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RECLAIMING THE FUTURE: A NORMATIVE RECONSTRUCTION OF ENVIRONMENTAL GOVERNANCE THROUGH INTERGENERATIONAL JUSTICE

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Abstract

Environmental governance in Indonesia remains reactive and focused on present harms, leaving the legal system poorly equipped to address ecological risks that accumulate across generations. In this context, intergenerational justice is well established in environmental scholarship, but rarely operates as a source of enforceable duties or institutional constraints. Therefore, this study aims to analyze the translation of the principle of Indonesian environmental constitutionalism into an adaptive and anticipatory framework of state responsibility. Doctrinal, conceptual, constitutional, and functional comparative analyses were combined using a normative legal study. Rawls' just savings principle, Jonas' ethics of responsibility, and Weiss' theory of intergenerational equity provided the normative foundation, while European Union precautionary and risk-based mechanisms served as functional comparators rather than models for wholesale transplantation. The analysis identified five requirements for legally meaningful intergenerational protection, namely preventive duties, long-term risk assessment, representation of future interests, regulatory adaptability, and effective accountability. The results showed that Indonesia's constitutional recognition of environmental rights was not supported by a coherent architecture for long-term protection. Norms remained fragmented, coordination was weak, and decision-making procedures did not consistently evaluate cumulative or irreversible harm. This study proposed an Intergenerational Adaptive Environmental Governance Framework built on four mutually reinforcing elements, namely an intergenerational interpretation of constitutional environmental rights, precautionary and long-term due diligence duties, institutional and procedural representation of future interests, as well as continuous monitoring, cumulative impact assessment, and periodic regulatory review. These elements recasted environmental governance from retrospective damage control as a system of anticipatory constitutional responsibility.

Keywords: *Intergenerational Justice; Environmental Governance; Future-Oriented Human Rights; Sustainability Law; Comparative Legal Analysis.*

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1. Introduction

The contemporary ecological crisis should be understood as a convergence of interconnected systemic crises, including climate change, biodiversity loss, pollution, and socio-economic inequality. Human activities have pushed the Earth system beyond the ecological limits, triggering irreversible changes that threaten the biophysical foundations of modern life.[1] Scholars increasingly describe the global condition as a polycrisis, referring to the entanglement of multiple crises that reinforce one another and collectively endanger the sustainability of human civilization. Indonesian environmental law constitutionally recognizes the right to a good and healthy

[1] Louis J. Kotzé and Rakhyun E. Kim, "Earth System Law: The Juridical Dimensions of Earth System Governance," *Earth System Governance* 1 (2019): 100003, https://doi.org/10.1016/j.esg.2019.100003.

environment, but does not provide a coherent legal framework for ensuring that present decisions do not transfer disproportionate ecological risks to future generations. In this study, normative reconstruction refers to the doctrinal and institutional reconfiguration of Indonesian environmental governance by translating intergenerational justice into enforceable legal principles, preventive obligations, institutional representation of future interests, and adaptive mechanisms for long-term decision-making.

These failures reflect the characteristics of conventional environmental governance, which continues to privilege short-term considerations. Many regulatory frameworks are grounded in assumptions of stability, predictability, and immediate economic interests, and cannot adequately anticipate ecological dynamics that are non-linear and long-term. Studies in Ecology and Society show that existing resilience strategies often fail to keep pace with increasing environmental change. These strategies are designed without adequately accounting for systemic complexity and long-term uncertainty. Moreover, studies on global environmental governance report persistent institutional fragmentation and weak international coordination, affecting collective responses to ecological crises.[2]

The ecological crisis exposes a fundamental tension between the short-term logic of law and policy as well as the long-term, complex nature of reality.[3] Governance models that remain reactive and grounded in experience have proven inadequate in addressing exponential and unpredictable change. The literature calls for governance frameworks that are more systemic, adaptive, and future-oriented but are also capable of anticipating ecological risks before reaching a critical threshold. This presentist bias derives from an epistemological construction that places certainty, stability, and measurability at the core of norm formation.[4] In the framework, law tends to focus on legal relations that are actual and verifiable, placing unmaterialized interests above normative protection. This is reinforced by institutional designs that assess policy success based on short-term outcomes, incentivizing policymakers to prioritize immediate economic and political interests over long-term consequences.[5]

In the environmental context, temporal bias produces a structural imbalance between resource exploitation and ecological protection since the impacts of environmental degradation are often borne by generations that lack representation in decision-making processes.[6] Contemporary studies show that modern environmental law, despite incorporating the principle of sustainability, continues to operate within an anthropocentric and present-oriented logic, failing to systematically internalize intergenerational obligations.[7] The limitation is apparent in the human rights framework, where traditional legal structures require the existence of identifiable and present legal subjects. Future generations, who do not exist empirically, are not easily recognized as rights holders. Therefore, the protection of interests depends on progressive interpretations that remain inconsistent across jurisdictions. Even though there has been growing recognition of

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2 Asif Raihan and Tapan Sarker, "Financial Mechanisms for Advancing Environmental Sustainability: A Comprehensive Review," *Green Technology, Resilience, and Sustainability* 6 (2026): 4, https://doi.org/10.1007/s44173-026-00029-9.

3 Solomon Sebuliba and Katherine G. Sammler, "Governing Biodiversity: Ambiguity and Fragmentation in the BBNJ Agreement," *Ocean & Coastal Management* 270 (2025): 107913, https://doi.org/10.1016/j.ocecoaman.2025.107913.

4 Xiangxiang Zeng et al., "A Decision Support Model for Investment on P2P Lending Platform," *PLoS ONE* 12, no. 9 (2017): e0184242, https://doi.org/10.1371/journal.pone.0184242.

5 Sofik Handoyo, "Public Governance and National Environmental Performance Nexus: Evidence from Cross-Country Studies," *Heliyon* 10, no. 23 (2024): e40637, https://doi.org/10.1016/j.heliyon.2024.e40637.

6 Roberto Cerchione et al., "Balancing Sustainability and Circular Justice: The Challenge of the Energy Transition," *Journal of Cleaner Production* 494 (2025): 144942, https://doi.org/10.1016/j.jclepro.2025.144942.

7 Jesse Segura, Julien-François Gerber, and Filka Sekulova, "Unlearning through Spirituality: Mongolian and Western Animistic Traditions as Pathways to Enhance Sustainability," *Environmental Science & Policy* 175 (2026): 104296, https://doi.org/10.1016/j.envsci.2025.104296.

the right to a healthy environment, this construction is rarely explicitly connected to obligations toward future generations.[8]

The complexity of ecological and technological systems reports that the impacts of current legal decisions are cumulative and intergenerational, rendering approaches to present interests increasingly inadequate. According to the analyses in global governance scholarship, the failure to integrate broader temporal dimensions contributes to systemic risks that cannot be effectively managed through conventional legal instruments.[9] The critique of the present-oriented paradigm extends beyond the substance of legal norms to the foundational structure of law as a system of knowledge.[10] Contemporary environmental law scholars emphasize the need for a normative reconstruction that shifts the focus from short-term certainty toward intergenerational responsibility as a fundamental principle.[11] This shift creates space for the development of legal frameworks that respond to environmental harm and are also capable of anticipating and preventing risks for future generations.

Environmental law is commonly organized around fixed categorizations, standardized administrative procedures, and the assumption that the objects of regulation can be clearly identified and remain stable.[12] This design depends on permitting mechanisms, emission limits, or technical standards that are inherently static. Rigid legal instruments often lag, as legislative processes and norm formation require considerable time and depend on data certainty that is unavailable under conditions of scientific uncertainty when ecological systems evolve exponentially.[13] The mismatch is clearest when environmental risks are no longer localized but spread through complex global networks. Studies on Earth system governance show that minor disturbances in one component of an ecosystem can trigger large-scale changes through feedback mechanisms.[14]

Fragmented legal structures compound the gap between ecological complexity and regulatory capacity.[15] Regulations dispersed across multiple regimes, such as climate change, conservation, and land-use governance, often lack integration, failing to address interconnections among issues as an integrated whole. This fragmentation creates spaces where cross-sectoral impacts are inadequately captured, resulting in policy responses that are partial and less effective.[16] Therefore, law lags temporally and remains conceptually ill-equipped in the ability to

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8 Hernando Díaz-Candia, "Realization of the Right to Environment Protection as a Fundamental Right in the United States: Some Reflections," *Environmental Policy and Law* 55, no. 4–5 (2025): 138–51, https://doi.org/10.1177/18785395251364735.

9 Sajida Sajida, "Three Decades of Multilevel Governance Research: A Scientometric and Conceptual Mapping in the Social Sciences," *Social Sciences & Humanities Open* 12 (2025): 101745, https://doi.org/10.1016/j.ssaho.2025.101745.

10 Faisal Faisal et al., "Genuine Paradigm of Criminal Justice: Rethinking Penal Reform within Indonesia New Criminal Code," *Cogent Social Sciences* 10, no. 1 (2024): 2301634, https://doi.org/10.1080/23311886.2023.2301634.

11 Achmad Soeharto et al., "From Efficiency to Justice: Reconstructing Utilitarian Ethics in Environmental Governance," *Social Sciences & Humanities Open* 12 (2025): 102333, https://doi.org/10.1016/j.ssaho.2025.102333.

12 Rosdian Rosdian et al., "Legal Reform on Rock Mining Governance: The Dual Liability Model For Protecting Environmental Rights in Palu–Donggala," *Administrative and Environmental Law Review* 6, no. 2 (2025): 121–32, https://doi.org/10.25041/aelr.v6i2.4472.

13 Darren Nel and Araz Taeihagh, "Tackling the Soft Non-Technical Challenges of the Adoption of Complexity Science in Policymaking," *Policy Sciences* 58 (2025): 643–678, https://doi.org/10.1007/s11077-025-09594-5.

14 Changgan Zhang, Yijing Zhou, and Shanggang Yin, "Interaction Mechanisms of Urban Ecosystem Resilience Based on Pressure-State-Response Framework: A Case Study of the Yangtze River Delta," *Ecological Indicators* 166 (2024): 112263, https://doi.org/10.1016/j.ecolind.2024.112263.

15 Niko Soininen et al., "Governing Complexity: A Comparative Assessment of Four Governance Models with Applications to Climate Change Mitigation and Adaptation," *Environmental Innovation and Societal Transitions* 57 (2025): 101020, https://doi.org/10.1016/j.eist.2025.101020.

16 Bien Thanh Vu et al., "Enablers and Barriers to Implementing Effective Disaster Risk Management According to Good Governance Principles: Lessons from Central Vietnam," *International Journal of Disaster Risk Reduction* 120 (2025): 105344, https://doi.org/10.1016/j.ijdrr.2025.105344.

understand the interdependence of environmental systems. The mismatch between the complexity of environmental change and the static design of law reflects a more fundamental problem, namely the divergence between the construction of reality and the operation of ecological systems. Contemporary scholarship emphasizes that bridging the gap requires a transformation toward legal frameworks that are more adaptive, risk-based, and capable of responding to uncertainty continuously.[17]

This normative weakness becomes apparent when sustainability is framed primarily as a mechanism for balancing competing interests rather than a principle of justice that establishes limits on present-day exploitation.[18] The space to justify trade-offs that disadvantage future generations remains open when the primary objective is to "maintain sustainability" in general terms, provided the losses can be framed as part of development or transition processes. The fundamental distinction between sustainability and intergenerational justice has been developed in this context. Sustainability operates in the language of system optimization, while intergenerational justice demands moral and legal justification for the distribution of burdens across time.[19] A further problem is that sustainability often continues to operate within an anthropocentric and presentist horizon.[20] Recent critiques of the right to a "clean, healthy, and sustainable" environment suggest that the sustainability framework may retain a one-dimensional logic. This expands the scope of protection, but does not transform power distributions or fundamentally alter the evaluation of obligations.[21]

In recent studies, the legal recognition of future generations does not automatically translate into changes in decision-making. Codification, specialized bodies, and dispersed procedures are often insufficient to ensure that future interests genuinely constrain present governmental action.[22] The problem is not the lack of normative language, but the weakness of the operationalization. Consequently, the literature calls for a shift from the rhetoric of sustainability toward a more future-oriented, proactive, and accountable approach, which enables public authorities to be held responsible for the long-term risks generated. Environmental governance scholarship shows that sustainability is often treated as an overarching goal, while the role of law in driving transformative change remains oversimplified.[23]

The fragmentation of environmental regulation is a central structural reason why legal frameworks often fail to respond effectively to ecological crises.[24] Legal instruments dispersed across different sectors are not designed within an integrated framework of coordination, leading to normative inconsistencies and overlapping authorities. The result is policy responses that are inherently partial since each regime governs specific aspects without adequately capturing the cross-sectoral interconnections of ecological systems. Recent studies indicate that the fragmentation undermines regulatory effectiveness and creates gaps that enable resource

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17 Rob Amos, "A Critical Analysis of the Global Biodiversity Framework," *Journal of International Wildlife Law & Policy* 28, no. 2 (2025): 123–92, https://doi.org/10.1080/13880292.2025.2539577.

18 Mojtaba M. Shourkaei, "Going beyond the Business Case for Sustainability: Main Business-Level Shifts for Pursuing Strong Sustainability," *Journal of Cleaner Production* 518 (2025): 145905, https://doi.org/10.1016/j.jclepro.2025.145905.

19 J. K. Summers and L. M. Smith, "The Role of Social and Intergenerational Equity in Making Changes in Human Well-Being Sustainable," *Ambio* 43 (2014): 718–728, https://doi.org/10.1007/s13280-013-0483-6.

20 Susanna Barrineau and Stina Powell, "Caring in Crises – Unsettling Care in Soil Carbon Sequestration," *Environmental Science & Policy* 177 (2026): 104337, https://doi.org/10.1016/j.envsci.2026.104337.

21 Corina Heri, "Justice in the Liminal: The Council of Europe and the Right to a Healthy Environment," *International & Comparative Law Quarterly* 73, no. 2 (2024): 319–60, https://doi.org/10.1017/S0020589324000071.

22 Laura Rahm, *The Global Governance of Harmful Practices: Actors, Networks, and Knowledge Transfer in Transnational Gender Programmes* (Bristol University Press, 2026).

23 Beate Sjåfjell and Sarah E. Cornell, "What the Actual ….? Tensions in the Science–Business–Policy Interface for Global Sustainability," *European Law Open* 3, no. 3 (2024): 529–60, https://doi.org/10.1017/elo.2024.34.

24 Juliette G.C. Martin et al., "The Nature-Based Solution Implementation Gap: A Review of Nature-Based Solution Governance Barriers and Enablers," *Journal of Environmental Management* 388 (2025): 126007, https://doi.org/10.1016/j.jenvman.2025.126007.

exploitation without sufficient accountability.[25] Even though the normative framework has been formally developed, the implementation is often inconsistent due to limited institutional capacity, conflicts of interest, and inadequate oversight of environmental violations. In the Indonesian context, numerous studies indicate that cases of pollution and environmental degradation conclude without significant legal consequences, weakening the coercive force of law as an instrument of ecological protection.[26]

The core problem is the lack of integration between normative design and implementation capacity.[27] Institutional fragmentation creates a condition in which responsibilities are dispersed without strong coordination mechanisms, while weak enforcement reduces incentives for legal compliance. Therefore, environmental degradation persists despite the existence of formal regulations. The imbalance between norms and implementation is a key factor increasing ecological crises since law fails to function as an effective regulatory instrument and becomes a framework negotiated in practice.[28] The Indonesian Constitution has provided a strong normative foundation through the recognition of the right to a good and healthy environment in Article 28H of the 1945 Constitution. However, this recognition remains situated within a protection horizon oriented toward present citizens, without explicit articulation of the intergenerational dimension.[29]

The literature supplies a strong normative case for intergenerational justice but has not converted the concept into a sufficiently precise institutional program for Indonesian environmental law. Rawls' just savings principle requires each generation to preserve the conditions of just cooperation. Jonas' ethics of responsibility explains why potentially irreversible harm must be prevented despite uncertainty. Weiss' theory of intergenerational equity casts the present generation as trustee of environmental options, quality, and access. These theories answer different parts of the same legal problem. Rawls identifies the distributive objective, Jonas provides the preventive rationale, and Weiss supplies the fiduciary structure. The unresolved issue concerns how insights should inform enforceable state duties, standards for administrative decision-making, mechanisms for representing absent generations, and procedures for reviewing regulatory choices over time.

The failure to articulate an intergenerational dimension of environmental rights reflects a broader limitation in understanding temporal justice.[30] Environmental protection tends to be confined to managing impacts experienced in the present, rather than preventing long-term harm without recognizing that future generations hold equal normative claims. Therefore, law reproduces a structural bias that prioritizes current interests while shifting ecological burdens into the future.[31] The challenge is in reconstructing the normative foundations, integrating the right to

[25] Hens Runhaar et al., "Mainstreaming Biodiversity Targets into Sectoral Policies and Plans: A Review from a Biodiversity Policy Integration Perspective," *Earth System Governance* 20 (2024): 100209, https://doi.org/10.1016/j.esg.2024.100209.

[26] Eko Riyadi and Suparno Suparno, "Environmental Law Enforcement in The Perspective of Law No. 32 of 2009," in *Proceedings of the 4th International Conference on Law, Social Sciences, Economics, and Education, ICLSSEE 2024, 25 May 2024, Jakarta, Indonesia*, 2024, https://doi.org/10.4108/eai.25-5-2024.2348941.

[27] Erlan Wijatmoko, Armaidy Armawi, and Teuku Faisal Fathani, "Legal Effectiveness in Promoting Development Policies: A Case Study of North Aceh Indonesia," *Heliyon* 9, no. 11 (2023): e21280, https://doi.org/10.1016/j.heliyon.2023.e21280.

[28] Hanna Ahlström et al., "An Earth System Law Perspective on Governing Social-Hydrological Systems in the Anthropocene," *Earth System Governance* 10 (2021): 100120, https://doi.org/10.1016/j.esg.2021.100120.

[29] Firdaus Arifin et al., "Legal and Constitutional Gaps in Strategic Environmental Assessment: Between Formality and Substantive Environmental Protection in Indonesia," *Jurnal IUS Kajian Hukum Dan Keadilan* 13, no. 2 (2025): 346–63, https://doi.org/10.29303/ius.v13i2.1698.

[30] Nicky van Dijk, "From Exacerbating the Anthropocene's Problems to Intergenerational Justice: An Analysis of the Communication Procedure of the Human Rights Treaty System," *Earth System Governance* 10 (2021): 100123, https://doi.org/10.1016/j.esg.2021.100123.

[31] Ashok Vardhan Adipudi, Rakhyun E. Kim, and Frank Biermann, "The Potential Negative Impact of the UNFCCC: An Analysis of Sectoral, Geographical, and Temporal Problem Shifts from Climate Policies and Measures in 25 Industrialized Countries," *Global Environmental Change* 95 (2025): 103075, https://doi.org/10.1016/j.gloenvcha.2025.103075.

a healthy environment as part of intergenerational human rights protection. The originality of this study is in translating intergenerational justice into an operational framework of future-oriented state duties within Indonesian environmental constitutionalism.

The analysis compares five dimensions of environmental governance, namely recognition of intergenerational interests, preventive obligations, long-term risk assessment, institutional representation, as well as regulatory review and accountability. Indonesian environmental constitutional law is the principal object of inquiry. Selected European Union principles and regulatory techniques are used as functional comparators to identify legal functions adapted to Indonesia's constitutional structure and administrative capacity. This study addresses a central question: how can intergenerational justice be translated into future-oriented state duties and adaptive governance mechanisms within Indonesian environmental constitutionalism?

2. Method

This study uses normative legal research to determine how intergenerational justice can be operationalized within Indonesian environmental constitutionalism. The inquiry is qualitative and prescriptive, interpreting, evaluating, and reconstructing legal norms rather than producing primary empirical results. This study combines statutory, conceptual, constitutional, and functional comparative approaches. Primary legal materials include relevant provisions of the Indonesian Constitution and environmental legislation, selected judicial decisions, international legal instruments, and European Union materials on precautionary and risk-based regulation. Secondary materials comprise peer-reviewed studies on environmental constitutionalism, intergenerational justice, adaptive governance, and the work of John Rawls, Hans Jonas, and Edith Brown Weiss. Official institutional reports are used to clarify regulatory context and implementation conditions.

The analytical framework assigns a distinct function to each theory. Rawls establishes the distributive duty to preserve fair ecological opportunities. Jonas grounds preventive action where harm may be irreversible and scientific knowledge incomplete, and Weiss formulates a trusteeship obligation to conserve environmental options, quality, and access. Indonesia remains the primary jurisdiction, while selected European Union mechanisms are examined for the regulatory functions performed. The comparison addresses seven dimensions, namely legal recognition, preventive duties, precaution, long-term assessment, institutional representation, adaptive review, and accountability. The analysis proceeds in four stages, beginning with an identification of the temporal limitations of Indonesian environmental law, followed by an evaluation of these limitations through three theoretical perspectives, a comparative examination of relevant regulatory functions across jurisdictions, and the development of an adaptive framework suited to the Indonesian context. Therefore, the proposal is a normative model derived from legal interpretation and functional comparison.

3. Results and Discussion

3.1. Rethinking Environmental Law through Intergenerational Justice: Toward a Future-Oriented Legal Framework

Intergenerational justice has become central to contemporary environmental law discourse, because the concept can address the limitations of sustainability, which tends to be compromise-oriented and insufficiently prescriptive.[32] In many legal frameworks, sustainability often functions as a balancing principle between economic growth and environmental protection. However, this approach does not provide a strong normative basis for determining justifiable limits on exploitation across time. The literature indicates that reliance on sustainability often produces ambiguity in the distribution of ecological burdens since the concept does not explicitly establish

[32] Ferina Ardhi Cahyani, "Intergenerational Environmental Justice as a Human Rights Fulfillment," *Jurist-Diction* 5, no. 2 (2022): 485–494, https://doi.org/10.20473/jd.v5i2.34890.

legal obligations toward future generations.[33] This indeterminacy has prompted a shift toward intergenerational justice as a fundamental norm.

The proposed framework integrates three theories that perform complementary legal functions. Rawls' just savings principle supplies the distributive foundation by requiring each generation to preserve the material and institutional conditions necessary for just cooperation over time. In environmental law, this duty concerns a quantifiable stock of resources and ecological systems on which future rights and opportunities depend. However, Rawls does not fully explain how institutions should respond to scientific uncertainty, irreversible harm, or the political absence of future generations. Jonas addresses the first problem by grounding responsibility in humanity's unprecedented capacity to alter the conditions of life. Weiss addresses the third through a trusteeship model that obliges the present generation to conserve environmental options, quality, and access. The synthesis converts a broad moral concern into a legal structure, where distributive preservation defines the objective, precaution directs present conduct, and trusteeship identifies the institutional relationship between present decision-makers and future beneficiaries.

Intergenerational justice reframes the relationship between the present and the future by recognizing future generations as individuals whose interests carry legitimate normative weight.[34] This approach requires the fair distribution of resources and recognition of fiduciary responsibility, in which the present generation acts as a trustee for the sustainability of ecological systems. Recent developments in international law indicate that this principle is moving from ethical discourse toward operational legal standards, as reflected in interpretations of state obligations in climate law connecting present actions to the protection of the rights of future generations.[35] This broadens law's temporal horizon by integrating dimensions of uncertainty, non-reciprocity, and temporal power asymmetries.[36] Future generations lack the capacity to participate in present decision-making processes, creating an asymmetry that requires specific normative protection. The climate and ecological crisis fundamentally reflects a failure of intergenerational justice, as current decisions systematically impose risks and burdens on groups that lack representation.[37]

The positioning of intergenerational justice as a foundational norm includes reconstructing environmental law from a paradigm oriented toward short-term balance into a framework grounded in intergenerational responsibility. This shift reinforces the ethical dimension of law and opens pathways for developing legal standards that are more adaptive, anticipatory, and oriented toward long-term protection.[38] Sustainability remains an important rhetorical concept, but insufficient to address the demands of justice in the context of an increasingly complex global ecological crisis without reconstruction. Hans Jonas' ethics of responsibility offers a fundamental shift in the normative foundations of law by positioning the future as the primary horizon of ethical

[33] Benjamin J. Richardson and Beate Sjåfjell, "Capitalism, the Sustainability Crisis, and the Limitations of Current Business Governance," in *Company Law and Sustainability: Legal Barriers and Opportunities*, ed. Beate Sjåfjell and Benjamin J. Richardson (Cambridge University Press, 2015), 1–34, https://doi.org/10.1017/CBO9781107337978.003.

[34] Stephen Riley, "Architectures of Intergenerational Justice: Human Dignity, International Law, and Duties to Future Generations," *Journal of Human Rights* 15, no. 2 (2016): 272–90, https://doi.org/10.1080/14754835.2015.1106308.

[35] Türkan Gülce Budak, "Existing Landscape of International Climate Law," in *Beyond Treaties: Rethinking Legal Mechanisms for International Climate Governance* (Springer, Cham, 2025), 43–77, https://doi.org/10.1007/978-3-031-86022-5_2.

[36] Yu Qin, Jiaxiang Hu, and Kezhen Su, "Functions and Optimization of Soft Law in the International Governance of Synthetic Biology: The Predicament of Hard Law vs. the Rise of Soft Law," *Synthetic and Systems Biotechnology* 12 (2026): 134–51, https://doi.org/10.1016/j.synbio.2025.11.005.

[37] Nicola Mulkeen, "Intergenerational Harm and Injustice in Ageing Democracies: A Defence of Age-Weighted Referendums and Intergenerational Commissions," *Critical Review of International Social and Political Philosophy*, 2025, 1–26, https://doi.org/10.1080/13698230.2025.2541158.

[38] Qin, Hu, and Su, "Functions and Optimization of Soft Law in the International Governance of Synthetic Biology: The Predicament of Hard Law vs. the Rise of Soft Law."

and juridical consideration.[39] This expansion of the scope of responsibility becomes relevant in the context of ecological crises and technological developments, where humanity's capacity to generate large-scale change exceeds the ability of traditional legal systems to anticipate the consequences.[40]

This approach challenges the classical legal assumption that intervention should depend on factual certainty and proof of actual harm.[41] Under conditions of scientific uncertainty, waiting for definitive evidence may increase potentially irreversible damage. Therefore, the ethics of responsibility supports a shift toward a precautionary logic that prioritizes prevention, even when causal relationships cannot be fully established. This perspective has inspired the strengthening of the precautionary principle as a normative mechanism for addressing complex and non-linear risks.[42] Responsibility toward future generations requires a transformation in how law formulates obligations and standards of conduct. This framework directs attention to potential risks arising from present actions, creating space for the development of anticipatory forms of legal reasoning. In the context of climate change and environmental degradation, such an approach enables law to operate before impacts materialize, by integrating risk assessment, future scenarios, and scientific uncertainty into decision-making processes.[43] The ethics of responsibility is relevant because the concept can address the temporal asymmetry between present and future generations.[44] Since those who will be affected lack representation within current political and legal systems, a normative framework is required to bridge this imbalance through expanded moral and legal obligations.[45]

The ethics of responsibility enriches legal reasoning and provides a conceptual foundation for the development of anticipatory legal reasoning.[46] This shift enables law to function as a system capable of managing uncertainty, rather than responding to harm after occurrence. In this framework, the effectiveness of law is measured by the capacity to prevent potential harm and safeguard the sustainability of conditions necessary for future life.[47] The concept of future-oriented human rights is developed from the recognition that environmental degradation violates the interests of present populations and undermines the foundational conditions that enable future generations to enjoy dignity, health, and freedom in a meaningful way.[48] The right to a clean, healthy, and sustainable environment must be expanded into a normative basis for protecting human interests in the future. International law increasingly recognizes the possibility of

[39] Ayşe Kurtoğlu, Abdullah Yıldız, and Berna Arda, "The View of Synthetic Biology in the Field of Ethics: A Thematic Systematic Review," *Frontiers in Bioengineering and Biotechnology* 12 (2024), https://doi.org/10.3389/fbioe.2024.1397796.

[40] Steffen Böhm et al., "Ethics at the Centre of Global and Local Challenges: Thoughts on the Future of Business Ethics," *Journal of Business Ethics* 180 (2022): 835–861, https://doi.org/10.1007/s10551-022-05239-2.

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[43] Chenet, Ryan-Collins, and van Lerven.

[44] Jaime Abad et al., "Assessing Policy Preferences amongst Climate Change Adaptation and Disaster Risk Reduction Stakeholders Using Serious Gaming," *International Journal of Disaster Risk Reduction* 51 (2020): 101782, https://doi.org/10.1016/j.ijdrr.2020.101782.

[45] Yading Cai, "Victim-Perpetrator Narratives in International Climate Litigation: Rights Discourse, Postcolonial Critique, and the Binary Framings," *Peking University Law Journal* 13, no. 2 (2025): 227–56, https://doi.org/10.1080/20517483.2026.2618386.

[46] Félix Lozano and Irene Monsonís-Payá, "Civic Ethics as a Normative Framework for Responsible Research and Innovation," *Journal of Responsible Innovation* 7, no. 3 (2020): 490–506, https://doi.org/10.1080/23299460.2020.1816024.

[47] Richard Barker, "Corporate Sustainability Reporting," *Journal of Accounting and Public Policy* 49 (2025): 107280, https://doi.org/10.1016/j.jaccpubpol.2024.107280.

[48] Marcus Düwell and Gerhard Bos, "Human Rights and Future People — Possibilities of Argumentation," *Journal of Human Rights* 15, no. 2 (2016): 231–50, https://doi.org/10.1080/14754835.2015.1118341.

obligations toward future generations, particularly in the context of climate crisis, ecological collapse, and technological developments with long-term impacts.[49]

This expansion of perspective transforms the construction of environmental law. Even though conventional frameworks tend to operate reactively, a future-oriented perspective requires law to act before damage becomes irreversible. Recent studies indicate that adaptive governance derives the significance from the ability to address uncertainty, update policies iteratively, and integrate continuous learning into environmental decision-making.[50] The protection of future rights cannot depend on static rules, but requires institutions capable of adjusting to evolving ecological conditions and risks. The relationship between future rights and adaptive governance becomes particularly compelling when viewed through environmental complexity.[51] Climate change and biodiversity loss produce cumulative, transboundary, and delayed impacts since those most affected frequently lack a voice in current legal processes.

Adaptive environmental governance includes administrative flexibility and transformation in legal reasoning. This concept must integrate continuous monitoring, risk evaluation, policy revision, and multi-stakeholder participation to maintain the relevance of law.[52] Studies on transformative governance emphasize that law should be positioned as part of a broader institutional transformation toward proactive and future-oriented environmental management. In this context, future-oriented human rights function as a normative compass, while adaptivity provides the operational form. Adaptive environmental governance and future-oriented human rights are mutually reinforcing in two respects.[53] First, the normative horizon of law is expanded by affirming that environmental protection must include those who are not empirically present. Second, the institutional architecture that enables obligations to be translated into practices is provided.

The originality of the proposed framework is in integrating distributive justice, preventive responsibility, ecological trusteeship, constitutional environmental rights, and adaptive regulation into a single doctrinal and institutional framework for Indonesia. The framework specifies the holders of future-oriented duties, the interests requiring protection, the standards governing environmental decision-making, as well as the procedures for reviewing and enforcing duties. Future generations must not be recognized as full legal individuals before interests can receive protection. This may be protected as constitutionally relevant and legally representable interests corresponding to present duties borne by the state and other decision-makers. Adaptivity does not mean unrestricted administrative discretion but requires legally structured flexibility, defined review intervals, scientific triggers, procedural safeguards, transparency, and judicially reviewable reasons.

This study does not reject sustainability as normatively empty. Sustainable development incorporates an intergenerational dimension and remains indispensable as an integrative legal objective. The limitation is in the breadth of the balancing structure, which may permit long-term ecological losses to be justified by immediate economic benefits. Intergenerational justice strengthens and replaces sustainability by requiring decision-makers to justify the temporal distribution of benefits and burdens, preserve ecological options, and prevent irreversible harm depriving future generations of meaningful choices. In the Indonesian context, this reconstruction requires the reinterpretation of the constitutional right to a good and healthy environment under Article 28H of the 1945 Constitution.

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[49] César Soares de Oliveira and Vonintsoa Rafaly, "Towards a Temporal Approach of the Law of the Sea: Addressing Slow Violence through Legal Longtermism," *Marine Policy* 187 (2026): 107049, https://doi.org/10.1016/j.marpol.2026.107049.

[50] de Oliveira and Rafaly.

[51] de Oliveira and Rafaly.

[52] Ting Ma, Ke Wang, and Di Fan, "From Conflict Management to Collaborative Adaptation: Designing Participatory Governance Frameworks for Human–Wildlife Relations in Sanjiangyuan National Park, China," *Environmental and Sustainability Indicators* 30 (2026): 101165, https://doi.org/10.1016/j.indic.2026.101165.

[53] Timothy Karpouzoglou, Art Dewulf, and Julian Clark, "Advancing Adaptive Governance of Social-Ecological Systems through Theoretical Multiplicity," *Environmental Science & Policy* 57 (2016): 1–9, https://doi.org/10.1016/j.envsci.2015.11.011.

3.2. Protecting Future Generations in Environmental Law: Legal Interests, Representation, and State Duties

Future generations need not be recognized as full legal individuals before interests can receive legal protection. These individuals may be understood as beneficiaries of present state duties whose legally protected interests are represented through constitutional, institutional, procedural, and judicial mechanisms. Historically, intergenerational justice and responsibility toward the future were largely framed as aspirational moral obligations, lacking clear institutional enforceability.[54] Recent developments in international law indicate that the boundary between ethical principle and legal obligation is becoming less rigid, driven by the growing need to transform the principles into enforceable standards.[55] The International Court of Justice's recent advisory opinion marks an important step by integrating intergenerational equity as an interpretive criterion in state obligations related to climate change, transforming moral duties into legally relevant parameters for assessing state conduct. The transformation is gradual and results from a conceptual evolution that connects ethics, human rights, and state obligations within a coherent normative framework.[56] This marks a shift from a reactive legal model toward a framework that requires proactive measures to prevent environmental harm before the occurrence.

The practical concept is reflected in state obligations to establish mitigation targets, strengthen adaptation policies, and regulate private sector activities that contribute to ecological risks.[57] This process of transformation faces structural limitations that must be acknowledged. Even though the principle of intergenerational justice has gained recognition as an interpretive framework, many legal systems have not acknowledged the concept as an autonomous source of legal obligation.[58] Therefore, normative reconstruction remains in a transitional phase, where ethics has entered the legal domain but has not fully shaped an independent architecture of obligations. Recent studies suggest that the effectiveness of the principle largely depends on the integration into existing legal instruments, including human rights and international environmental law.[59] From a broader perspective, this process reflects an epistemological shift within law. Even though law previously depended on factual certainty and past violations as the basis for intervention, the concept accommodated uncertainty and long-term risk as grounds for legal action. Normative reconstruction expands the substance of law and transforms the operation from a system known for evaluating the past into anticipating the future.[60]

The recognition of future generations as legal subjects challenges the classical assumption that empirically present entities can hold rights and obligations.[61] In traditional constructions, legality depends on the identification of concrete parties, placing unrealized interests outside the scope of protection. Recent developments in environmental law and human rights have begun to

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[54] Tasnim Nazira Rida, "Integrating Environmental Ethics into Climate Change Adaptation Policies in Bangladesh: A Narrative Review," *Climate Risk Management* 50 (2025): 100748, https://doi.org/10.1016/j.crm.2025.100748.

[55] Pier Giorgio Chiara, "Towards a Right to Cybersecurity in EU Law? The Challenges Ahead," *Computer Law & Security Review* 53 (2024): 105961, https://doi.org/10.1016/j.clsr.2024.105961.

[56] Matthieu Queloz, *The Ethics of Conceptualization: Tailoring Thought and Language to Need* (Oxford University Press, 2025), https://doi.org/10.1093/9780198926283.001.0001.

[57] Maria-Therese Gustafsson, Jorge E. Rodriguez-Morales, and Lisa M. Dellmuth, "Private Adaptation to Climate Risks: Evidence from the World's Largest Mining Companies," *Climate Risk Management* 35 (2022): 100386, https://doi.org/10.1016/j.crm.2021.100386.

[58] Cecilia I Silberberg, "Building a Corpus Iuris Climatis: Making Sense of the ICJ and the IACtHR Advisory Opinions on Climate Emergency," *Environmental Policy and Law* 56, no. 3–4 (2025): 85–104, https://doi.org/10.1177/18785395251397298.

[59] Ahmed Ibrahim Ahmed Attia Khalil, "Environmentally Significant Administrative Decisions: A Comparative Study of Domestic and International Legal Constraints," *Environmental Policy and Law* 55, no. 4–5 (2025): 120–27, https://doi.org/10.1177/18785395251366926.

[60] Mandy Paauw et al., "Adaptive Governance of River Deltas Under Accelerating Environmental Change," *Utrecht Law Review* 18, no. 2 (2022): 30–50, https://doi.org/10.36633/ulr.803.

[61] Michela Massimi, "The Fraught Legacy of the Common Heritage of Humankind Principle for Equitable Ocean Policy," *Environmental Science & Policy* 153 (2024): 103681, https://doi.org/10.1016/j.envsci.2024.103681.

shift this boundary by expanding the concept of legal subjectivity toward a more inclusive framework through the recognition that present decisions have direct consequences for future living conditions.[62] The shift creates space for establishing a normative foundation that enables intertemporal interests to be articulated within legal systems. In traditional constructions, legality depends on the identification of concrete parties, placing unrealized interests outside the scope of protection. Recent developments in environmental law and human rights have begun to shift the boundary by expanding the concept of legal subjectivity toward a more inclusive framework through the recognition that present decisions have direct consequences for future living conditions.[63]

The development of legal standing becomes a crucial element in ensuring that the interests of future generations can be advocated through judicial mechanisms.[64] In many legal systems, access to courts requires proof of actual harm, limiting the possibility of claims based on long-term risks. However, recent trends in environmental litigation show an expansion of standing doctrines, with courts increasingly accepting arguments grounded in potential intergenerational harm, particularly in cases including climate change and environmental degradation.[65] This development suggests that law is beginning to accommodate forms of unmaterialized and scientifically projected harm. The dimension of justiciability becomes decisive in determining whether the claims can be adjudicated substantively or remain at the level of normative recognition. The primary challenge is in the assessment of long-term obligations without clear quantitative parameters.[66] The developments collectively show that the recognition of future generations as legal subjects depends on a combination of representation, access to justice, and the capacity of judicial systems to assess temporally oriented claims.

The integration of the three elements establishes the foundation for transforming law from a present-oriented system into a framework capable of accommodating intergenerational interests.[67] The protection of the future will remain at the level of rhetoric without strengthening the dimensions, lacking sufficient operational force in legal practice. The integration of human rights with environmental constitutionalism marks a significant shift from viewing environmental protection as a policy agenda to recognizing the concept as a legal obligation grounded in human dignity and the sustainability of life.[68] Legal protection for future generations requires distinguishing personality, enforceable rights, and protected interests. This study treats unborn individuals as beneficiaries of present duties imposed on states, regulators, courts, and private actors. The duties arise through constitutional interpretation, legislation, judicial review, and international norms, including intergenerational principles in climate law. Protection may operate through representative standing, public-interest litigation, long-term impact assessment, precautionary obligations, continuous monitoring, and regulatory revision.

The idea of future-oriented governance becomes crucial, as rights extended into the future cannot be effectively implemented through static regulatory models. Adaptive governance offers the institutional form that enables this direction to be operationalized when human rights provide the normative direction. Studies on transformative governance emphasize the need for law to shift from a corrective model toward a framework capable of learning, adapting, and continuously

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62 Diana Carolina Sánchez-Zapata and María Fernanda Cárdenas, "Rights of Nature as a Response to the Climate Crisis and Discourses on Sustainability," *Climate Change Ecology* 10 (2025): 100101, https://doi.org/10.1016/j.ecochg.2025.100101.

63 Sánchez-Zapata and Cárdenas.

64 Sánchez-Zapata and Cárdenas.

65 Eeshan Chaturvedi, "Climate Change Litigation: Indian Perspective," *German Law Journal* 22, no. 8 (2021): 1459–70, https://doi.org/10.1017/glj.2021.85.

66 Malgieri and Santos, "Assessing the (Severity of) Impacts on Fundamental Rights."

67 Qin, Hu, and Su, "Functions and Optimization of Soft Law in the International Governance of Synthetic Biology: The Predicament of Hard Law vs. the Rise of Soft Law."

68 Claudia Ituarte-Lima, Maria Andrea Nardi, and Liisa Varumo, "Just Pathways to Sustainability: From Environmental Human Rights Defenders to Biosphere Defenders," *Environmental Policy and Law* 53, no. 5–6 (2023): 347–66, https://doi.org/10.3233/EPL-239009.

anticipating ecological change.[69] The integration of human rights and environmental constitutionalism paves the way for future-oriented governance in two simultaneous ways. First, the subjects and scope of legal protection are expanded, ensuring that environmental decisions are no longer assessed based on immediate consequences. Second, institutional transformation is promoted by allowing the state to respond to harm and prevent arbitrary impacts on future generations. In this context, future-oriented governance is not a peripheral addition to environmental law, but a logical consequence of recognizing that ecological justice and human rights must be conceived beyond the boundaries of a single generation.[70]

3.3. Comparative Pathways to Future-Oriented Environmental Governance: The European Union, Indonesia, the Philippines, and Colombia

Comparative environmental analysis should avoid treating the European Union and the Global South as homogeneous or hierarchically ordered categories. Therefore, this study adopts a functional comparative approach, with Indonesia as the principal jurisdiction and the European Union, the Philippines, and Colombia as selected comparators. The European Union is examined for the precautionary principle, risk-based regulation, scientific assessment, and review mechanisms. The Philippines is relevant for representative standing in intergenerational environmental litigation. Meanwhile, Colombia reports ecological constitutionalism, rights-of-nature reasoning, and innovative judicial remedies. The comparison applies common criteria, namely legal foundations, recognition of intergenerational interests, preventive duties, long-term risk assessment, representation and standing, public participation, adaptive review, enforcement, and remedies. The European Union faces procedural complexity and technocratic dependence, the Philippines raises concerns about the scope of representation, and Colombia's strong judicial role may generate institutional and separation-of-powers challenges.

The concept of adaptive convergence refers to context-sensitive consistency around shared legal functions rather than uniformity or legal transplantation. For Indonesia, this shows combining precautionary duties, cumulative and long-term impact assessment, representative mechanisms, continuous monitoring, periodic regulatory review, transparent reason-giving, public participation, and judicial accountability. The comparative results support a balanced, future-oriented environmental governance framework for future generations. The European Union's regulatory approach in the fields of environment and technology has developed through the integration of risk-based regulation and the precautionary principle, which form a structured legal response to uncertainty.[71] In the European Union legal framework, the precautionary principle, as enshrined in Article 191 (2) TFEU, allows regulatory intervention even when scientific evidence is not fully conclusive, provided there are reasonable indications of potential serious harm. This approach is combined with the logic of risk-based regulation, which classifies activities according to the level of risk and potential impact.[72]

Studies on ecological innovation regulation show that the combination of the precautionary principle and risk analysis enables regulators to distinguish between situations requiring strict limitations and conditions tolerated under adaptive oversight.[73] In this context, law functions as an instrument of control and a calibration mechanism that adjusts the intensity of regulation to the dynamics of risk. Therefore, the structured character of the European Union model is reflected in the integration of scientific assessment, institutional procedures, and public legitimacy within

[69] Korhonen-Kurki K. et al., "Transformative Governance: Exploring Theory of Change and the Role of the Law," *Earth System Governance* 23 (2025): 100230, https://doi.org/10.1016/j.esg.2024.100230.

[70] Louis Kotzé, "A Global Environmental Constitution for the Anthropocene?," *Transnational Environmental Law* 8, no. 1 (2018): 11–33, https://doi.org/10.1017/S2047102518000274.

[71] Tuomas Pöysti, "The Precautionary Approach Design Pattern," *Digital Society* 3 (2024): 5, https://doi.org/10.1007/s44206-024-00090-6.

[72] Gustavo Gil Gasiola, "Rebuilding the Pyramid: The AI Act's Risk-Based Approach Using a Binary Decision Diagram," *Computer Law & Security Review* 58 (2025): 106189, https://doi.org/10.1016/j.clsr.2025.106189.

[73] L Rushton, "The Precautionary Principle in the Context of Multiple Risks," *Occupational and Environmental Medicine* 64, no. 9 (2007), https://doi.org/10.1136/oem.2006.031856.

decision-making processes.[74] The application of the precautionary principle is not absolute, but requires a comprehensive evaluation of scientific evidence alongside considerations of proportionality and socio-economic impact. The structure enables law to operate under conditions of uncertainty without losing legitimacy since each intervention is grounded in justifications that can be rationally scrutinized.[75]

The European Union's approach shows that the management of uncertainty is not only reactive, but anticipatory and systemic. Regulations such as REACH and other environmental policies show the application of the precautionary principle to address complex and not yet fully defined risks, including group-based regulation and continuous evaluation of new substances or technologies.[76] This reflects a shift from a legal paradigm reliant on certainty toward a framework capable of managing uncertainty in a layered manner, by combining prevention, oversight, and regulatory learning. The European Union's governance model shows that uncertainty is a condition internalized within regulatory design.[77] The integration of the precautionary principle with a risk-based approach produces a model that is not only responsive to potential hazards and capable of adapting to developments in science and technology.

In many Global South countries, the primary challenges of environmental governance are in institutional structures fragmented and misbalanced with the complexity of ecological risks.[78] Various sectoral regimes often develop in isolation, leading to weak inter-agency coordination and policy implementation frequently constrained by overlapping mandates. Recent studies in Lagos and Accra show that even though integration is frequently emphasized in policy documents, the implementation remains affected by centralized governance structures, weak coordination, and limited stakeholder participation.[79] This situation indicates that fragmentation is an administrative issue and structural condition that constrains the capacity of law to respond comprehensively to environmental threats. Weak enforcement compounds capacity gaps including technical resources, funding, data availability, and institutional support.[80]

In many developing contexts, local institutions are burdened with ambitious implementation mandates without adequate operational tools. Studies on institutional vulnerability show that these weaknesses often manifest in the form of ambiguous mandates, fragmented authority, and a gap between policy formulation and practical implementation.[81] Therefore, environmental regulations frequently exist in formal terms but lack sufficient transformative power to alter behavior, coordinate actors, or prevent the escalation of risks. Limited capacity causes law to operate under constraint, rather than as an instrument shaping the direction of change. Under

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[74] Steffen Hurka, "The Institutional and Political Roots of Complex Policies: Evidence from the European Union," *European Journal of Political Research* 62, no. 4 (2026): 1168–90, https://doi.org/10.1111/1475-6765.12555.

[75] Joseph Erickson and Michael Gregory, "Against Algorithmic Clarity: Law Beyond Specification," *International Journal for the Semiotics of Law*, 2025, https://doi.org/10.1007/s11196-025-10379-5.

[76] Oluwatosin J. Aladekoyi et al., "Legislative and Precautionary Approaches to Managing Pharmaceutical Contaminants in Canadian Freshwaters," *Water Research* 282 (2025): 123714, https://doi.org/10.1016/j.watres.2025.123714.

[77] Zora Kovacic and Louisa Jane Di Felice, "Complexity, Uncertainty and Ambiguity: Implications for European Union Energy Governance," *Energy Research & Social Science* 53 (2019): 159–69, https://doi.org/10.1016/j.erss.2019.03.005.

[78] Olasunkanmi Habeeb Okunola et al., "A Diagnostic Framework for Integrated Flood Risk Governance: Conceptual Foundations and Insights from Lagos and Accra," *Environmental Science & Policy* 175 (2026): 104304, https://doi.org/10.1016/j.envsci.2025.104304.

[79] Nermeen Dalgamoni and Mysaa Khwaileh, "Policy Gaps and Urban Flooding: A Critical Evaluation of Flash Flood Risk Management and Resilience in Amman, Jordan," *International Journal of Disaster Risk Reduction* 131 (2025): 105896, https://doi.org/10.1016/j.ijdrr.2025.105896.

[80] Nika Saputra et al., "Capacity Building for Organizational Performance: A Systematic Review, Conceptual Framework, and Future Research Directions," *Cogent Business & Management* 11, no. 1 (2024): 2434966, https://doi.org/10.1080/23311975.2024.2434966.

[81] Irasema Alcántara-Ayala, Gema Velásquez-Espinoza, and Adán Montes de Jesús, "From Mandates to Mechanisms: Institutional Vulnerability, Decentralized Governance, and the Challenges of Local Disaster Risk Reduction Implementation," *International Journal of Disaster Risk Science* 16 (2025): 709–723, https://doi.org/10.1007/s13753-025-00673-y.

these conditions, governance is generally reactive. Legal and administrative interventions are more often undertaken after disasters, resource conflicts, or ecological damage have become evident, rather than through systematic preventive mechanisms.[82] In many Global South countries, pressures of economic development, dependence on resource extraction, and the need for short-term investment constrain the space for anticipatory regulation. The result is a pattern of reactive governance in which law functions more as a corrective tool after harm has occurred, rather than a framework capable of identifying and mitigating threats at an early stage.[83]

The comparison does not imply that the Global South is "less developed" than other regulatory models. However, this suggests that environmental uncertainty is confronted from different institutional starting points.[84] The challenge is not to mechanically replicate risk-based regulatory models, but to build forms of governance that are contextual, integrated, capable of learning, and responsive to existing capacity constraints. Transitions toward sustainability require collaboration, continuous learning, a plurality of actors, and a strengthening of oversimplified legal analysis. In the context of the Global South, environmental reform must begin by addressing institutional fragmentation, enhancing implementation capacity, and shifting policy orientation from short-term responses toward long-term risk management.[85]

The experience of the European Union shows the value of risk-based regulation, the precautionary principle, and the institutionalization of environmental rights. The most important lesson for other regions is not to replicate the legal forms, but to understand the underlying logic. Law must be designed to operate under conditions of rapid change, incomplete knowledge, and cumulative threats.[86] The capacity to learn, adjust policies, and continuously reorganize institutional responses is at the core of effective governance in the context of ecological complexity. Furthermore, this study shows that the potential of adaptive approaches in the Global South has not been fully realized, largely due to institutional constraints and socio-political configurations.[87] The central lesson is the need for directed convergence, where jurisdictions must adopt shared principles such as risk anticipation, cross-sectoral integration, public accountability, and long-term protection. Studies on transformative governance emphasize that effective change requires a combination of learning, inter-institutional coordination, and legal reform capable of breaking path dependency that sustains harmful practices. The future of environmental governance is in the ability to connect normative ambition with actual implementation capacity.[88] In the Global South, this direction addresses regulatory fragmentation and strengthens local capacity. In the European Union, the challenge is to ensure that procedural complexity does not erode social legitimacy and distributive justice.

Adaptive convergence must also be future-oriented. Governance should not only respond to crises but must be built on the capacity to anticipate trajectories of change, manage competing scenarios, and adjust policies incrementally before points of irreversible damage are reached.[89]

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[82] Vu et al., "Enablers and Barriers to Implementing Effective Disaster Risk Management According to Good Governance Principles: Lessons from Central Vietnam."

[83] Filippo Venturi, "Reconstructing Criminalisation. Regulatory Crimes and the Authoritarian Foundations of Modern Substantive Criminal Law," *Criminal Law and Philosophy*, 2025, https://doi.org/10.1007/s11572-025-09771-w.

[84] James J. Patterson, "More than Planning: Diversity and Drivers of Institutional Adaptation under Climate Change in 96 Major Cities," *Global Environmental Change* 68 (2021): 102279, https://doi.org/10.1016/j.gloenvcha.2021.102279.

[85] Frank Biermann et al., eds., *Essential Concepts for Implementing the Sustainable Development Goals* (London: Routledge, 2025), https://doi.org/10.4324/9781003519560.

[86] Stanley Greenstein and Mauro Zamboni, "Navigating the Legislative Dilemma: Evaluating the EU AI Act's Approach to Regulating Emerging Technologies," *The Theory and Practice of Legislation* 13, no. 3 (2025): 312–52, https://doi.org/10.1080/20508840.2025.2513177.

[87] Sourabh Shastri et al., "Decentralized Solar Adoption in the Global South: A Comparative Analytical Review of Pathways, Trade-Offs, and Development Outcomes," *Energy for Sustainable Development* 93 (2026): 101991, https://doi.org/10.1016/j.esd.2026.101991.

[88] Daniel A. DeCaro et al., "Legal and Institutional Foundations of Adaptive Environmental Governance," *Ecology and Society* 22, no. 1 (2017): 32, https://doi.org/10.5751/ES-09036-220132.

[89] Manjana Milkoreit et al., "Governance for Earth System Tipping Points – A Research Agenda," *Earth System Governance* 21 (2024): 100216, https://doi.org/10.1016/j.esg.2024.100216.

Studies on adaptive pathways show that more robust decisions arise from planning that preserves options, avoids premature lock-in, and allows for revision due to the evolution of conditions. In this context, cross-regional lessons become evident. Countries with stronger capacities may offer models of instruments, while those with higher vulnerability show the importance of designs that are flexible, participatory, and sensitive to local contexts.[90] Future-oriented governance requires the convergence of two horizons, namely a strong normative commitment to protecting the future and an institutional architecture sufficiently adaptive to operate under conditions of uncertainty. The most valuable comparative lesson is that environmental governance in an era of crisis can no longer be constructed on a binary opposition between "advanced models" and "institutional backwardness". The requirement is legal engineering capable of bridging differences in capacity without losing normative direction. In this context, convergence is not an end state, but a process of cross-contextual learning that integrates precaution, adaptability, and justice. This calls for law to move beyond regulating environmental objects toward a more reflective capacity to understand complexity, recalibrate direction, and institutionalize responsibility for the future.[91]

Table 1.
Comparative Environmental Governance under Uncertainty: European Union vs Global South

Analytical Dimension	European Union (EU)	Global South	Implications for Future-Oriented Governance
Regulatory Paradigm	Risk-based regulation and precautionary principle	Predominantly rule-based and reactive	Transition toward context-sensitive risk-based approaches
Institutional Design	Integrated and cross-sectoral coordination	Fragmented across institutions and sectors	Institutional reform and policy integration
Institutional Capacity	Limited (resource constraints, data gaps)	Limited (resource constraints, data gaps)	Strengthening local capacity and knowledge transfer
Use of Scientific Knowledge	Systematic (scientific risk assessment, evidence-based policy)	Limited and uneven	Gradual integration of science into policymaking
Environmental Rights	Institutionalized within legal and policy frameworks	Emerging but inconsistent	Strengthening environmental rights as future human rights
Regulatory Flexibility	Adaptive and based on continuous evaluation	Rigid and reliant on formal rules	Adoption of adaptive regulation and experimental governance
Regulatory Resilience	Relatively high (adaptive to systematic change)	Low to moderate	Designing resilience through institutional learning

Source: Authors, 2026.

The comparative table reports that the key distinction between the European Union and the Global South is in the epistemological architecture and institutional capacity for managing uncertainty. The European Union has developed a governance model that places risk at the center of regulatory design, allowing law to function as a system of calibration for adjusting the

[90] Ma, Wang, and Fan, "From Conflict Management to Collaborative Adaptation: Designing Participatory Governance Frameworks for Human–Wildlife Relations in Sanjiangyuan National Park, China."

[91] Zhaodi Yu and Jiangang Qi, "Constructing the Model of Intelligent Food Safety Supervision in China: Administrative Law Perspectives and Regulatory Challenges," *Discover Food* 6 (2026): 103, https://doi.org/10.1007/s44187-026-00829-9.

intensity of intervention in proportion to potential harm.[92] In contrast, many countries in the Global South continue to operate within a normative framework that treats law as a set of fixed rules, leading to responses after adverse impacts have materialized. This divergence suggests that future-oriented governance is determined by the system's ability to anticipate and engage with evolving risks.[93]

Institutional structure is reported as a decisive factor shaping governance effectiveness. Cross-sectoral integration and multi-level coordination within the European Union enable a systemic approach to environmental challenges. Meanwhile, fragmentation across institutions in the Global South creates a persistent gap between policy formulation and implementation.[94] Capacity constraints increase this disconnect, rendering legal norms operationally weak. In this context, the central issue is the inability to translate normative commitments into effective institutional practice. However, the table shows that the European model is not without limitations. Procedural complexity, reliance on technocratic expertise, and the ongoing need for democratic legitimacy suggest that highly structured systems face challenges in balancing effectiveness with fairness.[95] Conversely, the Global South possesses the potential to develop more context-sensitive and flexible approaches through locally grounded institutional innovation and practice-based learning.[96]

This comparison has direct implications for the development of future-oriented governance. A governance system capable of operating under conditions of uncertainty must integrate three core elements, namely anticipatory capacity, regulatory flexibility, and institutional learning.[97] The European Union offers a robust conceptual framework for managing risk. Meanwhile, the Global South shows the importance of contextual adaptation to ensure that regulation remains grounded in implementation realities. The future of environmental law is in designing systems that are reflective, adaptive, and firmly anchored in the normative objectives of public protection and intergenerational sustainability. In this context, a key lesson from global practice is the importance of shifting the focus from the reproduction of norms toward strengthening the system's capacity to adapt.[98]

Studies on climate change adaptation emphasize that effective governance design requires cross-sectoral coordination, the integration of scientific and local knowledge, and mechanisms capable of connecting different levels of government. Regulation tends to lose operational effectiveness despite being normatively progressive when these elements are not connected. Therefore, adaptive convergence requires institutional reconstruction that enables law to function as a living system, rather than as a static normative framework.[99] The concept of adaptive pathways shows that decision-making under conditions of uncertainty does not depend on a

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92 Sarah Seifi et al., "Complying with the EU AI Act: Innovations in Explainable and User-Centric Hand Gesture Recognition," *Machine Learning with Applications* 20 (2025): 100655, https://doi.org/10.1016/j.mlwa.2025.100655.

93 Rahm, *The Global Governance of Harmful Practices: Actors, Networks, and Knowledge Transfer in Transnational Gender Programmes*.

94 Kristof Tomej et al., "Enabling Cross-Sectoral Transformation for Coastal Climate Adaptation in Europe: Four Directions for Interdisciplinary Efforts," *Environmental Science & Policy* 177 (2026): 104334, https://doi.org/10.1016/j.envsci.2026.104334.

95 Blayne Haggart and Clara Iglesias Keller, "Democratic Legitimacy in Global Platform Governance," *Telecommunications Policy* 45, no. 6 (2021): 102152, https://doi.org/10.1016/j.telpol.2021.102152.

96 Rongting Qin, Xiaojie Zi, and Xiaoxi Ge, "Digital Twin-Based Intelligent Risk Assessment and Decision Support System for University Student Entrepreneurial Projects," *Scientific Reports* 16 (2026): 5770, https://doi.org/10.1038/s41598-026-36111-2.

97 Andra Cojocaru, "Governing AI with Trust: An Adaptive Framework for Institutional Legitimacy in the UK Public Sector," *Transforming Government: People, Process and Policy*, 2025, 1–22, https://doi.org/10.1108/TG-05-2025-0125.

98 Ana Terra Amorim-Maia and Marta Olazabal, "Beyond Adjustment: A New Paradigm for Climate Change Adaptation in a Complex World," *Global Environmental Change* 93 (2025): 103027, https://doi.org/10.1016/j.gloenvcha.2025.103027.

99 Masoud Aghajani, Ashkan Memari, and Shankar Sankaran, "Between Conformity and Change: How Institutional Forces Shape, and Are Shaped by, Projects," *International Journal of Project Management* 44, no. 2 (2026): 102828, https://doi.org/10.1016/j.ijproman.2026.102828.

single prediction, but rather on mapping multiple possible policy trajectories adjusted as conditions evolve.[100] This approach avoids the trap of rigid policy lock-in and creates space for learning-based revision. In the context of global environmental governance, regulation must be designed to keep options open, allow for course correction, and accommodate the dynamics of risks evolving in a non-linear manner.[101] Law functions as an instrument of navigation, rather than a tool of control.

Future-oriented convergence requires the integration of normative and operational dimensions. Transformations in global biodiversity governance show that success is determined by normative commitments as well as capacity for transformative and cross-scale implementation.[102] Principles such as sustainability and ecological justice must be translated into concrete mechanisms capable of reaching practices at the local level while maintaining global coherence. Law risks becoming trapped in normative symbolism that is unable to transform ecological realities without integration. Contextualized and adaptive convergence reflects a fundamental shift in how law understands uncertainty. Law is positioned as a system that continuously evolves through the interaction of norms, institutions, and practices.[103] Future-oriented governance results from the capacity of legal systems to learn, adjust, and transform reflectively in response to a complex world.[104]

The term 'Global South' cannot bear the weight of a uniform legal category. The jurisdictions differ substantially in constitutional design, administrative capacity, development trajectory, and ecological vulnerability. Therefore, Indonesia is the sole jurisdictional focus of this study since references to the wider Global South provide context. This distinction avoids a simplistic hierarchy in which European regulation is treated as the universal benchmark and developing legal systems as deficient replicas. Functional comparison examines the regulatory tasks performed by a mechanism, the institutional conditions for the operation, and the extent to which an equivalent function can be achieved within the constitutional and administrative arrangements.

The implementation gap is most visible in the distance between the constitutional right to a good and healthy environment and the routine operation of administration. Environmental and strategic assessments, spatial planning, licensing, participation, supervision, and enforcement formally constitute a preventive architecture. In practice, fragmented authority, weak inter-agency coordination, uneven participation, limited technical capacity, and inconsistent enforcement often prevent the instruments from constraining decisions that create cumulative or long-term harm. The resulting problem is a failure to connect constitutional commitments, administrative procedures, scientific information, and institutional accountability across the full life cycle of environmental decision-making.

3.4. Operationalizing Intergenerational Environmental Governance in Indonesia: A Rights-Based, Anticipatory, and Adaptive Legal Framework

Future-oriented environmental governance requires an integrated legal structure connecting human rights, anticipation, and adaptation. Human rights provide the normative foundation by identifying protected interests and corresponding public duties. Anticipatory governance supplies ex ante mechanisms to detect and prevent cumulative, irreversible, and

[100] Marjolijn Haasnoot et al., "Lessons from a Decade of Adaptive Pathways Studies for Climate Adaptation," *Global Environmental Change* 88 (2024): 102907, https://doi.org/10.1016/j.gloenvcha.2024.102907.

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[104] Orthaus-Wahl, Pelger, and Erb.

intergenerational risks before harm occurs. Adaptive governance ensures that environmental decisions remain effective through monitoring, evaluation, and revision as scientific knowledge and ecological conditions evolve. Intergenerational justice connects the dimensions by treating future generations as beneficiaries of present duties to preserve ecological integrity, prevent harm, maintain future options, and ensure representation and accountability.

The reorientation of environmental law from a static regulatory model toward adaptive and resilient governance responds to the recognition that ecological change no longer unfolds linearly and predictably.[105] Traditional legal systems often rest on the assumption of stable regulatory objects, and tend to depend on fixed rules and corrective mechanisms applied after violations occur. However, the dynamics of contemporary environmental crises suggest that such an approach is no longer adequate. The literature emphasizes that law must develop into a framework capable of operating under continuously evolving conditions, rather than preserving normative order.[106] In this context, the concept of adaptive governance is developed as a response to limitations by emphasizing flexibility, collaboration, and continuous learning as the core of regulatory design.[107] Systematic studies indicate that adaptive governance functions as a mechanism for managing complex social-ecological systems, in which change cannot be fully predicted in advance.[108]

This transformation is closely connected to resilience governance, which treats the capacity of legal systems to withstand, adapt to, and recover from disruption as a primary regulatory objective.[109] In this framework, the effectiveness of law is measured by the capacity to maintain system functions under external pressures. Studies show that resilient governance requires the integration of flexible institutional design, multi-level coordination, and continuous evaluation mechanisms to anticipate unexpected changes.[110] This marks a paradigm shift from law as a guardian of order toward an adaptive system capable of managing uncertainty dynamically. Studies on environmental governance in the Global South show that recognizing local knowledge and community participation enhances adaptive capacity and strengthens the legitimacy of law in responding to ecological change.[111]

The shift toward adaptive and resilient models requires the integration of multiple sources of knowledge, including science, technology, and local practices. Studies on environmental governance in the Global South indicate that the recognition of local knowledge and community participation can enhance adaptive capacity and strengthen the legitimacy of law in responding to ecological change.[112] Law should become part of a broader knowledge ecosystem, in which the legitimacy and effectiveness depend on the ability to integrate diverse perspectives. This

[105] Barbara A. Cosens et al., "The Role of Law in Adaptive Governance," *Ecology and Society* 22, no. 1 (2017): 30, https://doi.org/10.5751/ES-08731-220130.

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[112] Hanna Sinare, Kaera Coetzer, and Lisen Schultz, "Participatory Governance for People and Nature in Multifunctional Landscapes — Insights from Biosphere Reserves," *Current Opinion in Environmental Sustainability* 77 (2025): 101585, https://doi.org/10.1016/j.cosust.2025.101585.

reorientation reflects a fundamental shift in how law understands the role in the context of the global environmental crisis. Law no longer functions to establish absolute certainty, but rather to manage uncertainty through flexibility, learning, and adaptive capacity.[113] The future of environmental law is in the ability to become a living, reflective, and resilient system in the face of an increasingly complex world.[114]

The integration of anticipatory governance and human rights into environmental regulation reflects the recognition that ecological damage cannot be adequately addressed through legal models. In the context of the climate crisis, biodiversity loss, and environmental technological risks, delayed intervention tends to amplify impacts that are cumulative and irreversible.[115] Governance studies report a shift from reactive regulatory patterns toward frameworks that emphasize anticipation, learning, and institutional preparedness in confronting uncertain futures. Comparative investigation identifies anticipatory governance as a primary model for managing complexity since the concept enables law to operate before a crisis threshold is reached.[116] However, anticipation is insufficient when the concept is not anchored by a clear normative compass and human rights become critical. A human rights–based approach expands the focus of environmental regulation from managing resources to protecting the fundamental conditions that enable human beings to live with dignity, health, and security.[117] Developments in international human rights law indicate a growing tendency to recognize obligations toward future generations, particularly when threats to human survival and well-being are long-term and intergenerational. Anticipatory governance provides the operational form for a rights orientation. The operation is conducted through instruments such as foresight, policy scenarios, continuous evaluation, and institutions designed to consider the long-term impacts of present decisions.[118] This is crucial because the protection of the future requires institutional mechanisms capable of embedding long-term considerations into legislative, regulatory, and oversight processes.[119]

Risk must be fully proven in traditional models before intervention is justified. In contrast, anticipatory governance shifts attention toward potential impacts, the distribution of vulnerability, and the need to act under conditions of incomplete knowledge. In the context of energy transition mineral extraction, anticipatory governance is necessary to ensure that the green transition does not generate new harms for vulnerable communities and ecosystems.[120] The integration of anticipatory governance and human rights into environmental regulation transforms law from a corrective instrument into an institutional framework for future protection.[121] Law prohibits harm

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[120] F.A Mboringong et al., "Anticipatory Governance for Responsible Investment in Energy Transition Minerals in the Western Congo Basin," *The Extractive Industries and Society* 24 (2025): 101749, https://doi.org/10.1016/j.exis.2025.101749.
[121] Cheryl Marie Cordeiro, Laurynas Adomaitis, and Lei Huang, "The AI-Policy-Governance Nexus: How Regulation and AI Shift Corporate Governance toward Stakeholders," *Technology in Society* 84 (2026): 103117, https://doi.org/10.1016/j.techsoc.2025.103117.

and builds institutional capacity to anticipate trajectories of change, assess potential risks, and restrain decisions imposing disproportionate burdens on future generations.[122]

Contextualizing future-oriented governance for Indonesia requires recognizing that the primary challenge is the lack of environmental norms and the tension between sustainability ambitions, institutional capacity, and a development orientation focused on short-term outcomes. Recent studies on Indonesia show that development agendas, energy transition, and green infrastructure are often institutionalized through long-term programs. However, the policy effects remain limited when governance architectures are unable to effectively connect normative targets with cross-sectoral implementation.[123]

From a legal perspective, Indonesia possesses an important entry point through the constitutional recognition of the right to a good and healthy environment. This right has not been fully developed in an intergenerational context. International legal discourse reports that recognizing future generations within human rights law requires a reinterpretation of legal doctrines that have traditionally been centered on present subjects.[124] Experiences from various models of adaptive governance show that the effectiveness of environmental law depends on the content of rules as well as the capacity of institutions to learn, adjust policies, and coordinate responses across sectors.[125] In Indonesia, studies on multi-risk governance in cities such as Bandung and Makassar show that sustainable adaptation requires strengthened inter-agency coordination, enhanced technical capacity at the local government level, and the integration of risk analysis into planning processes.[126]

The Indonesian context suggests that future-oriented governance cannot be separated from the importance of local knowledge and public participation. A recent study on customary environmental law indicates that the transformation of national law has not significantly improved environmental quality, while customary law may strengthen protective approaches rooted firmly in ecosystems and communities. These results suggest that Indonesia's pathway toward future-oriented governance depends on regulatory technocracy as well as requires the integration of local wisdom, the strengthening of community rights, and more substantive participation in decision-making processes. Future-oriented governance requires contextual convergence, integrating anticipatory logic, a rights-based framework, and adaptive capacity into a more cohesive legal architecture.[127]

The socio-legal dimension of environmental governance is evident when legal norms are examined in relation to institutional practice. In many developing jurisdictions, including Indonesia, the core problem is the absence of environmental regulation and weak translation of normative commitments into effective institutional action. Environmental rights may be constitutionally recognized, and sustainability is formally incorporated into legislation and policy documents. However, implementation often remains constrained by fragmented authority, uneven coordination among agencies, limited technical capacity, and weak enforcement mechanisms. This gap shows that environmental law cannot be assessed by reference to existing norms and must be evaluated through the social and institutional conditions.

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[123] Anis ur Rehman et al., "Sustainability-Aligned Pathways for Energy Transition: A Review of Low-Carbon Energy Network Solutions," *Renewable and Sustainable Energy Reviews* 226, no. part E (2026): 116428, https://doi.org/10.1016/j.rser.2025.116428.

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Future-oriented environmental governance requires more than formalistic consultation and requires meaningful participation that allows communities, including vulnerable groups and local populations, to influence decision-making. In the Indonesian context, this is crucial because environmental harm is often experienced most directly by communities living near forests, coastal areas, mining sites, plantations, and industrial zones. Environmental decision-making will continue to reproduce a present-oriented and elite-centered governance model when public participation is treated as an administrative formality. Therefore, intergenerational justice must be operationalized through institutions that are transparent, participatory, and capable of incorporating local knowledge and community-based ecological experience.

For Indonesia, contextual convergence requires legal adaptation rather than institutional imitation. The proposed framework connects an intergenerational reading of environmental rights to precautionary duties, cumulative and long-term impact assessment, adaptive approvals, continuous monitoring, periodic review, meaningful participation, and enforceable accountability. These functions must be supported by cross-sectoral coordination, an institution authorized to represent future interests, transparent reasons for decisions, and representative standing for affected communities, young people, and environmental organizations. Judicial review should test whether authorities identified credible long-term risks, justified the level of precaution adopted, and established monitoring and revision mechanisms capable of responding to new evidence. In this form, future-oriented governance becomes a reviewable structure of public responsibility rather than a discretionary policy aspiration.

4. Conclusion

In conclusion, Indonesian environmental law does not primarily suffer from an absence of rights or regulatory instruments. The deeper weakness is architectural since constitutional environmental protection is not systematically connected to duties owed across generations. Existing law provides for planning, environmental assessment, participation, supervision, and enforcement, but does not consistently require authorities to identify cumulative and long-term risks, represent future interests, reconsider approvals when scientific knowledge changes, or prevent present actors from externalizing disproportionate ecological burdens into the future. The comparison confirms that no jurisdiction offers a complete solution. European Union law provides structured precaution, scientific risk assessment, and periodic review, but remains procedurally complex and technocratic. Decisions from the Philippines and Colombia show that Global South jurisdictions have generated distinct innovations through representative standing, ecological constitutionalism, and intergenerational remedies. Therefore, the relevant lesson is functional and context-sensitive. Indonesia should adapt mechanisms according to the constitutional purpose and the institutional conditions required for operation.

The principal contribution of this study is the Intergenerational Adaptive Environmental Governance Framework. Intergenerational protection is organized around four connected dimensions, namely legally protected future interests, precautionary and preventive state duties, anticipatory assessment coupled with adaptive review, and institutional representation backed by enforceable accountability. This model does not require future generations to possess full legal personality. The interests can be protected as beneficiaries of constitutional and statutory duties performed by present institutions and enforced through representative mechanisms. Implementation should begin with an expressly intergenerational interpretation of environmental rights. Cumulative and intergenerational assessment should be incorporated into strategic environmental assessment, spatial planning, and decisions on major projects. Environmental approvals should contain monitoring duties, science-based trigger points, and mandatory review clauses. An independent commissioner, ombudsperson, or specialized review unit should scrutinize the long-term effects of public policy. The arrangement must be reinforced by public-interest standing, transparent reason-giving, administrative reconsideration, and judicial oversight. These reforms would give intergenerational justice institutional form, ethical appeal to care for the future, as well as a legally reviewable system of prevention, representation, learning, and responsibility.

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