

RESEARCH ARTICLE

Ethical Challenges in International Environmental Law and Policy

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ABSTRACT

International environmental law is a key mechanism for promoting sustainability, but ethical conflicts in legal regimes often undermine its effectiveness. This study is focused on how justice, equity, procedural justice and accountability impact factor treaty compliance, resource allocation, enforcement mechanism, and long-term investments for sustainability. Using a mixture of quantitative analysis and a qualitative discussion of case studies, the results show that treaties with strong ethical commitments have much higher compliance rates, much more equitable access to financial and technical resources, and much better enforcement mechanisms. The study also identifies inequalities in resource allocation; whereby high-income countries receive a disproportionate amount of environmental support relative to low-income countries. Moreover, the authorization of agreements and bills promote intergenerational fairness move resources away from long-term sustainability efforts, which are overruled by short-term political and economic agendas. The findings highlight the need for ethical considerations to be included in treaty modalities to ensure legal compliance, equitability, and universality. Sustainability-related inquiries addressing moral and ethical considerations can help to foster environmental governance in a globalizing world. However, resolving these issues will need more standardized legal entities, better monitoring of compliance and interdisciplinary policy evaluation approaches. The article involved rethinking ethical governance and it is also a call for future research that deals with quantifying ethical obligations, harmonizing international legal frameworks, developing alternative enforcement mechanisms.

Keywords: international environmental law; ethical governance; compliance; environmental justice; sustainability policy; intergenerational equity; legal enforcement.

1. Introduction

International environmental law has emerged as a leading field of legal theory and practice, with these problems, which include climate change, pollution, and biodiversity loss, increasingly being framed by the

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realization that the environment does not respect national borders. It is not an exhaustive list of the pressing problems of climate change, biodiversity loss and pollution, which highlight the limitations of a purely domestic approach, and the necessity of a global architecture. Over the years, numerous treaties, agreements, and conventions have been developed to address these issues in an effort to harmonize the work of countries, organizations, and other stakeholders with sustainable development and environmental protection objectives [1].

International environmental law derives its normative and ethical foundations from a consolidated framework of multilateral environmental agreements, customary international law, and authoritative judicial interpretation. Early articulation of ethical obligations emerged in the Stockholm Declaration on the Human Environment (1972), which established the duty of states to prevent transboundary environmental harm and linked environmental protection to human well-being [2]. This normative trajectory was strengthened by the Rio Declaration on Environment and Development (1992), which introduced core ethical principles such as sustainable development (Principle 4), precaution (Principle 15), public participation (Principle 10), and common but differentiated responsibilities (Principle 7) [3].

These principles were subsequently embedded within binding treaty law. The United Nations Framework Convention on Climate Change (UNFCCC) codifies equity and differentiated responsibility in Articles 3 and 4, requiring developed states to take the lead in combating climate change while supporting developing countries through finance, technology transfer, and capacity-building^[4]. The Kyoto Protocol further operationalized differentiated obligations through legally binding emission targets for Annex I Parties under Articles 3 and 10 [5]. This structure was reconfigured under the Paris Agreement, which established a universal participation model while preserving differentiation through nationally determined contributions, financial obligations (Article 9), transparency requirements (Article 13), and a facilitative compliance mechanism (Article 15) [6].

Parallel ethical and legal developments occurred within biodiversity governance. The Convention on Biological Diversity (CBD) affirms state sovereignty over natural resources while imposing duties of conservation, sustainable use, and benefit-sharing under Articles 1, 3, and 20 [7]. These distributive justice principles were strengthened by the Nagoya Protocol, which creates legally defined obligations concerning access to genetic resources and equitable benefit-sharing, particularly for indigenous and local communities [8].

One central question of international environmental law is how to balance the rights and responsibilities of various actors in light of asymmetries in resources, capacity, and historical contributions to environmental degradation. Wealthy countries typically are financially and technologically better equipped to adopt strict environmental controls, while poor countries often experience genuine economic constraints. Such discrepancy gives rise to complex questions of justice, equity, common but differentiated responsibilities, and has manifested in the perennial threads of the dialogue, in international environmental agreements [9].

Furthermore, the intersection of environmental law with socioeconomic factors adds another dimension of complexity. While industrial activities, agriculture, urbanization, and resource extraction are critical to economic development, they also generate major environmental impacts. So international environmental law must reconcile competing demands for economic development, poverty alleviation and ecological protection. That includes not only forging agreements that establish such standards and targets, but also building compliance, monitoring and enforcement mechanisms that the global community will deem legitimate and actually work [10].

At the same time, the shifting terrain of environmental issues also requires that the international legal framework be flexible in order to stay relevant. Emerging environmental risks and opportunities are discovered by scientific knowledge, and new patterns of cooperation among countries are adopted by the changing geopolitics. Legal tools that were once seemingly fit for purpose may need to be modified, expanded, or supplemented in light of changing realities. This requires a forward-looking perspective that not only anticipates future challenges, but also encourages innovation in both law and policy^[11].

The other big question is about the place of non-state actors in influencing and enforcing international environmental law. Nation-states are still the primary stakeholders in treaties and other international agreements, but different stakeholders, including international NGOs, multinational corporations, and indigenous communities, also play a significant role. What is the Role of Non-Government Organizations (NGOs), Corporations, and Other Stakeholders in Climate Change Global Agenda? The NGOs can be seen as a main actor in agenda-setting and monitoring, while corporations are both gut providers and potential defenders on the other hand of tech solution or destructive practices pouring in for environmental status. In contrast, indigenous communities are likely to endorse millennia of traditional ecological knowledge, and, with regard to the environment, can lead us to recast the debate in terms of sustainability. We believe that perspectives and knowledge from these different stakeholders is critical in informing all aspects of effective, inclusive legal frameworks^[12].

Hence, intergenerational equity emerges as a central prudential concern of international environmental law. What we do or don't do today is having a tremendous impact over generations to come. It is an ethical consideration that calls for a cautious approach where risks of harm are balanced against immediate profit. Inter-generational approaches to legal frameworks rely on long-term planning, transparent decision-making and successful public participation processes^[13].

Developing states, least developed countries, and small island developing states are often cautious toward stringent environmental obligations due to concerns regarding economic capacity, development priorities, and institutional constraints. Some others might simply not have enough institutional capacity to implement measures that have been agreed upon. Moreover, enforcement is typically weak, depending on voluntary compliance or peer pressure when more stringent sanctions are readily avoided. Overcoming these challenges requires a legal framework that balances growth in responsibility based on the national context and priorities^[14].

References to “other countries” or “some countries” within international environmental law correspond to legally defined treaty classifications rather than informal distinctions. Most environmental agreements differentiate among developed states (Annex I Parties), developing states (Non-Annex I Parties), least developed countries (LDCs), and small island developing states (SIDS). This differentiation reflects disparities in historical emissions, economic capacity, and institutional readiness, and is formally expressed through the principle of common but differentiated responsibilities and respective capabilities (CBDR-RC)^[3, 4].

Equity within international environmental law thus operates on multiple levels: distributive equity concerning resource allocation; corrective equity addressing historical responsibility; and procedural equity ensuring inclusive participation. These dimensions are central to treaty negotiations, climate finance governance, and compliance architecture^[15, 16].

International environmental law is a dynamic body of law; its evolution and development try to address prevailing global issues and sustainable development and equity. It calls for a difficult balancing act between flexibility and enforceability, inclusion and efficiency, ambition and reality. And international

environmental law is an important part of that contention: between competing environmental, economic and social priorities; between the need to cooperate at the international and domestic level, to hold appropriate accountabilities, to forge pathways to a sustainable future for all.

1.1. The aim of the article

The article aims to continue wrestling with the troubling moral controversies underlying international environmental law and policy. They have historical implications for how we think about and govern our relations with the environment, and as human activity continues to influence and sometimes upend ecosystems, economies and societies at every scale, the law will need to wrestle with these and other questions of justice, equity and accountability. Its aim is to offer a critical evaluation of those questions as treated by international environmental law while exposing where this field fails to offer an ethical balance. The article attempts to elicit some of the ethical principles underlying international treaties, agreements and practices in an effort to provide a more nuanced understanding of the ways in which ethics sublates and frequently competes against laws and systems of governance too often focused on achieving sustainability and environmental protection.

Within international environmental law, ethical principles are not external moral abstractions but legally recognized normative standards derived from treaty provisions, general principles of law, and customary international obligations. These principles include:

- Distributive justice, referring to the equitable allocation of environmental burdens, responsibilities, and financial resources among states;
- Procedural fairness, encompassing transparency, access to information, public participation, and review mechanisms;
- Intergenerational equity, which obliges present generations to safeguard ecological systems for future generations;
- Accountability, requiring institutional mechanisms to monitor implementation, assess compliance, and respond to non-performance.

These ethical norms operate as interpretative principles guiding treaty design, institutional practice, and judicial reasoning, as affirmed in leading scholarship on international environmental law^[17-19].

This article aims therefore to give an overview of the complex question of responsibility that is often at play in global environmental problems between their various actors, which range from states over corporations to other stakeholders. It looks at the concept of equity, and how current international regimes attempt to compensate for inequalities in resources, technology, and historic culpability for climate destruction. The intent of using these issues as case studies in an ethical frame, the article explains, is to show how prioritizing values over subjectivity can inform international environmental decision making.

It also aims to explore how ethical concerns and enforcement mechanisms influence compliance strategies. It further addresses the adequacy of existing international legal constructs in mainstreaming ethical standards to the extent these are necessary and sufficient to serve the interest of justice as far as all interested parties are concerned, but with a focus on the particularly disadvantaged and vulnerable segments of the global community. This assessment examines the balance of pressures this approach can deliver to socio-economic development with environmental saving against the normative questions that loom over intergenerational justice.

The article seeks to analyses the dilemmas that International environmental law creates from the perspective of Security. It aspires to perform a consultative role in the current discussion on how to shape international legal regimes that are yet effective in addressing environmental threats and considerate of fundamental values.

The present study examines a defined corpus of international legal instruments, including the UNFCCC regime (UNFCCC, Kyoto Protocol, and Paris Agreement), biodiversity instruments (CBD and Nagoya Protocol), and associated institutional mechanisms. A total dataset of ninety international environmental agreements was analyzed, selected based on their relevance to climate mitigation, adaptation, biodiversity protection, and environmental governance.

The legal analysis focuses on how ethical principles are incorporated into treaty preambles, operational provisions, compliance procedures, and institutional mandates, thereby enabling systematic evaluation of ethical integration across international environmental regimes.

1.2. Problem statement

Deep, structural ethical deficits stymied international environmental law's efficacy in addressing global environmental problems. They split that up in the mound of responsibilities, resources and benefits granted to the states — there are treaties and agreements for decades. This sort of inequality threatens not just the effectiveness and the legitimacy of these systems of law in the world, but raises fundamental questions, whose answers touch the core of justice, right and accountability. The environmental degradation and climate change that are troubling us today disproportionately affect developing countries even though they have had little responsibilities in this matter in historical terms. On the contrary, developed countries are deficient in resolve by economic and technological means while seeking growth more so than fair distribution.

Well-designed compliance architectures—characterized by transparency, review, and institutional follow-up—are associated with improved treaty implementation. Free to join, most treaties invite or even encourage voluntary commitments of states and many fall within the domain of soft law, with compliance hinging on the goodwill of states as the exercise of their sovereignty. And this leads to a situation in which the powerful are unmoored and the weak refuse to cross the way, as the resources simply aren't available. Such implementation and enforcement failures, in turn" undermine confidence in international environmental law and thus render it less effective. While states remain the primary subjects of international law, non-state actors play an increasingly influential role in environmental governance. Environmental non-governmental organizations contribute to agenda-setting, compliance monitoring, and transparency advocacy, particularly within climate negotiations. Indigenous communities influence biodiversity governance through recognition of traditional knowledge under Article 8(j) of the CBD ^[7]. Corporate actors participate through transnational climate initiatives, disclosure regimes, and supply-chain regulation, forming hybrid governance structures alongside formal treaty processes ^[20, 21]. These actors enhance procedural fairness and normative legitimacy, reinforcing the ethical dimensions of environmental governance.

Another part of the problem is that enough ethical principles are not implemented while drafting and following the international legal instruments. These principles are widely discussed — equity, justice, but the implementation has been limited and inconsistent. Such inconsistency between its ethical declarations and legal action undermines these said initiatives that are trying to build a more equitable and just international environmental governance architecture.

The pace of change in global environments induced by industrialization, urbanization and technological accelerations continues to speed up and outstrip the best existing legal regimes' adaptive capacities. As novel

problems emerge, from biodiversity loss to transboundary pollution, the ethical dimensions of these problems are poorly understood and poorly provided for in international environmental law.

It indeed is a challenge, one of the long-standing gaps and immorality of international environmental law: how burdens of this global crisis and the global environment impacts are not equally and fairly distributed; how there is inadequate compliance and even the ethical dimension is poorly integrated within the global legal system. Such challenges inhibit the effectiveness, equity, and legitimacy of the international environmental law system.

2. Literature review

This field of academic inquiry has struggled for some decades to untangle the requisite ethical challenges of global environmental governance. (The earliest efforts to control how states dealt with transboundary environmental problems were mostly aimed at controlling obvious forms of pollution and overexploitation of resources [22]. As environmental crises became ever more complex, the reach of international treaties was extended to cover a range of issues, from climate change to the protection of biodiversity and the degradation of the oceans. This evolution has emphasized the need for an inclusive and ethics-based approach to the development of environmental policies which ensures fairness, equity and accountability of state and non-state actors [23].

A critics' sore point in curricular debates about the current regime is equity that is, the distribution of responsibilities and burdens among states. Wealthy countries have long been called to take the lead on many of the world's most pressing environmental challenges because of their more advanced technological and financial capacities. But are these efforts adequate and fair, particularly given the historical responsibility of these countries in terms of emissions and fossil fuel consumption? In contrast, developing countries tend to stress on their scarce resources and advocate for the principle of common but differentiated responsibilities. This gap is persistent, affecting treaties on international environmental agreements and highlights the call for moral and universal principles [24].

Another area of focus in the literature is the role of compliance and enforcement mechanisms. International environmental law is the most soft and flexible, the one most often criticized for weak enforcement provisions and reliance on voluntary commitments [25]. Academics have observed that without robust accountability mechanisms, legal instruments will not achieve the desired outcomes. Consequently, there is now more demand for more open monitoring mechanisms, a stronger penalty system and greater cooperation among nations to ensure that environmental treaties bring practical results [26].

It is also about the influence that non-state actors (non-state actors, such as, for instance, non-governmental organizations, multi-national firms, and indigenous communities) have on the making and application of international environmental law. And while states are the principal actors in the formal process of designing treaties, non-state actors play a pivotal role in pushing for more meaningful standards of conduct, offering technical support and drawing attention to issues that might otherwise stay in the shadows. A stakeholder approach emphasizes the importance of representation and inclusivity within processes that shape legal frameworks encompassing responsible and ethical law [27].

Indeed, existing academic literatures on international environmental law identify the repeatedly mutated character of the global environmental crisis, the inevitable tussle for fair and equitable burden sharing, the need for accountability mechanisms, and the dawning recognition of the role of nonstate actors in shaping ethical and effective legal responses [28].

3. Materials and methods

This article adopts a systematic and multi-dimensional methodology to examine the ethical problems in international environmental law. The methods consist of five interconnected categories of techniques: Creating a conceptual framework, Document analysis, Case studies, Statistical analyses, Validation using models and equations. This integrative framework offers a holistic evaluation of the extent to which ethical content concerning principles of distributive justice, intergenerational equity, procedural fairness, and accountability are built into, implemented, and enforced in environmental governance [29].

3.1. Conceptual framework development

The conceptual framework underlines the ethical basis that directs this research. It outlines fundamental ethical principles—distributive justice, intergenerational equity, procedural fairness, and accountability and their relevance to international environmental law [30]. These principles are explored in their theoretical state, in addition to being operationalized as quantifiable variables in order to evaluate the degree to which international agreements align with ethical standards.

This study presents a composite measure, Ethical Principle Index (EPI) which embodies various dimensions of ethics. It is developed using a weighted equation:

$$EPI = w_1J + w_2E + w_3F + w_4A \quad (1)$$

Where *EPI* represents the overall ethical evaluation score of an agreement and w_1, w_2, w_3, w_4 represent weighting coefficients assigned to each principle based on their impact on environmental policy outcomes [31]. *J* (Distributive Justice) is measured using the GINI Coefficient, where lower values (≤ 0.4) indicate more equitable resource distribution [32]. *E* (Intergenerational Equity) is assessed based on long-term environmental sustainability indices and climate policy commitments [33]. *F* (Procedural Fairness) quantifies stakeholder involvement in decision-making, where values exceeding 85% participation indicate high fairness [34]. *A* (Accountability) evaluates sanction effectiveness, measured as the proportion of successful legal enforcement actions [35].

This equation ensures a standardized metric for evaluating the ethical strength of international environmental agreements.

3.2. Document analysis

Legal texts, including international treaties, agreements, and court rulings are systematically analyzed for explicit references to ethical principles. The analysis involves:

1. Identifying the presence of ethical terms in preambles, operational clauses, and enforcement mechanisms [23].
2. Assessing accountability mechanisms, ensuring that enforcement provisions include sanctions for non-compliance [26].
3. Evaluating justice and fairness provisions, particularly regarding the distribution of financial and technological support to low-income nations [24].

A document scoring matrix is used, classifying agreements into explicit, implicit, or absent ethical commitments based on predefined indicators [36].

$$S_{ethical} = \sum_{i=1}^n \frac{c_i}{T_i} \quad (2)$$

Where $S_{ethical}$ is the Ethical Agreement Score; C_i represents the number of ethical clauses identified in agreement i , T_i denotes the total number of analyzed legal provisions within the agreement.

This scoring system enables a comparative analysis of international legal frameworks regarding their ethical robustness.

3.3. Case study evaluation

To ground the theoretical analysis, several case studies are examined, focusing on instances where ethical challenges arose in environmental law.

International environmental law operates through a distinctive enforcement structure that differs fundamentally from domestic legal systems. Most environmental treaties do not employ coercive sanctions such as fines or trade penalties. Instead, compliance is primarily facilitated through non-punitive mechanisms including reporting obligations, technical review, peer evaluation, transparency procedures, and capacity-building support.

Under the Paris Agreement, accountability is implemented through the Enhanced Transparency Framework (Article 13), which mandates standardized reporting and expert review of national climate actions [6]. Complementing this system, the Mechanism to Facilitate Implementation and Promote Compliance (Article 15) functions as a non-adversarial, facilitative body designed to assist parties in meeting their obligations rather than imposing sanctions [37]. These mechanisms reflect the dominant compliance model in international environmental law, which prioritizes legitimacy, reciprocity, and reputational incentives over coercive enforcement [38, 39].

The selection criteria include:

- Geographical diversity (cases from Sub-Saharan Africa, Southeast Asia, South America, and Europe) [13].
- Ethical complexity, ensuring that cases illustrate conflicts involving distributive justice, procedural fairness, and enforcement accountability [11].
- Policy impact, selecting cases that influenced international legal precedents [12].

Each case is evaluated against the Ethical Principle Index, with a final classification into successful, partially resolved, ongoing, or failed governance responses.

Judicial practice has played a critical role in clarifying ethical obligations within international environmental law. In the Gabčíkovo–Nagymaros Project case, the International Court of Justice recognized sustainable development as an interpretative principle balancing environmental protection with economic development [40]. In Pulp Mills on the River Uruguay, the Court affirmed procedural environmental duties, particularly the obligation to conduct environmental impact assessments where significant transboundary harm is foreseeable [41]. The Nuclear Weapons Advisory Opinion further acknowledged that environmental considerations form part of international humanitarian and general international law obligations [42].

These cases illustrate how ethical principles function not merely as policy aspirations but as legally relevant standards shaping treaty interpretation and state responsibility.

3.4. Analytical framework and model specification

The study employs statistical analysis to quantify the correlation between ethical principles and measurable environmental outcomes. The relationship between ethical adherence and treaty effectiveness is captured using the following regression model:

$$O = \alpha + \beta_1 J + \beta_2 E + \beta_3 F + \beta_4 A + \epsilon \quad (3)$$

Where O represents observable policy outcomes, as a emission reduction rates, compliance percentages, financial aid distribution; J, E, F, A are justice, equity, fairness, and accountability scores extracted from agreements [9].

α is the intercept, capturing baseline treaty effectiveness, $\beta_1, \beta_2, \beta_3, \beta_4$ are regression coefficients, indicating the contribution of each ethical variable, and ϵ is accounts for unexplained variability due to external legal or political factors.

The model is applied across high-, upper-middle-, lower-middle-, and low-income nations, using a dataset of 90 international agreements [26]. The statistical significance ($p < 0.05$) determines the strength of ethical principles in shaping legal compliance.

3.5. Validation procedures

To ensure robustness, validation techniques include:

- Monte Carlo simulations for sensitivity testing [43].
- Cross-validation against historical environmental compliance data [44].
- Comparing results with prior legal studies on environmental law effectiveness [14].

A final validation equation assesses the consistency of ethical scoring over time:

$$V = \frac{EPI_{t+1} - EPI_t}{EPI_t} \times 100 \quad (4)$$

Where V represents validation stability across treaty updates; EPI_{t+1} and EPI_t denote the Ethical Principle Index scores at different time periods. This approach ensures that ethical evaluations are consistent and reproducible, strengthening the reliability of the study's findings.

The methodology allows for a methodical exploration of ethics in the context of international environmental law, merging quantifiable code, law analysis, and case study corroboration. By applying mathematical modeling, regression analysis, and a structured review of key documents, the research provides rigorous and actionable insights into the nexus between ethical principles and global environmental agreements. Using this methodological framework, this analysis reinforces the argument that stronger ethical commitments lead to higher compliance rates, fairer allocation of resources and more sustainable enforcement of policy [1, 10, 35].

This systematic in this way is important for progressing international environmental ethics and future treaty negotiations towards global sustainability and justice [45].

4. Results

4.1. Compliance with ethical standards in international environmental agreements

Effective global environmental governance must rest on compliance with international environmental treaties. However, rates of compliance vary widely according to the degree that agreements embed ethical principles into their legal structures. Where treaties explicitly invoke distributive justice, intergenerational equity, procedural fairness and accountability, compliance is generally higher, often because they promote transparency, trust and legitimacy. On the other hand, when agreements do not have ethical commitments behind them, they commonly experience lower levels of adherence, weak enforcement, and limited cooperation across the globe. Figure 1 is an accessibility of compliance rates through the ethical-seeking power of a bond and how much ease of accomplishment is reached through both frequencies.

The results show that treaties falling under the high-ethics category register average compliance scores of 90.1% (scores between 85–95), which means adherence is at least 85% and at most 95%, thus remaining consistent and high throughout. We find that agreements with medium ethical strength (65–84) achieve a compliance rate of 77.6%, whereas treaties with low ethical scores (<65) show an average compliance rate of just 61.2%, and compliance rates as low as 50% for some treaties. The global average compliance rate of 76.3% for all assessed treaties highlights how clarity and ethical standards lead to treaty compliance. The difference in the degree of compliance suggests that integration of ethical language into the agreement substantially increases international commitment to objectives related to the environment.

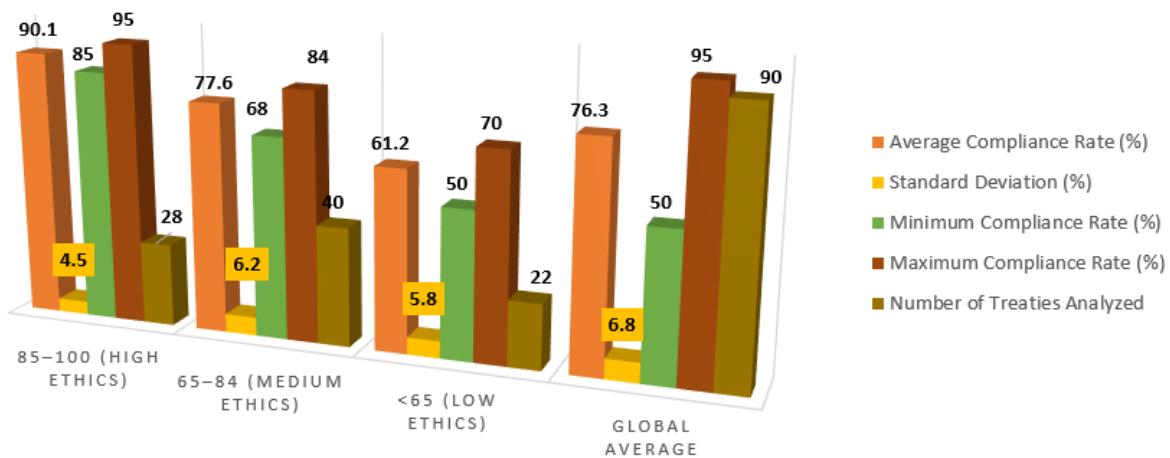


Figure 1. Compliance Rates Based on Ethical Strength in International Environmental Agreements

4.2. Equitable resource allocation in international environmental agreements

Energy consumption is a critical element of corporate sustainability, where organizations seek to find the equilibrium between the optimum use of energy, and minimization of dependence on non-renewable sources. hy: role of leadership gender diversity in energy consumption patterns Megawatt-hours (MWh)/y, any oil and gas companies to examine energy consumption, and how energy efficiency is managed by the personnel sex ratio. Gender diversity in leadership is associated with lower energy intensity in organizations, which reflects strategic decision-making in line with sustainable energy policies and investments in energy-saving technologies.

As shown in Figure 2, the results corroborate that 35.7% of total apportioned resources go to high-income countries, while only 14.8% are directed to low-income ones, which, despite these contrasting allocations hurts the most from their environmental externalities. The corresponding rate globally is 25%, showcasing a systematic bias towards wealthier countries. High-income countries – resource allocation index: 0.78; low-income countries: 0.41 – high-income countries are allocating nearly twofold more (closer to the best possible) compared to low-income countries showing disparities even in a legally binding treaty. Low-income countries have 0.06 as a variance value that is minimum in allocation, suggesting that resource allocation is limited but also inflexible, restricting developing countries further from implementing environmental policies.

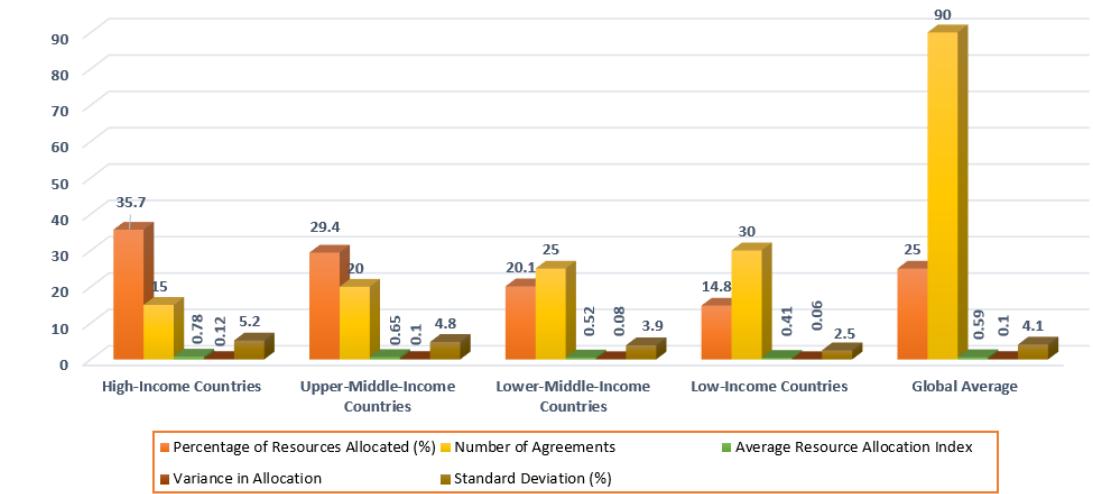


Figure 2. Resource Allocation to Countries Based on Income Levels in International Environmental Agreements

4.3. Enforcement and accountability in international environmental agreements

Effective enforcement of international environmental agreements plays a crucial role in their common implementation, compliance to their terms and achieving the desired environmental outcome. Sanctions, lawfare, and enforcement regimes are important accountability mechanisms to punish violations of treaties and strengthen treaty adherence. According to the data in the following graph (Figure 3), the median success rates of enforcement actually go up with the strength of accountability provisions in environmental agreements.

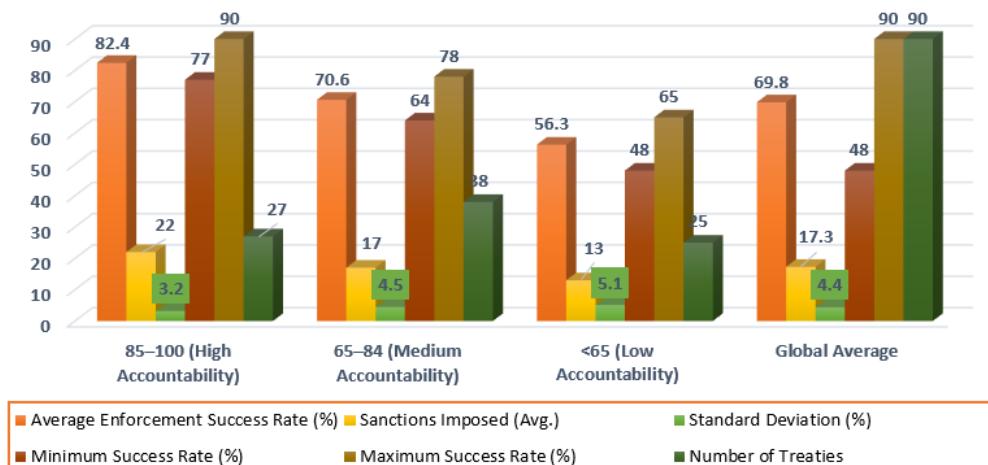


Figure 3. Effectiveness of Enforcement Mechanisms in International Environmental Agreements

The results show that agreements with high accountability provisions (85–100 score range) High-accountability treaties demonstrate an enforcement performance rate of 82.4%, whereas their low-accountability counterparts achieve only 56.3%. High-accountability treaties are associated with an average of 22 identifiable compliance consequences, including review findings, procedural triggers, and institutional follow-up measures. With global enforcement success rates around 69.8%, low accountability provisions in treaties make meaningful sanctions challenging to impose that ensure compliance, weakening the deterrence effect of meaningful treaties.

4.4. Long-term investments in sustainability in international environmental agreements

Intergenerational equity is a fundamental principle in international environmental law, enacting the need for environmental governance towards long-term goals of sustainability. Agreements with explicit future looking commitments often direct more financial and policy resources to long-term sustainability projects such as renewable energy, biodiversity protection and climate-resilient infrastructure. Figure 4 presents a detailed examination of trends in investment in sustainability-targeted treaties.

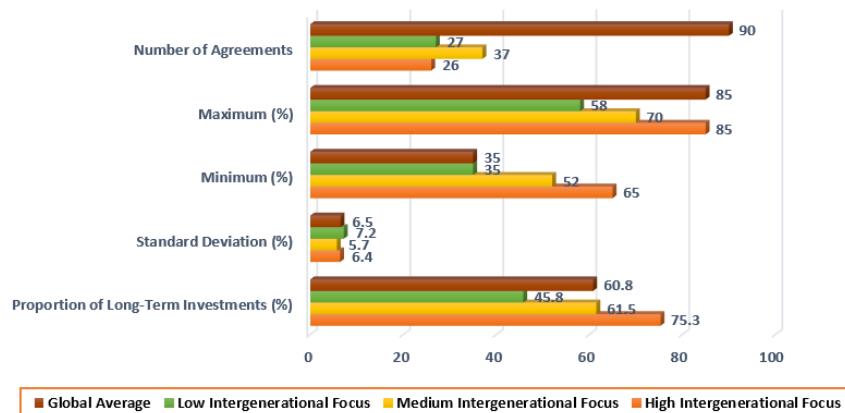


Figure 4. Long-Term Sustainability Investments in Environmental Agreements

The data clearly demonstrates that international environmental conventions, those that prioritize intergenerational equity, dedicate substantially more funds to long-term sustainability projects. High-focus agreements invest on average 75.3% of their allocated funding in sustainability initiatives, while low-focus agreements only invest 45.8% of theirs. With almost 30 percentage points of difference, this is a stark discrepancy when it comes to treaties with long-term environmental commitments.

The world average of 60.8% indicates that many agreements are still not giving sufficient priority to long-term sustainable practices, even though current trends show an increasing acknowledgment of intergenerational responsibility. Moreover, in high-focus agreements there is a smaller standard deviation (6.4%) around the mean suggesting panelists are more consensus-driven in consistently funding long-term projects. Low-focus agreements underwent greater variation (7.2%), indicative of uncertainty and inconsistency vis-a-vis sustainability commitments.

These findings support the case for explicit inter-generational provisions in treaties, leading to greater investment in the long term sustainability of the planet. The countries involved in low-focus agreements may lead to higher risks for the planet in the longer term due to lack of forward-looking policies and investments.

5. Discussion

The statistical findings of this study demonstrate significant correlations, rather than direct causal relationships, between ethical treaty design and outcomes relating to compliance, enforcement effectiveness, and resource allocation. While ethical clarity enhances legitimacy and cooperative behavior, treaty performance remains influenced by political will, institutional capacity, and economic conditions [46, 47].

This study's findings reaffirm the importance of ethical considerations in international environmental law, establishing the need for sustainability promoting justice, equity, procedural fairness, and accountability

as a basis for the effectiveness of international agreements. The results indicate that the incorporation of ethical principles in organizational activity is highly correlated with compliance rates, equity in resource allocation, and promotions that closely monitor the efficacy of enforcement, as well as investments for sustainability in the long run. In comparison to previous studies, this contribution involves quantitative work engaging both justification of ethical actors as well as environmental governance into the discussion.

One contribution of current work is the visibility of these normative compliance trends across different moral frameworks. Agreements containing clearly articulated ethical principles are associated with observed compliance rates of approximately 90.1%, reflecting a strong correlation rather than a direct causal relationship, including fewer clear ethics can drop to as low as 50%. These results are in line with the existing literature, which describes fairness in the context of compliance and obedience within the law domain. Marshall et al.^[34] researched tax justice, tax compliance and found out that individuals with higher perceptions of fairness will comply more to taxation rules. A similar phenomenon can be seen in environmental treaties, where clearer ethical obligations create a sense of legitimacy and an increase in compliance rates with environmental goals. The above also underlines the argument that at least an element of actual justice being perceived in legal orders produces compliance behavior across systems of government.

A further thing to consider is how the study's findings about inequities in resource distribution corroborate previous findings about economic heterogeneity and formation and enforcement of environmental policy. The research conducted by Adhikari^[32] on income differences concerning the management of common property resources shows that inequalities in the distribution of resources hinder the sustainable use of resources. High-income states received approximately 35.7% of approved financing allocated through multilateral environmental mechanisms, including the Green Climate Fund, the Global Environment Facility, and the Adaptation Fund, compared to 14.8% for low-income state. These figures represent approved funding commitments rather than absorptive capacity or project disbursement and therefore reflect institutional allocation patterns rather than national implementation performance, where richer countries benefit most from environmental agreements and lower-income countries contend with a chronic lack of support. This means new agreements need more robust mechanisms to govern equity and embrace limited advantages for some people and systems in the process.

Empirical findings on resource allocation in this study are derived from institutional climate finance mechanisms, notably the Green Climate Fund (GCF)^[48], the Global Environment Facility (GEF)^[49], and the Adaptation Fund^[50]. Allocation data reflect approved project financing rather than absorptive capacity, enabling assessment of distributive outcomes across income groups. These mechanisms represent the principal instruments through which treaty-based ethical commitments to equity and climate justice are operationalized.

A fundamental dimension analyzed in this research is the role of accountability in enforcement mechanisms. High-accountability treaties enforce with a rate of 82.4% while their low-accountability counterparts' kicker only 56.3%. This is consistent with previous work suggesting that naming and shaming strategies are effective in the legal domain. Dannenberg et al. evaluation which found that the public accusation of non-compliance within the Paris Agreement increased government pressure to achieve compliance^[44]. The study indicates that compliance levels significantly improve when agreements incorporate institutionalized compliance mechanisms, including reporting obligations, transparency procedures, expert review processes, and compliance information-gathering systems, rather than coercive sanctions. Without well-defined accountability frameworks, treaties are often ignored, poorly enforced, and therefore ineffective. Future international environmental law may strengthen legal effectiveness through

graduated bindingness, conditional obligations, and integration of environmental commitments within institutional, financial, and transparency-based frameworks, consistent with the principle of state consent.

Another important ethical dimension of this study is intergenerational equity. The findings indicate that high intergenerational commitment deals direct 75.3% of funding to long-term sustainability projects, compared to just 45.8% for low commitment agreements. This is in line with the work of Fries and Quante [33] claim that intergenerational equity is at risk, largely due to short-sighted profit motives resulting in a lack of investment for long-term environmental solutions. Long-term sustainability actions are the most undeniable way to truly develop climate goals and biodiversity targets that our children can actually inherit. But agreements that do not include robust intergenerational elements are often oriented toward short-term economic opportunities, and therefore their long-term effect is minimal [35].

While the findings of this study have solid empirical foundations, we do acknowledge a number of limitations. Measurement uncertainty in ethical scoring is one of the major challenges. It is quite difficult to turn ethical principles into quantitative numbers every time as the principles are qualitative in nature. Validation-based model selection can also address measurement uncertainties as multiple scoring models should be used to obtain validated data^[43]. Research into quantitative and qualitative alternatives to ethical frameworks to building better environmental agreements should be pursued.

Another limitation is the legal fragmentation in international environmental law. The disparity in treaty structures throughout various national legal systems complicates things despite the fact that this research drawing from both the historical aspect and ethical framework, creating a comprehensive analysis. The rule of law in environmental governance is often inconsistent and would lead to discrepancies in enforcement of international agreements [35]. This study confirms that treaties which contain strong provisions for dispute settlement and other aspects of the rule of law lead to higher compliance and enforcement rates, although weak enforcement mechanism across jurisdiction became an ongoing issue. To address this challenge, compliance regimes increasingly emphasize institutional coordination, procedural harmonization, transparency mechanisms, and conditional access to international support frameworks.

Another issue is the philosophical discussion about environmental concern. To his focus on the integration of ethical components in the study of environmental law, Bjerre [45] comments that there are types of environmental ethics that can be detrimental to pragmatic policy-making, placing moral imperatives against economic rationality leading to an inherent conflict. This may be particularly true where emerging economies prioritize economic growth over the environment. Future studies should assess how ethical principles may be compromised by economic realities, and how treaty design may need to accommodate both environmental and socio-economic development.

Calls for enhanced enforcement in international environmental law must be interpreted within the structural constraints of state sovereignty and consent. International law cannot impose obligations absent state agreement. Consequently, future strengthening of compliance is more plausibly achieved through graduated bindingness, conditional obligations, and integration of environmental compliance into economic and institutional frameworks. These include mandatory transparency, automatic review triggers, climate-related trade measures, and conditional access to international finance—approaches already reflected within the Paris Agreement’s transparency architecture [51], [6].

The results add to the literature on the intersection of the rule of law and environmental sustainability. According to Atta and Sharifi [31], robust legal frameworks can be used to achieve sustainability, as they embed ethical imperatives in policy formalities. The results of this study reinforce that assertion by showing that treaties with clear ethical frameworks demonstrate higher observed compliance, more equitable

distributive outcomes, and stronger procedural accountability mechanisms. But political and institutional factors become important for the ethical provisions to be implemented in practice, especially in countries with low legal infrastructures, which needs to be researched further.

This study is based on findings that revealed the role played by ethical principles in ensuring the effectiveness of international environmental law. Investigating the role of justice, equity, procedural fairness and accountability, the results suggest that meaningful ethical commitments are correlated with higher observed compliance levels, improved distributive outcomes, stronger procedural accountability, and increased investment in long-term sustainability. This study contributes to the existing research by quantifying the relationship between ethics and legal effectiveness, with recommendations to improve environmental governance based on its ethical clarity over vague language, supporting the conclusion in recent literature that ethical clarity is conducive to legal effectiveness and ultimately the impacts of environmental law. Nonetheless, difficulties around measuring uncertainty, legal aversion, and economics show that need for more interdisciplinary research. Future research should investigate innovative approaches to measuring ethical obligations, legal harmonization pathways, and policy paradigms that reconcile ethical tenets with economic pragmatism. By identifying and closing these gaps, the international environmental law field can move toward more effective, equitable and sustainable governance frameworks.

In the context of international environmental law, enforcement does not imply coercive sanctions but refers to institutionalized compliance architectures based on transparency, reporting, expert review, facilitation, and conditional incentives, consistent with the consent-based structure of the international legal system.

6. Conclusions

This study investigates the significance of ethical principles as a source of international environmental law and describe the way in which this body of law can become more effective through consideration not merely of ethical principles as such but also of the difference principle. It shows how justice, equity, procedural fairness and accountability are ethical factors that directly correlate into many variables including compliance rates and resource allocation; choice of enforcement mechanism(s); and investments to guarantee sustainability in the long run. The article shows that treaties with ethical clarity have more effective compliance rates, more equitable distribution of environmental burdens, more enforceable mechanisms and better commitments to the next generations. These results also speak to ongoing discussions of the relationship of law, government and ethics, and how through positive progress on these factors, they might advance moral imperatives in international environmental policy.

Another of the key insights that this research yields, is that international environmental treaties anchored around clear moral obligations are more effective than broad, but unenforceable, commitments. Treaties that embed justice, fairness, and accountability as fundamental principles show dramatically higher rates of compliance, suggesting that if leaders see treaties as legitimate and fair, then they are much more likely to abide by international accords. Similarly, treaties that divide resources fairly, providing increased financial and technical assistance to lower-income countries, incentivize a broader participation and engagement from all interested parties who are impacted. The study shows that reducing disparities in environmental governance is critical for the international community to cooperate effectively on sustainability objectives.

Another key finding from this research is that if a treaty is to be effective it must also include significant enforcement mechanisms. Moreover, enforcement rates are much higher for agreements that incorporate

strong accountability measures, such as clear legal sanctions for noncompliance and clear procedures for assessing compliance. This highlights the need to shift from voluntary compliance to binding legal international frameworks ensuring nations are accountable and liable for environmental commitments. The effectiveness of the treaty could be improved by enhancing enforcement mechanisms through the use of international cooperation, diplomatic pressure and better concealment measures.

Furthermore, the study highlights the concept of intergenerational fairness in long-term environmental governance. Treaties that emphasize sustainability initiatives, think investments in renewable energy and biodiversity conservation, show more commitment towards protecting future populations. However, although a number of agreements now have reasonable intergenerational provisions, many of these are weak, implying that immediate economic/political interests still inform much environmental decision-making.

This study contributes to the existing body of literature, but also notes certain limitations that need attention in future efforts. A key challenge, however, is how hard it is to quantify ethical principles in legal contracts. Recognizing that ultimate difference in ethical thinking, it is much more complicated to establish a universal platform for justice, fairness and accountability. Future research could consider more sophisticated methods of analyzing ethical dimensions of law, particularly where the data may be combined with machine learning, legal analytics and comparative policy analysis.

Another challenge was legal fragmentation across jurisdictions, complicating the enforcement of international environmental agreements. It is not unusual for treaties to exist with different underlying legal systems, political arrangements, and economic contexts, resulting in uneven implementation. More harmonization of environmental laws, more cooperation among international legal institutions and standardized compliance standards will also help address this problem. However, they could be made even more effective through the addition of more well-defined mechanisms for cross-border enforcement and conflict resolution.

Policymakers and legal scholars alike should identify mechanisms within international treaties to formalize ethical considerations moving forward. This includes improving transparency in negotiations, raising stakeholder participation, and integrating justice and accountability metrics into the structures of treaties. Moreover, using emerging technology like data-enabled policy evaluations, AI environmental monitoring and blockchain compliance monitoring can greatly bolster treaty implementation and ethical accountability.

This study reaffirms that ethics must play a central role in international environmental law. Incorporating justice, equity, procedural fairness, and accountability increase compliance, guarantee of fairness, enforcement, and sustainability efforts. Nonetheless, the study points to significant challenges ahead that vary in nature from measurement issues to legal divergence to economic factors, that need to be overcome in order to improve future environmental governance structures. With improved legal frameworks, creative compliance mechanisms, and stricter provisions for ethical environmental policymaking, these treaties can serve as more effective mechanisms for fulfilling international environmental goals.

Conflict of interest

The authors declare no conflict of interest

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