secondary legal materials comprise environmental law textbooks, national and international academic journals, research reports, and scholarly articles discussing air pollution, non-material harms, and corporate environmental liability mechanisms. Tertiary legal materials include law dictionaries, encyclopedias, and other supporting references that help clarify terms and concepts used in the study. Legal materials are collected through systematic literature searches using academic journal databases, university repositories, and official government sources. All materials obtained are then classified and selected based on their relevance to the research questions. The analysis is conducted qualitatively using a descriptive-analytical method. The legal materials are examined by outlining the applicable normative rules, comparing them with concepts and theories developed in the literature, and assessing the implications of the absence of a standardized framework for valuing non-material damages on the effectiveness of strict liability. The findings are subsequently used to draw deductive conclusions, moving from general legal norms and theoretical frameworks toward specific understandings of corporate liability issues in air pollution cases.

4. Results and Discussion

Non-Material Losses and the Lack of Standard Measurement

Air pollution not only causes physical effects that can be calculated directly, but also brings losses that are not reflected in conventional economic values. In many cases of air pollution, especially those caused by large-scale industrial activities, the affected communities do not only suffer material losses such as healthcare costs or reduced working capacity. They also experience non-material losses.

Non-material damages are understood as impacts that do not possess a direct market value and cannot be measured through conventional valuation methods such as market pricing or replacement cost. These damages encompass a wide range of adverse experiences, including discomfort, disruption of daily routines, psychological distress caused by pollution, and a sense of loss associated with the degradation of a previously clean and healthy environment. In some communities, air pollution may even erode cultural values embedded in the social meaning of clean air. Within environmental studies, non-material damages are often classified as non-use values, referring to values that individuals experience even without directly utilizing the environmental resource in question. Consequently, assessing this category of harm requires more complex evaluative methods than those used for material

economic losses. One of the most widely applied techniques in environmental economics for estimating non-market values is the contingent valuation method (CVM). This method relies on surveys to determine the public's willingness to pay (WTP) or the compensation they consider appropriate to avoid certain environmental impacts, including air pollution. Such an approach enables the translation of non-market values into quantifiable figures, although its application remains contested due to its hypothetical nature and strong dependence on respondents' perceptions.

In the realm of corporate liability for air pollution in Indonesia, the issue of the acceptability of non-material losses and how to assess them has become a major debate. Law No. 32 of 2009 concerning Environmental Protection and Management (UUPPLH) does indeed stipulate that businesses that cause pollution can be held liable. This provision provides a legal basis for the state to seek compensation from corporations that cause damage or pollution, including those originating from industrial activities. Although this regulation provides a normative framework for accountability mechanisms, there are still shortcomings related to the standards for assessing non-material damages. This gap has led to uncertainty in practice, both for victims seeking full recovery and for law enforcement officials who need clear measures to assess the extent of such intangible losses (Putri & Sukarsa, 2024).

Recent studies increasingly demonstrate that air pollution constitutes an environmental hazard that affects not only the physical dimension of human health but also the psychological and social well-being of communities. Exposure to polluted air has been shown to correlate strongly with heightened stress levels, increased anxiety, and a measurable decline in the psychological welfare of populations residing in polluted areas. Over the long term, such exposure can even trigger behavioral changes, diminish motivation, and disrupt sleep patterns. For many communities living in highly polluted environments, the sense of comfort in everyday life is often the first intangible loss they experience.

When the air is saturated with coal dust, pungent industrial odors, or combustion smoke, residents are compelled to alter their daily routines: reducing outdoor activities, keeping windows closed nearly all day, or wearing masks even inside their homes. These seemingly minor adjustments can generate persistent emotional strain. Poor air quality has also been closely linked to decreasing levels of life satisfaction, comfort, and subjective perceptions of well-being. Beyond the erosion of daily comfort, long-term health concerns represent another significant category of non-material harm. Parents living in polluted areas, for instance, often experience continuous anxiety whenever their children cough or struggle to breathe, fearing that these symptoms may indicate the early onset of chronic respiratory illness.

Although various studies have shown the extent of non-material impacts of air pollution, many of which can be scientifically identified, Indonesia still does not have specific benchmarks for assessing these types of losses. Law No. 32 of 2009 does contain provisions on compensation for losses in environmental cases, but its construction emphasizes financial aspects or ecological restoration costs. The method for measuring non-material losses is not clearly outlined. In fact, Government Regulation No. 22 of 2021, which regulates licensing and environmental quality standards, does not provide guidance on the development of standards for assessing the psychological or emotional losses experienced by the community.

The absence of assessment standards for non-material losses is increasingly apparent when examining law enforcement practices in court. Various studies on environmental case rulings in Indonesia show that although business actors can be required to pay material damages, judges still face great difficulty in determining compensation that proportionally reflects non-material losses. This difficulty arises because there are no uniform technical guidelines at the national level, whether in the form of recognized valuation methods, clear rules of evidence, or quantitative indicators that can be applied consistently across cases.

Research examining judges' views on valuation methods in environmental damage cases also shows that they often use a practical approach or rely solely on expert testimony, while non-material losses are often calculated in a highly subjective manner, or not calculated at all. The absence of such standards ultimately leads to inconsistencies in judgments, where cases with similar facts can result in vastly different compensation amounts simply because of differences between the judges ruling on them, rather than because of clear and consistent measurement standards (Ndruru & Halawa, 2024).

Moreover, the Indonesian regulatory framework particularly the Environmental Protection and Management Act (UUPPLH) does not provide a clear definition of what constitutes non-material damages, nor does it establish parameters for assessing such damages in litigation. Although several ministerial regulations address environmental losses in general, such as damages arising from violations of environmental quality standards, pollution

mitigation costs, or ecosystem degradation, these provisions do not elaborate on non-material harms, including psychological impacts or diminished quality of life. This regulatory ambiguity forces legal practitioners both lawyers and judges to rely on general principles of civil law, which were never designed to quantify non-economic harms in the context of large-scale environmental pollution. As a result, corporate actors who should bear responsibility for the social and psychological consequences of pollution often escape proportionate liability, while affected communities fail to obtain remedies that genuinely reflect the magnitude of the losses they suffer (Rahmadi, 2011).

The absence of such standards is not merely a conceptual deficiency; it has tangible implications for legal certainty. In the context of environmental liability, legal certainty requires rules that are predictable, judicial decisions that are consistent, and norms that provide clarity for all stakeholders corporations, government authorities, and affected communities. Without a standardized framework for assessing non-material damages, the scope of judicial interpretation becomes excessively broad, as judges are left without clear methodological guidance. Consequently, the determination of compensation often hinges on the subjective judgment of individual judges or on expert opinions that rely on disparate valuation approaches, increasing the likelihood of significant discrepancies between rulings in cases with similar factual circumstances. This inconsistency undermines public confidence in environmental adjudication and diminishes the effectiveness of liability mechanisms in encouraging corporations to adopt more responsible practices aimed at reducing air pollution (Aryanda et al., 2024).

The absence of assessment standards also directly affects the fulfillment of victims' rights to comprehensive recovery. The right to a decent and healthy environment is a constitutional right, but in practice this right is difficult to fully realize when some of the impacts experienced by residents are not recognized or adequately assessed. If the compensation provided only covers material aspects such as healthcare costs or other economic losses without including the decline in quality of life or psychological distress experienced, then the compensation is incomplete. Victims ultimately only receive part of the recovery they should receive for the impacts of air pollution they face.

This issue also affects the preventive power of corporate accountability mechanisms. One of the reasons for imposing strict liability is to provide preventive pressure so that business actors are more careful and do not pollute the environment. However, when sanctions or compensation do not proportionally include non-material losses, this preventive function becomes less effective. Business actors tend to view compensation as a predictable operational cost, rather than a form of responsibility that reflects the serious social impact on the quality of life of the community (Ardiansyah et al., 2024).

In this situation, the need to update and formulate standards for assessing non-material losses in Indonesia has become increasingly urgent. Many experts in the fields of environment and law recommend the development of national technical guidelines that include widely accepted valuation methods, such as the use of contingent valuation surveys combined with other approaches that take psychological and social aspects into account. The existence of such guidelines will provide a standard reference at the national level, making it easier for judges to determine the amount of compensation based on more structured data, as well as strengthening legal certainty for all interested parties.

The standards developed must be able to capture various types of non-material losses and their nature, which indeed have no market value. This approach can help address various technical obstacles that have hitherto hampered the implementation of fair punishment for corporations that cause air pollution. For example, the creation of a measurable quality of life index or the implementation of public perception surveys on welfare levels before and after exposure to pollution could form part of such an assessment instrument. In this way, the parameters used would not only be based on economic losses, but would also include non-economic values that are truly felt by the community.

If such guidelines are not available, corporate accountability mechanisms may continue to focus solely on material losses and overlook the non-material impacts that are actually widely felt by the community. As a result, an environmental legal system that appears ideal in theory becomes less effective in practice, especially when dealing with cases of high-intensity air pollution in residential areas.

Implications of Standard Vacancy on the Effectiveness of Strict Liability

The absence of standards for assessing non-material damages in air pollution cases carries serious consequences for the effectiveness of the strict liability principle, which is intended to serve as a strong foundation for environmental law enforcement in Indonesia. As articulated in Article 88 of Law No. 32 of 2009, strict liability was designed to simplify the evidentiary process by removing the requirement to prove fault or negligence. In principle, corporations engaged in inherently hazardous activities such as cement manufacturing, coal-fired power plants, or chemical production are automatically held liable for harms resulting from their polluting activities.

However, despite the elimination of the fault element, victims of air pollution continue to face substantial obstacles in demonstrating the existence of compensable harm, particularly non-material losses such as emotional distress, loss of comfort in daily activities, or long-term anxiety about health risks caused by exposure to fine particulate matter (PM2.5) and hazardous gases such as SO_2 and NO_x. The absence of standardized criteria is not merely a procedural gap; it creates a fundamental contradiction that undermines the core function of strict liability. Without measurable parameters for instance, valuation models that incorporate exposure intensity, psychological impact, or declines in quality of life courts are forced to rely on the subjective assessments of judges. This often results in inconsistent and disproportionate rulings that weaken the deterrent effect of strict liability and diminish its role in fostering corporate responsibility in mitigating air pollution.

As a consequence, law enforcement loses its firmness, the precedential value of judicial decisions becomes weakened, and the deterrent effect on corporations diminishes. Ultimately, polluting companies are able to continue operating while treating legal risks merely as additional operational costs rather than as obligations that demand behavioral change (Wongkar, 2024). Although Article 88 of Law No. 32/2009 establishes strict liability without requiring proof of fault, plaintiffs remain obligated to demonstrate the existence of harm and the causal link between high-risk activities and the resulting pollution. In the absence of clear standards for quantifying damages particularly non-material losses judicial assessments inevitably become highly case-dependent. As a result, victims struggle to establish compensable damages in a methodologically robust manner that is acceptable in court. Even for material losses such as medical expenses or reduced income, there are no sector-specific guidelines that directly connect pollution exposure data with compensation formulas.

Victims are therefore often compelled to submit fragmented individual evidence such as receipts or medical records, which seldom provide a comprehensive picture of the harms suffered. For large corporations, the complexity of production and distribution processes further complicates efforts to prove a direct causal relationship between specific emission sources and particular harms. Thus, even though fault is no longer an element to be proven, disputes over the amount of compensation remain wide open. Recent studies reveal persistent ambiguity and inconsistency in how courts apply the strict liability principle in environmental civil cases, including in determining both the types and amounts of damages awarded. Some decisions focus heavily on environmental restoration while granting only minimal financial compensation to victims, whereas others impose large damage awards without relying on clear valuation methods. Such inconsistency significantly undermines predictability for all parties involved.

Ultimately, immediate reforms are needed to address these issues. The government needs to establish new regulations at the ministerial level that incorporate international best practices through a hybrid approach, for example by combining data from air quality monitoring applications (such as IQAir or the Ministry of Environment and Forestry application) with instruments for assessing non-material losses based on scientific findings from the Ministry of Health and social data from Statistics Indonesia. With this approach, the principle of strict liability not only serves to eliminate the obligation to prove fault, but also provides a faster mechanism for obtaining adequate compensation, ensuring consistency in decisions, strengthening the value of precedents, and providing a real deterrent effect for corporations, so that air pollution does not continue to be a hidden threat that erodes millions of healthy days of life each year. Without this update, the principle of strict liability will continue to be weakened by the absence of standards, and victims will remain trapped in protracted legal uncertainty.

Directions for Strengthening Regulation and Proposals for Developing Standards

The development of parameters for assessing non-material damages in Indonesia must be grounded in scientifically recognized national and international standards while also reflecting the practical needs of environmental litigation. Environmental damage valuation particularly for non-material losses such as the loss of ecosystem services has become a central theme in environmental economics literature. Valuation methods such as the contingent valuation method and ecosystem services approaches are considered strategic tools for assigning economic value to damages that lack a direct market price. These methods enable courts to calculate compensation that reflects the actual extent of harm beyond physical or resource-based costs. Findings from this study demonstrate that without clear methodological parameters, proving non-material damages in judicial proceedings becomes highly dependent on judicial interpretation and expert testimony, leading to inconsistent rulings.

Therefore, incorporating well-established environmental valuation methods such as the contingent valuation method into national technical guidelines would significantly enhance the quality of evidentiary assessments and promote legal certainty in environmental civil litigation (Tresnadi, 2025). The urgency of national technical guidelines becomes even more apparent when viewed through the lens of judicial practice. Empirical studies examining judges' perceptions of environmental damage valuation reveal that, although judges generally acknowledge the strict liability principle in environmental lawsuits, methodological challenges persist in determining the amount of compensation particularly for complex non-material harms. Ambiguities in methodological application and differing interpretations of ecosystem service values have contributed to inconsistent outcomes across cases, thereby creating legal uncertainty for litigants. Standardized technical guidelines would provide clear benchmarks for selecting valuation methods and procedures, enabling judges and plaintiffs to objectively quantify intangible environmental losses (Perwira et al., 2022).

Cross-institutional policy harmonization is a crucial step to ensure consistent implementation of these technical guidelines. As the primary technical authority, the Ministry of Environment and Forestry (KLHK) must coordinate with the Ministry of Law and Human Rights (Kemenkumham) and the judiciary to ensure that the guidelines are formally accepted as valid tools in environmental civil proceedings. Cooperation with statistical agencies and other governmental institutions is also essential for developing baseline environmental data that can serve as reliable references for valuation. Such harmonization would reduce disparities in damage assessments, enhance legal predictability, and expedite judicial processes. Strengthening the capacity of valuation experts and improving the competence of judges and prosecutors in interpreting environmental valuation reports are also integral components of this policy alignment. Projected benefits of establishing standardized metrics for assessing non-material environmental damages in Indonesia include enhanced legal certainty through more consistent judicial decisions, expanded access to justice for victims who often struggle to substantiate their losses, and a strengthened deterrent effect on corporations and other actors responsible for environmental harm.

Standardized methodologies would enable damages to be calculated using scientifically validated approaches, ensuring that judges, plaintiffs, and defendants rely on a shared evaluative framework. Literature on ecosystem service evaluation and environmental valuation consistently underscores that clear methodological standards are essential for improving the quality of policy decisions and judicial outcomes, particularly when addressing complex and multidimensional non-material damages (Stanford et al., 2024). As a follow-up measure, it is recommended that KLHK develop a Technical Guideline for Assessing Non-Material Environmental Damages. This guideline should include a list of accepted methods, detailed instructions for application, competency criteria for experts, and standardized report templates for use in civil litigation. The guideline must also be widely disseminated and socialized among judicial institutions and academic communities to ensure uniform application of valuation methodologies in litigation practice. In doing so, the technical guideline can serve as an effective instrument for operationalizing the strict liability principle in a consistent and fair manner, thereby strengthening Indonesia's environmental legal framework.

5. Comparison

A comparison with state-of-the-art approaches is crucial to clarify the scholarly position of this research and to highlight its substantive contribution to contemporary environmental liability studies. Existing literature on strict liability in environmental law both in Indonesia and internationally generally focuses on simplifying the burden of proof in cases involving hazardous industrial activities. Prior studies predominantly examine issues such as causal links between emissions and health impacts, economic loss quantification, or institutional barriers in enforcing environmental regulations. However, these studies seldom address the methodological vacuum concerning the valuation of non-material damages, even though such damages represent a significant portion of the harm experienced by victims of air pollution. Internationally, jurisdictions with advanced environmental compensation mechanisms, such as the European Union, Japan, and select U.S. states, have developed more structured approaches to assessing intangible losses. These include multidimensional valuation models that incorporate exposure intensity, psychological distress, loss of environmental enjoyment, and long-term anxieties linked to pollutants like PM2.5, SO_2, and NO_x.

Despite their conceptual robustness, these models remain largely absent in the Indonesian context. Existing Indonesian scholarship tends to rely on doctrinal analysis of Article 88 of Law No. 32/2009 without offering concrete metrics or frameworks to operationalize non-material damage assessment within strict liability claims. Compared to these state-of-the-art approaches, the present study provides a more targeted contribution by demonstrating how the absence of standardized valuation criteria for non-material damages creates a structural contradiction within the strict liability regime. While previous research emphasizes the advantage of strict liability in eliminating the need to prove fault, this study shows that such doctrinal simplification becomes ineffective when courts lack measurable parameters to establish the harm itself. This research therefore advances the field by proposing an analytical framework that links exposure-based indicators, psychological impact dimensions, and quality-of-life degradation as potential components for a standardized assessment model. By situating these findings within global best practices and highlighting the specific institutional gap in Indonesia, this study provides a clearer, more measurable illustration of its novelty. It shows that without standardized methods for evaluating non-material damages, strict liability loses its foundational purpose namely, providing effective, predictable, and fair remedies for victims of environmental harm.

6. Conclusion

This study underscores that although the principle of strict liability is normatively recognized under the Environmental Protection and Management Act (UUPPLH), its effectiveness in addressing air pollution remains limited due to the absence of standardized parameters for assessing non-material damages. The lack of such standards results in evidentiary difficulties, inconsistent judicial decisions, and a weakened deterrent effect on corporations, ultimately leaving many victims without remedies that reflect the full extent of the harm they have suffered. This condition demonstrates that the problem is not merely normativei.e., the formal acknowledgment of absolute liabilitybut also technical and institutional. Without operational valuation guidelines, integrated baseline data, and adequate institutional capacity to evaluate valuation evidence, the strict liability regime cannot fulfill its justice-oriented purpose in the context of diffuse and non-physical air pollution. To enhance legal certainty and enforcement effectiveness, several measures are required: (1) the Ministry of Environment and Forestry (KLHK) must develop and issue Technical Guidelines for the Assessment of Non-Material Environmental Damages, adopting relevant international valuation methods (e.g., contingent valuation, ecosystem services/SEEA-based approaches, ISO-related environmental valuation standards) and providing expert report templates and data verification standards; (2) cross-institutional harmonization (KLHK–Ministry of Law and Human Rights Supreme Court Ministry of Health BPS/BPKP) must be carried out to ensure that these technical guidelines are formally recognized as admissible evidence and can be utilized both in civil litigation and the execution of judgments; (3) the establishment of an integrated registry of baseline air-quality data and pilot programs to test valuation methodologies in selected cases, along with certification schemes for valuation experts and capacity-building programs for judges and prosecutors; and (4) when necessary, refinement of sectoral regulations to incorporate these technical standards so that compensation awards can proportionally include non-material losses. These measures are expected to strengthen

legal certainty, expand access to justice for victims, and enhance the deterrent effect on polluters.

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