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Climate Reparations and Legal Accountability: Bridging International Law and Environmental Justice

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ABSTRACT

This study aims to explore the legal, ethical, and institutional dimensions of climate reparations within international law, proposing an integrated framework that bridges legal accountability, environmental justice, and equitable redistribution. Employing a narrative review methodology with a descriptive analytical approach, the article synthesizes academic literature, international legal documents, and policy frameworks published between 2019 and 2024. Sources were selected from legal databases, climate governance archives, and peer-reviewed journals, focusing on themes such as state responsibility, loss and damage mechanisms, and human rights-based approaches. The analysis was structured thematically to trace the evolution of reparations discourse, assess the strengths and limitations of existing legal instruments, and identify key challenges and opportunities for institutional innovation. The review reveals that while existing international frameworks—such as the UNFCCC, the Paris Agreement, and human rights conventions—acknowledge the need for support to climate-vulnerable nations, they fall short in delivering enforceable reparative justice. Legal barriers including jurisdictional constraints, attribution of harm, and sovereignty concerns hinder the establishment of binding accountability mechanisms. Politically, tensions between high-emission and low-emission states and resistance to the notion of liability obstruct progress. Ethically, there is continued disagreement over responsibility, eligibility, and the scope of reparations. Practically, current funding mechanisms are inadequate, under-resourced, and lack transparency. The findings support the development of a holistic reparations model that integrates legal liability, climate finance, and restorative justice, emphasizing multilateralism, civil society engagement, and youth participation. Achieving climate reparations requires moving beyond fragmented and voluntary systems toward a globally coordinated, legally grounded, and ethically robust framework that centers the rights and needs of those most affected by climate change.

Keywords: *climate reparations, legal accountability, environmental justice, international law, climate finance, restorative justice, loss and damage, global inequality.*

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1. Introduction

Climate reparations refer to a set of remedial actions intended to compensate communities, regions, or nations that have suffered disproportionate harm from the effects of climate change. These reparations can take the form of financial compensation, technology transfer, capacity-building, or debt relief and are rooted in the ethical and legal argument that those who have contributed the most to greenhouse gas emissions should bear the greatest burden of repair. Legal accountability, in this context, involves mechanisms through which responsible parties—often high-emitting states or corporations—can be held answerable for their historical and ongoing contributions to climate change, either through binding

legal judgments or through structured, voluntary frameworks. The growing intersection of these two domains—climate justice and international legal responsibility—reflects a global reckoning with long-standing ecological debt and inequity.

The urgency of environmental justice has become increasingly prominent in international discourse, especially as climate-related disasters escalate and disproportionately impact marginalized populations. Environmental justice emphasizes the fair distribution of environmental benefits and burdens, ensuring that historically oppressed and vulnerable groups are not left behind in climate responses. The southwestern coastal region of Bangladesh, for instance, has faced severe disruptions due to salinity intrusion, flooding, and erosion, raising questions about justice for communities with negligible carbon footprints but devastating exposure to climate threats (Ashrafuzzaman et al., 2022). Similar cases have emerged globally, where vulnerable nations and communities bear the brunt of environmental degradation without adequate support or accountability from the global North.

Key developments in international forums further reflect the rising prominence of climate reparations and legal accountability. The 2022 COP27 summit marked a pivotal moment with the formal inclusion of a "Loss and Damage" fund designed to offer financial support to countries experiencing irreversible climate impacts. Although the fund's operationalization remains contested, its existence signals an international acknowledgment of the need for reparative mechanisms. Another landmark development came with the 2023 initiative by Vanuatu, a small island nation, to seek an advisory opinion from the International Court of Justice (ICJ) on states' legal obligations related to climate change. This move represents a strategic use of international law to clarify the responsibilities of nations under existing legal frameworks such as the UN Charter, the Universal Declaration of Human Rights, and the United Nations Framework Convention on Climate Change. It also illustrates how small and vulnerable states are leveraging legal pathways to demand recognition and accountability for the climate crisis (Nyka, 2021).

The call for a legal lens on reparations is rooted in the deep asymmetry that defines global climate governance. High-emission countries, often industrialized and wealthier, have disproportionately contributed to climate change, while low-emission nations continue to suffer the most from its consequences. This imbalance challenges the ethical foundations of the current global order and demands a reassessment of responsibilities and liabilities. In recent legal debates, some scholars have explored how state sovereignty intersects with climate action, questioning whether traditional norms of non-intervention are adequate in the face of planetary-scale crises (Shafi et al., 2021). Furthermore, the challenge lies not only in apportioning responsibility but also in defining appropriate compensatory frameworks that account for non-economic losses, such as cultural degradation, displacement, and loss of biodiversity. These issues complicate the legal architecture of reparations, which has historically been grounded in tangible, monetary compensation models.

The legal basis for climate reparations can be traced through several evolving mechanisms in international law. For example, innovative approaches have emerged around the concept of compensation funds designed to address unpredictable or uninsurable losses due to climate change. Such proposals recognize that existing insurance markets often exclude the most vulnerable, rendering them exposed to irreversible damages without recourse to justice (Watts et al., 2023). In a similar vein, research on state responsibility for climate-related damages has emphasized the importance of codifying obligations that extend beyond voluntary contributions or moral appeals (Nyka, 2021). There is also increasing discourse around the role of compensation within multilateral treaties, with some scholars exploring how legal doctrines like the "polluter pays" principle can be operationalized at a global scale (Stabile et al., 2022). Notably, discussions about legal accountability have begun to explore the intersection of environmental law and tort law, where causation, harm, and responsibility must be proven through legal channels (Watts et al., 2023).

Despite these advances, significant gaps remain in both the legal recognition and enforcement of climate reparations. International legal mechanisms often lack enforceability, especially when powerful states refuse to comply with non-binding resolutions or avoid participation in climate litigation. The development of climate coalitions, however, provides a pathway for advancing collective interests among vulnerable states.

Mass preferences in democracies such as India and the United States indicate support for redistributive policies aimed at compensating climate-vulnerable populations, suggesting a possible shift in political will (Gaikwad et al., 2022). Moreover, innovative ideas such as carbon liability frameworks and transnational compensation mechanisms continue to emerge, revealing the fluid and dynamic nature of legal discourse in this domain (Nikitina & Пожилова, 2023).

Given the ethical, legal, and political dimensions of the climate crisis, there is a compelling need for a comprehensive review of how climate reparations can be integrated into binding international legal frameworks. This narrative review seeks to examine the evolving discourse surrounding climate reparations and legal accountability through a descriptive analysis of scholarly literature, policy documents, and case law published between 2019 and 2024. By bridging environmental justice with international legal theory, the study aims to highlight existing gaps, identify promising legal innovations, and contribute to the broader understanding of reparative justice in the age of climate emergency.

2. Methodology

This study adopts a narrative review methodology with a descriptive analytical approach, aiming to synthesize existing scholarly and legal literature on climate reparations and international legal accountability within the framework of environmental justice. The narrative review method allows for an in-depth conceptual exploration of diverse legal, political, and ethical dimensions associated with climate reparations, without the constraints of a systematic review protocol. This approach is particularly suited to subjects that are interdisciplinary and evolving, where rigid inclusion-exclusion criteria may limit the scope of analysis. The descriptive analysis method further enables the identification of trends, gaps, and emerging patterns in academic thought and international legal practices related to environmental justice, climate equity, and reparative frameworks.

The sources used in this study were drawn from a broad array of academic databases and institutional repositories, including JSTOR, Scopus, Web of Science, Google Scholar, HeinOnline, and the United Nations Treaty Collection. To ensure the relevance and currency of the review, only sources published between 2019 and 2024 were included, focusing primarily on peer-reviewed journal articles, legal commentaries, official policy papers, and international reports. Preference was given to interdisciplinary works at the intersection of law, environmental studies, human rights, and political science. Additionally, documents from reputable global organizations such as the United Nations, the Intergovernmental Panel on Climate Change (IPCC), and the United Nations Framework Convention on Climate Change (UNFCCC) were reviewed to contextualize legal frameworks within ongoing global policy dialogues. Reports from climate advocacy groups and non-governmental organizations were also consulted to incorporate perspectives from civil society actors engaged in climate justice advocacy.

The analytical process involved three stages. First, a preliminary scoping review was conducted to identify the key themes and debates surrounding climate reparations, including definitions, historical trajectories, and terminological nuances. Second, relevant legal instruments and case studies were extracted and examined in relation to the principles of state responsibility, international environmental law, and human rights obligations. Special attention was given to the normative content and enforceability of legal mechanisms, as well as the interpretive role of international courts and tribunals. Third, emerging challenges and policy proposals were mapped in relation to global equity discourses, with the aim of identifying areas where legal accountability and environmental justice intersect or diverge. This stage also included the examination of regional dynamics, particularly the positions and demands articulated by the Global South, Small Island Developing States, and Indigenous communities.

Throughout the review, sources were analyzed thematically, with cross-comparisons made between theoretical frameworks and applied legal practices. The findings were organized to reflect both the historical evolution of climate reparations discourse and the contemporary efforts to codify environmental justice within binding legal mechanisms. By synthesizing knowledge from multiple disciplines and integrating perspectives from both legal scholarship and grassroots advocacy, this study offers a multidimensional understanding of the challenges and opportunities in

operationalizing climate reparations within international law.

3. Theoretical Framework

The concept of climate justice provides the foundational lens through which contemporary debates on climate reparations and legal accountability are understood. Climate justice centers on the idea that climate change is not merely an environmental issue, but a socio-political and ethical one, characterized by disproportionate burdens and benefits distributed across regions, communities, and generations. At its core, climate justice draws from established principles in political philosophy and legal theory, including distributive justice, historical responsibility, and the polluter pays principle. These principles are deeply intertwined with international legal frameworks, particularly those addressing state responsibility, transitional justice, and human rights-based responses to environmental harm.

Distributive justice is a central tenet of climate justice, concerned with how the costs and benefits of climate change and its mitigation are allocated across populations. The unequal distribution of climate risks is evident in the heightened vulnerability of low-income nations and marginalized communities to extreme weather events, sea-level rise, and biodiversity loss. These groups often lack the infrastructure, financial resources, or political influence to adapt to changing environmental conditions. In the context of the southwestern coastal region of Bangladesh, for example, repeated flooding and saltwater intrusion have created cascading socioeconomic crises for communities that contribute minimally to global emissions (Ashrafuzzaman et al., 2022). The principle of distributive justice demands that such communities receive not only aid but also structural compensation and support that reflects their unjust exposure to environmental harm.

Historical responsibility further reinforces the ethical dimension of climate reparations by asserting that those who have contributed most to greenhouse gas emissions over time bear a greater moral and legal obligation to redress the consequences. Industrialized nations have historically emitted the bulk of greenhouse gases, often while profiting from fossil fuel-based development models. This historical asymmetry continues to shape present-day emissions patterns and the global capacity to mitigate climate change. Legal scholars have emphasized that historical emissions create a form of liability, where past conduct informs current obligations to act in a reparative and just manner (Nyka, 2021). The legacy of colonialism is also implicated in this discourse, as resource extraction and land dispossession under colonial regimes have left many formerly colonized states with weakened environmental resilience and economic dependency. This historical context reinforces the claim that reparations are not only appropriate but necessary for restoring a measure of equity in international relations.

Closely linked to the notion of historical responsibility is the polluter pays principle, a doctrine originating in environmental economics and incorporated into various international legal instruments. According to this principle, the entities—whether states or corporations—responsible for pollution should bear the costs of managing it, including environmental restoration and victim compensation. In practice, however, operationalizing this principle at the global level remains fraught with legal and political challenges. Recent proposals suggest the creation of compensation funds as a pathway to enforce the polluter pays doctrine in transnational contexts, particularly where damages are widespread and legal attribution is complex (Watts et al., 2023). For example, legal and policy discussions in the European Union have explored how tort-based compensation schemes might be used to fund recovery efforts in vulnerable regions without relying solely on voluntary aid or development assistance (Watts et al., 2023). The polluter pays principle, when embedded in international legal mechanisms, offers a tangible route toward financial accountability for historical and ongoing emissions.

These principles of climate justice—distributive equity, historical responsibility, and the polluter pays doctrine—are increasingly being linked with broader international legal theories that offer pathways for accountability. One such framework is state responsibility, a cornerstone of public international law. This principle holds that states may be held liable for internationally wrongful acts, including those that result in cross-border environmental harm. Legal scholars have argued that climate change constitutes such a harm when one state's emissions significantly damage the territory, resources, or populations of another (Nyka,

2021). While current legal structures are not always conducive to such claims—due to issues of causation, evidence, and political reluctance—the invocation of state responsibility in climate litigation is growing. The advisory opinion sought by Vanuatu at the International Court of Justice exemplifies efforts by small island states to clarify the obligations of larger, high-emission states under customary international law and human rights conventions (Nikitina & Пожилова, 2023).

Another relevant legal paradigm is transitional justice, traditionally associated with post-conflict societies, but increasingly applied to environmental and climate harms. Transitional justice emphasizes the need for acknowledgment, reparations, and institutional reforms in contexts of systemic harm. Its principles are applicable to climate justice in that they recognize the need to address structural inequalities and provide compensation to those affected by large-scale, often state-sanctioned, harm. For example, in the context of deforestation in the Amazon, transitional justice has been invoked to call for policies that not only prevent further damage but also compensate Indigenous and local communities for the losses already suffered (Stabile et al., 2022). This approach suggests that reparative frameworks must be both retrospective and prospective, addressing past injustices while ensuring sustainable and inclusive futures.

A human rights-based approach to environmental harm offers yet another legal avenue for climate reparations. Under international human rights law, states have a duty to protect the life, health, and dignity of their citizens, and environmental degradation can constitute a violation of these rights. Climate-induced displacement, food insecurity, and loss of livelihood can all be framed as human rights violations, especially when states fail to mitigate or adapt to foreseeable climate risks. This perspective has been championed by scholars and advocates who argue that legal remedies for climate harm should not be limited to property or economic loss but must also account for infringements on fundamental rights and freedoms (Shafi et al., 2021). A notable example is the use of climate litigation in international human rights courts, where claimants seek recognition of state failure to act on climate change as a breach of their right to life or adequate living conditions.

Legal theories and principles are also evolving in response to new scientific understandings of environmental change and its systemic implications. Emerging research has highlighted how atmospheric and oceanic interactions exacerbate heat transport and intensify regional climate impacts, suggesting that certain countries may be more scientifically identifiable as contributors to specific environmental harms (Hazeleger et al., 2020; Liu et al., 2020). These findings could play a crucial role in shaping legal arguments about attribution and causality, which have historically been weak points in environmental litigation. For instance, identifying the specific contributions of countries to Arctic ice melt or ocean acidification can strengthen the case for assigning legal responsibility under international law (Caballero & Merlis, 2024).

In sum, the theoretical framework for this review rests on the integration of climate justice principles with international legal doctrines that collectively articulate a vision of fair, accountable, and rights-based climate governance. Distributive justice, historical responsibility, and the polluter pays principle underscore the ethical imperative of reparations, while legal frameworks such as state responsibility, transitional justice, and human rights law provide the mechanisms through which reparations can be formalized. This confluence of normative and legal theory supports the notion that climate reparations are not merely aspirational ideals but viable components of international law and global policy. As climate harms become increasingly severe and irreversible, the need for robust, legally grounded reparative frameworks is more pressing than ever.

4. Historical Context of Climate Reparations

The idea of climate reparations emerged alongside the early stages of international climate negotiations, as vulnerable states began to voice concerns about the inequitable distribution of climate change impacts and the historical responsibilities of industrialized nations. As early as the 1991 negotiations under the United Nations Framework Convention on Climate Change (UNFCCC), the Alliance of Small Island States (AOSIS) proposed a mechanism for compensating countries facing loss and damage due to sea-level rise. This proposal, which sought financial support from high-emitting countries, marked one of the first formal calls for climate reparations in global diplomacy. Although the suggestion was sidelined at the time, it planted the seed

for subsequent demands for justice-oriented climate finance. These early appeals were grounded in moral reasoning, emphasizing that countries least responsible for greenhouse gas emissions were also the most susceptible to its destructive consequences (Nyka, 2021).

In the decades that followed, the concept of reparations was gradually reframed and reinforced by a growing consensus among developing nations. The Group of 77 (G77) and China became central actors in articulating demands for climate equity, consistently asserting that historical emissions and global power imbalances should be central considerations in climate finance and mitigation responsibilities. During negotiations leading to the Kyoto Protocol and the Paris Agreement, the G77 coalition argued for a differentiation of obligations based on a country's contribution to cumulative emissions, economic capacity, and technological advancement. Their position was grounded in the principle of "common but differentiated responsibilities and respective capabilities" (CBDR-RC), which acknowledged the asymmetrical capacities and liabilities of nations in addressing climate change (Nikitina & Пожилова, 2023). This principle, while contested by some developed countries, provided an ethical and legal foundation for continued discussions around reparative obligations.

Small Island Developing States (SIDS) also played a pivotal role in advancing the reparations discourse. With their very existence threatened by rising sea levels, SIDS framed climate change as an existential issue, rather than a technical or economic problem. These states used moral and legal arguments to demand recognition of loss and damage as a distinct pillar of climate policy, separate from mitigation and adaptation. The Maldives, Tuvalu, and Vanuatu frequently emphasized that their populations were being forced to consider relocation and that entire cultures faced erasure due to the actions of distant polluting nations. The historical vulnerability of these states, combined with their negligible carbon footprints, made them powerful voices in advocating for a global framework of responsibility and reparation (Stabile et al., 2022).

As these calls gained traction, they were met with varying degrees of resistance from developed countries, many of whom feared the implications of accepting legal liability for climate change. The United States, in particular, has historically opposed any language in climate agreements that could imply legal responsibility or require compensation. Despite this resistance, the inclusion of a specific mechanism for loss and damage in the 2013 Warsaw International Mechanism marked a significant development, although it stopped short of offering reparations or formal accountability. Over time, the evolving architecture of climate finance has come to include targeted funds for vulnerable countries, but these are often framed as aid or cooperation rather than reparations, thereby avoiding the legal and political baggage of liability (Watts et al., 2023).

The push for climate reparations cannot be fully understood without addressing the deeper historical context of colonialism and post-colonial inequity. Many of the countries now demanding reparations were once colonies of European powers, subjected to resource extraction, environmental degradation, and labor exploitation. The colonial period entrenched global economic disparities that continue to shape climate vulnerability and adaptive capacity. The systematic depletion of natural resources and the imposition of monocultural economies in colonized regions left many post-colonial states with fragile ecologies and limited economic resilience. Furthermore, the infrastructure and wealth accumulated by colonizing powers during the industrial era were made possible, in part, by emissions-intensive development models that externalized environmental costs to the periphery (Gaikwad et al., 2022).

Post-colonial dynamics also influence how reparations are conceptualized in the global South. Reparations are not only about climate-related losses but also about broader patterns of historical injustice. For instance, many developing countries view climate reparations as part of a larger call for global restructuring, where fairness, participation, and recognition replace unilateral decision-making by powerful states. In this sense, reparations represent both a financial mechanism and a political demand for equity in global governance. This sentiment was especially visible during the negotiations around the Green Climate Fund, where developing countries advocated for governance models that ensured equal voice and autonomy in managing funds (Shafi et al., 2021). The idea was not simply to receive assistance but to exercise agency in determining how resources are allocated and used.

Scientific research has further reinforced these claims by illustrating the scale and impact of anthropogenic climate change attributable to industrialized nations. Studies on atmosphere–ocean interactions have revealed how emissions from the global North significantly affect climatic patterns in the South, especially in vulnerable coastal and deltaic regions (Hazeleger et al., 2020; Liu et al., 2020). Such findings lend empirical weight to the argument that the consequences of northern development are disproportionately borne by southern societies. For example, the amplification of relative sea-level rise in delta regions, such as those in South Asia, illustrates how physical geography and social marginalization intersect to create zones of acute risk (Morón et al., 2021). In these regions, communities are not only environmentally vulnerable but also politically and economically marginalized, making reparations an issue of survival and dignity rather than policy preference.

Within the broader post-colonial narrative, climate reparations are also understood as a continuation of anti-colonial struggles. Movements advocating for climate justice often draw connections between historical land dispossession, cultural erasure, and contemporary displacement caused by climate impacts. Indigenous communities, in particular, have framed climate reparations as part of a broader effort to reclaim sovereignty and restore environmental stewardship practices that were undermined by colonial expansion. For example, efforts to compensate farmers and ranchers in Brazil for avoided legal deforestation must also be seen through the lens of historical land use conflicts and Indigenous dispossession (Stabile et al., 2022). Such initiatives suggest that reparations cannot be reduced to monetary transfers but must involve structural changes in land tenure, governance, and environmental management.

The historical development of climate reparations discourse also reveals important shifts in language and strategy. Initially framed in moral and humanitarian terms, the conversation has increasingly adopted legal and scientific language to make more compelling and actionable claims. Recent legal scholarship has explored the feasibility of attributing specific climate harms to state or corporate actors using advanced modeling and causality assessment techniques (Chen et al., 2021). These approaches offer new opportunities for litigants to argue for compensation based on measurable contributions to global emissions and localized impacts. This legal evolution is mirrored by shifts in diplomacy, where states like Vanuatu have begun to employ international legal mechanisms, such as advisory opinions from the ICJ, to clarify the responsibilities of high-emitting countries (Nikitina & Пожилова, 2023).

Simultaneously, civil society has played a crucial role in keeping the demand for climate reparations alive. Grassroots movements, transnational advocacy networks, and environmental justice coalitions have used both protest and legal mobilization to push for greater accountability. These actors often emphasize the lived experience of climate impacts, centering narratives of displacement, food insecurity, and cultural loss in their calls for justice. Their work has helped to bridge the gap between abstract legal principles and the material realities faced by frontline communities. For example, community-driven reports from Bangladesh's coastal zones document how loss of livelihood due to salinization has forced migration and increased socio-economic vulnerability, reinforcing the need for targeted and reparative climate finance (Ashrafuzzaman et al., 2022).

In recent years, the conversation around reparations has extended beyond state actors to include corporations, particularly those in the fossil fuel industry. Scholars and activists alike have explored the possibility of holding multinational companies legally liable for a significant share of emissions and resulting damages. Legal analyses have examined how tort law, corporate accountability mechanisms, and international environmental standards can be leveraged to demand compensation from entities that have knowingly contributed to climate harm over decades (Watts et al., 2023). While these efforts face considerable legal and institutional barriers, they represent a significant broadening of the reparations discourse, moving from inter-state relations to include private actors with enormous influence on global emissions trajectories.

Altogether, the historical trajectory of climate reparations is a story of evolving resistance, negotiation, and redefinition. From the early proposals of small island states to the current demands voiced by diverse coalitions of developing nations, the call for reparations has grown more sophisticated and urgent. Rooted in the intertwined legacies of colonialism, industrialization,

and environmental degradation, the demand for climate reparations speaks to a broader reckoning with global injustice. As scientific evidence, legal theory, and diplomatic strategies converge, the call for reparative justice in the age of climate crisis grows more difficult to ignore.

5. Legal Instruments and Frameworks

The landscape of climate reparations and legal accountability is deeply embedded within a variety of international legal instruments and frameworks, each of which carries implications for how claims for compensation and justice can be articulated, pursued, and enforced. These legal instruments include multilateral environmental agreements such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, as well as broader legal systems rooted in international human rights law, international environmental law, and the statutes governing international judicial bodies such as the International Court of Justice (ICJ). Each of these frameworks offers specific entry points and limitations in the pursuit of reparative justice for climate-related harm.

The UNFCCC, adopted in 1992, serves as the foundational treaty in global climate governance and remains the primary forum for international cooperation on climate change. The Convention establishes the overarching principle of "common but differentiated responsibilities and respective capabilities," a concept that acknowledges historical emissions and unequal capacity among states to address climate change. This principle has been central to the demands of developing countries for recognition of their vulnerability and for financial and technological support from developed nations (Nikitina & Пожилова, 2023). However, while the UNFCCC laid the groundwork for collective action, it does not establish any binding obligations related to liability or compensation. Its provisions are framed around voluntary commitments and mutual cooperation, which, while politically significant, limit its enforceability in legal terms.

The Paris Agreement, adopted under the UNFCCC in 2015, marked a further evolution in climate governance by introducing nationally determined contributions (NDCs) and reinforcing the global temperature goals. Importantly, Article 8 of the Paris Agreement acknowledges the importance of addressing "loss and damage" associated with the adverse effects of climate change. This inclusion represented a major victory for the Least Developed Countries (LDCs) and the Alliance of Small Island States (AOSIS), both of which had long advocated for formal recognition of irreversible climate impacts. Nonetheless, the Paris Agreement also includes a decision text that explicitly states that Article 8 "does not involve or provide a basis for any liability or compensation." This clause was reportedly added to ensure the participation of major emitters like the United States, who were reluctant to accept any legal responsibility for historical emissions (Nyka, 2021). As a result, while the Paris Agreement advances the political visibility of loss and damage, it simultaneously limits the potential for reparative claims by preemptively excluding liability.

Despite these limitations, the UNFCCC and Paris Agreement have facilitated the creation of institutional mechanisms that may serve reparative functions. The Warsaw International Mechanism for Loss and Damage (WIM), established in 2013, aims to enhance understanding, action, and support in addressing climate-induced loss and damage. Although the WIM does not offer direct compensation, it provides a framework for the development of technical and financial responses to climate harm. The operationalization of the Loss and Damage Fund, formalized at COP27, signals progress in this direction. Still, questions remain about the adequacy, predictability, and accessibility of the fund, especially for frontline communities (Ashrafuzzaman et al., 2022). These institutional developments suggest that while current climate treaties fall short of legal reparation, they may serve as stepping stones toward a more robust framework of accountability.

Beyond the realm of climate-specific treaties, international human rights law presents a complementary and increasingly influential avenue for reparative claims. The link between environmental degradation and human rights violations is now well-established, with numerous international bodies recognizing that a healthy environment is essential for the realization of fundamental rights such as life, health, and adequate living standards. Legal scholars have argued that states failing to take appropriate climate action are violating their citizens' rights under

international human rights instruments, such as the International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR) (Shafi et al., 2021). The application of human rights law to climate harms provides claimants with legal standing and a framework for assessing state obligations, which are often more clearly defined than those under environmental treaties. Human rights-based approaches also enable affected communities to center their own experiences and articulate claims that go beyond economic loss. In this context, reparations may include not only financial compensation but also public acknowledgment, institutional reforms, and guarantees of non-repetition. The use of human rights law has been particularly impactful in cases involving Indigenous populations and climate-displaced persons, whose losses often include cultural, spiritual, and territorial dimensions. For example, in legal discussions surrounding the displacement of communities due to rising sea levels, scholars have emphasized the need to frame such outcomes as violations of the right to housing, cultural life, and self-determination, rather than as unfortunate but unavoidable consequences of environmental change (Stabile et al., 2022). By rooting climate harm in the human rights paradigm, claimants gain access to a well-developed system of legal norms and jurisprudence that can substantiate reparative demands.

International environmental law, though broader and less centralized than human rights law, offers another critical lens for examining state responsibilities and accountability. It encompasses a diverse array of treaties, customary principles, and judicial decisions that regulate the protection and sustainable use of the environment. Key principles such as the prevention of transboundary harm, the precautionary principle, and the duty to cooperate in environmental protection underpin much of this legal tradition. The principle of transboundary harm, in particular, has been cited in legal claims where emissions from one state are shown to have caused environmental damage in another. Although demonstrating causation remains challenging, scientific advancements in climate attribution modeling are helping to establish clearer links between emissions sources and specific climate events (Caballero & Merlis, 2024). These tools enhance the legal plausibility of environmental claims by offering empirical evidence of responsibility.

Additionally, the polluter pays principle—rooted in environmental law—reinforces the ethical and legal argument for reparations. This principle asserts that those responsible for pollution should bear the cost of managing it, including the mitigation of harm and compensation for affected parties. While widely accepted in domestic environmental law, its application at the international level has been inconsistent. Nonetheless, proposals for global compensation funds, financed through carbon taxes or levies on fossil fuel companies, are attempts to institutionalize the polluter pays principle in international frameworks (Watts et al., 2023). These proposals align with recent research on how state and corporate actors contribute to environmental degradation and how those contributions can be quantified and monetized (Chen et al., 2021).

The International Court of Justice (ICJ), as the principal judicial organ of the United Nations, offers yet another legal mechanism through which issues of climate accountability can be addressed. Although the ICJ has yet to issue a binding decision specifically on climate reparations, it has played a pivotal role in clarifying international legal norms related to environmental protection, human rights, and state responsibility. For example, in the 1996 Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons, the ICJ recognized that environmental considerations must be taken into account in assessing state behavior under international law. More recently, efforts by states such as Vanuatu to seek an ICJ advisory opinion on climate change obligations represent a strategic attempt to harness the Court's authority in service of climate justice (Nikitina & Пожилова, 2023). While advisory opinions are not legally binding, they carry significant normative and political weight, potentially influencing future treaty negotiations and national policies.

The ICJ also provides a formal venue for contentious cases between states, in which allegations of wrongful acts, including environmental harm, may be adjudicated. In theory, this mechanism could be used to pursue claims for climate-related damages, provided that jurisdictional hurdles and evidentiary requirements can be overcome. The challenge lies in the procedural complexity and political sensitivity of bringing such cases to the ICJ, especially given the reluctance of powerful states to

accept its jurisdiction in matters implicating their historical emissions. Nonetheless, the Court remains an important part of the broader legal architecture, offering both procedural tools and normative guidance in the development of climate law.

Despite the potential of these legal frameworks, significant limitations persist. Most notably, international law still lacks a comprehensive and enforceable mechanism for assigning liability and ordering compensation for climate harm. The voluntary nature of many climate agreements, the absence of binding enforcement provisions, and the reliance on political will all hinder the realization of reparative justice. Moreover, legal fragmentation and jurisdictional ambiguity often impede coordination between environmental, human rights, and economic legal regimes. This fragmentation can result in procedural delays, inconsistent standards of proof, and inadequate remedies for affected communities (Watts et al., 2023). Even where legal norms are well established, the lack of political consensus and financial commitment undermines their practical effectiveness.

Nonetheless, there is growing momentum to strengthen and harmonize these legal instruments. Emerging proposals for international climate courts, binding arbitration mechanisms, and revised treaty provisions reflect a recognition of the current system's inadequacies. Scholars have suggested that lessons from other domains, such as transitional justice and corporate liability frameworks, could inform the design of more effective reparative systems for climate harm (Shafi et al., 2021). These innovations represent a critical frontier in international law, where normative ambition must be matched by institutional design and political commitment.

In conclusion, the web of international legal instruments surrounding climate reparations is complex and evolving. While existing frameworks such as the UNFCCC, the Paris Agreement, international human rights law, international environmental law, and the ICJ statutes provide partial support for reparative claims, they also contain structural gaps and legal ambiguities. Bridging these gaps will require not only legal innovation but also sustained advocacy and multilateral cooperation. As the climate crisis deepens, the imperative to transform these frameworks from aspirational declarations into enforceable mechanisms becomes ever more urgent.

6. Challenges and Contested Issues

The pursuit of climate reparations within international legal and policy frameworks faces numerous challenges that complicate both the formulation and implementation of effective reparative mechanisms. These challenges span legal, political, ethical, and practical dimensions, each rooted in long-standing tensions and unresolved questions in global climate governance. While the growing momentum behind the reparations discourse signals increasing global recognition of historical responsibility and injustice, multiple structural and conceptual barriers continue to hinder its actualization.

From a legal standpoint, one of the most persistent obstacles is the issue of jurisdiction. Most international courts and tribunals require the consent of states to exercise jurisdiction, and powerful states—especially those with the highest cumulative emissions—have frequently declined to submit to such processes in climate-related matters. The reluctance of states like the United States and China to accept the jurisdiction of bodies such as the International Court of Justice (ICJ) in cases involving environmental harm severely limits the scope for adjudication (Nikitina & Пожилова, 2023). Furthermore, attribution of harm in the context of climate change presents another critical legal hurdle. While scientific advances have improved the ability to trace specific climate impacts back to aggregate emissions or to particular sectors and actors, the diffuse and cumulative nature of greenhouse gases complicates the direct assignment of legal liability. Research exploring the role of atmosphere–ocean interactions and radiative-advective energy transformations shows how interconnected climatic systems are, making it difficult to isolate causal pathways between one country's emissions and another country's damages (Caballero & Merlis, 2024).

Sovereignty remains a cornerstone of the international legal system and poses an additional constraint on reparations. Many states guard their sovereignty closely, resisting any measures that would infringe upon their perceived autonomy. Legal frameworks that suggest external accountability or require domestic policy changes—such as the imposition of carbon liability or

the reallocation of national budgets to pay into international compensation funds—are frequently interpreted as encroachments on sovereign rights (Shafi et al., 2021). This tension is especially apparent in debates about binding mechanisms versus voluntary frameworks, with the former often rejected on the grounds that they conflict with national sovereignty and democratic self-determination.

The political dimensions of climate reparations are equally contentious, particularly in relation to the enduring North–South divide. Countries in the Global South continue to emphasize the historical role of the Global North in causing the climate crisis and the resulting moral imperative for reparations. However, many developed nations resist framing climate finance as reparations, preferring terms such as aid, support, or partnership, which do not carry legal connotations of guilt or liability (Nyka, 2021). This linguistic and conceptual resistance reflects deeper geopolitical tensions, where the fear of setting legal precedents and opening the door to further claims plays a significant role in the reluctance of high-emission states to endorse reparative frameworks. Moreover, the dominance of developed countries in the governance structures of international financial institutions often results in imbalanced decision-making processes, where the interests of vulnerable nations are sidelined or diluted (Ashrafuzzaman et al., 2022).

Ethical questions surrounding climate reparations add further complexity to the discourse. Chief among them is the debate over who should pay, how much, to whom, and for what. While the polluter pays principle provides a normative foundation for determining responsibility, operationalizing this principle raises difficult questions. For instance, should contributions be based on historical emissions, current emissions, or a combination of both? Should private corporations, particularly those in the fossil fuel industry, also be held financially accountable, and if so, through what mechanisms? The issue of who receives reparations is equally fraught, as it involves determining which states, communities, or individuals are eligible and how to assess their losses. Research on mass preferences in large democracies has shown that public support for climate compensation often hinges on how vulnerability and contribution are framed, with some favoring compensation only for the most visibly affected populations (Gaikwad et al., 2022).

The ethical dimension is further complicated by the intangible and non-economic nature of many climate-related losses. Loss of biodiversity, cultural heritage, ancestral land, and spiritual connections to nature are not easily quantifiable in monetary terms. This raises the question of whether financial compensation alone is an adequate response to such losses. For many Indigenous and marginalized communities, reparations must include recognition, participation, and restoration of rights—not merely payments. This broader view of reparative justice aligns with the notion that reparations should be transformative, addressing root causes and not just symptoms (Stabile et al., 2022).

Practical challenges in implementing reparative mechanisms are no less formidable. One of the most immediate issues is the establishment and management of funding systems that are predictable, equitable, and accessible. While the creation of the Loss and Damage Fund at COP27 marked a significant milestone, questions remain about its long-term viability, the adequacy of its resources, and the transparency of its governance. Past experience with climate finance mechanisms such as the Green Climate Fund reveals that pledges are often underfunded, delayed, or restricted by complex administrative procedures that hinder disbursement (Watts et al., 2023). Moreover, the reliance on voluntary contributions makes such funds vulnerable to political shifts and economic downturns in donor countries.

Implementation mechanisms also suffer from institutional fragmentation. Climate reparations intersect with multiple domains—including environmental law, human rights, development policy, and trade regulation—each governed by different institutions, rules, and procedures. The lack of coherence and coordination among these systems creates inefficiencies and inconsistencies, which can undermine the effectiveness of reparative programs. Additionally, the monitoring and evaluation of reparations pose practical challenges. Ensuring that funds reach the intended beneficiaries, are used effectively, and lead to meaningful outcomes requires robust oversight structures, which are often lacking in international frameworks (Chen et al., 2021).

Administrative capacity in recipient countries also varies significantly, affecting their ability to absorb and utilize reparative funds. In regions where governance systems are weak or under-resourced, the risk of

mismanagement, corruption, or inefficiency can compromise the goals of reparation. Addressing these issues requires not only financial transfers but also investments in institutional capacity building, participatory governance, and accountability mechanisms (Ashrafuzzaman et al., 2022). In this regard, reparations must be conceived as a multidimensional process that includes legal, political, and developmental interventions rather than as a standalone financial transaction.

Altogether, these legal, political, ethical, and practical challenges reflect the profound complexity of operationalizing climate reparations within the existing global order. The questions of how to assign responsibility, structure compensation, and deliver justice remain unresolved not because of a lack of normative clarity but because of entrenched power dynamics, institutional inertia, and competing national interests. Moving forward, addressing these contested issues will require an integrated approach that combines legal innovation, political negotiation, ethical reflection, and practical coordination. Only through such a multidimensional effort can climate reparations evolve from aspiration to implementation.

7. Toward an Integrated Framework

Addressing the complex and multifaceted crisis of climate injustice requires a comprehensive framework that moves beyond fragmented legal instruments or ad hoc financial assistance. An integrated model for climate reparations must reconcile the legal imperatives of accountability with the ethical demands of justice, the structural requirements of equitable finance, and the social urgency voiced by civil society and youth-led movements. This approach envisions a reparative architecture grounded in international law but animated by transnational cooperation, community engagement, and the transformative potential of global solidarity. By bringing together legal accountability, climate finance and redistribution, and restorative justice mechanisms, such a model has the potential to operationalize climate reparations in a way that is normatively sound, institutionally viable, and socially inclusive.

Legal accountability remains the cornerstone of any credible reparations framework. Without enforceable obligations and clearly defined responsibilities, efforts to compensate for climate-induced harm risk becoming symbolic or inconsistent. International legal systems must evolve to hold both states and private actors liable for their contributions to global emissions. While mechanisms like the International Court of Justice offer pathways for states to pursue claims, legal theories must continue to adapt to account for shared and historical responsibilities (Nikitina & Пожилова, 2023). For instance, emerging climate attribution science enables the identification of causal links between specific emissions and localized harm, thereby enhancing the legal feasibility of reparations claims (Caballero & Merlis, 2024). A robust legal framework should incorporate binding norms on climate liability, drawing from both environmental and human rights law to ensure that obligations are not only moral but also justiciable. This would require international treaties to explicitly include provisions on compensation, supported by enforcement mechanisms through arbitration panels, regional courts, or an expanded mandate of existing international judicial bodies.

However, legal accountability alone cannot deliver climate justice without a parallel system of climate finance and redistribution. The polluter pays principle, when translated into institutional practice, must result in predictable, adequate, and accessible financial flows from high-emission countries and corporations to those most affected by climate change. Current financing mechanisms, including the Green Climate Fund and the nascent Loss and Damage Fund, represent early attempts at financial responsibility, yet they suffer from gaps in funding, political will, and administrative clarity (Watts et al., 2023). A reformed global financing system must include progressive taxation on carbon-intensive industries, levies on fossil fuel exports, and obligations for high-emission states to contribute to an international reparations trust. This trust could be managed by a consortium of UN bodies and regional organizations to ensure transparency, equitable access, and responsiveness to localized needs. Such a model must also address the disparities in disbursement capacity by investing in the institutional infrastructure of vulnerable countries and supporting participatory budgeting processes that reflect local priorities (Ashrafuzzaman et al., 2022).

At the heart of an integrated framework lies the principle of restorative justice, which extends beyond monetary compensation to address historical grievances, cultural

losses, and structural inequalities. Restorative justice emphasizes repair, recognition, and relationship-building between those who have caused harm and those who have suffered it. In the context of climate reparations, this means acknowledging the colonial roots of environmental exploitation, the erasure of Indigenous ecological knowledge, and the systemic marginalization of climate-vulnerable populations. Restorative mechanisms may include land restitution, formal apologies, cultural revitalization programs, and inclusive decision-making processes that elevate the voices of Indigenous peoples, displaced communities, and marginalized groups (Stabile et al., 2022). These initiatives should not be seen as supplemental but as essential components of reparations that seek to transform relationships and rebuild trust in global governance.

The success of such an integrated model depends heavily on the strength and inclusiveness of multilateral cooperation. Multilateralism offers the platform through which shared standards can be developed, best practices disseminated, and collective accountability enforced. International institutions, including the United Nations, the World Bank, and regional climate bodies, must play an active role in harmonizing legal, financial, and restorative mechanisms under a unified reparations architecture. However, this process must avoid replicating the power asymmetries that have long characterized international negotiations. Instead, developing nations, particularly those in the Global South, must be given equal voice in designing and governing reparations frameworks. This requires restructuring decision-making processes to ensure representation and the protection of vulnerable nations' interests (Shafi et al., 2021).

Equally critical is the mobilization of civil society, which has consistently been at the forefront of the climate reparations movement. Civil society organizations, including grassroots networks, legal advocacy groups, and environmental justice coalitions, provide essential expertise, legitimacy, and pressure on governments and corporations to act. Their work helps translate complex legal and financial concepts into community-driven demands that reflect lived experiences. For example, civil society actors have documented how climate impacts disproportionately affect women, Indigenous peoples, and rural communities, thereby shaping the discourse on reparative priorities (Ashrafuzzaman et al., 2022). These groups also play a monitoring role, ensuring that reparations funds are not misallocated and that the rights of affected populations are upheld.

Youth-led movements have emerged as a transformative force in global climate politics, injecting urgency, creativity, and moral clarity into debates around climate justice. From the Fridays for Future protests to legal actions filed by young plaintiffs in various jurisdictions, youth activists have foregrounded the intergenerational dimension of climate harm. Their calls for accountability are rooted in the recognition that today's decisions will determine the conditions of life for future generations. Legal scholarship has begun to incorporate the principle of intergenerational equity, recognizing it as a foundational norm in both environmental and human rights law (Nyka, 2021). Youth movements also challenge the technocratic framing of climate negotiations by insisting on justice, participation, and systemic change as the core principles of any climate policy. Their advocacy contributes to reshaping public discourse and influencing policymaking processes that are often inaccessible or opaque.

The convergence of legal, financial, and restorative approaches within a multilateral and participatory framework represents the most promising path toward meaningful climate reparations. This integrated model does not rely on a single institution or actor but rather on the coordinated efforts of states, international bodies, civil society, and youth advocates. Each component reinforces the others: legal accountability provides the normative basis for responsibility; climate finance ensures the material capacity for redress; and restorative justice fosters the social and cultural healing necessary for long-term reconciliation. Together, they constitute a framework capable of addressing the full spectrum of harm caused by climate change—material, psychological, historical, and ecological. As the impacts of climate change deepen and global inequalities widen, the need for such an integrated reparative system becomes not only a moral imperative but also a legal and political necessity.

8. Conclusion

The global conversation around climate reparations and legal accountability has evolved into a critical discourse that lies at the heart of environmental justice and

international law. As climate change continues to exacerbate existing inequalities and inflict irreversible harm on the most vulnerable populations, the demand for reparative action grows stronger and more urgent. This narrative review has explored the multifaceted dimensions of climate reparations by tracing their historical roots, analyzing key legal frameworks, identifying ongoing challenges, and proposing a comprehensive model that integrates legal responsibility, financial redistribution, and restorative justice.

At the core of the reparations debate is a call for fairness and equity in the face of an increasingly unequal climate burden. Nations and communities that have contributed the least to global emissions often face the gravest consequences, from rising sea levels and crop failure to displacement and cultural loss. The failure of existing frameworks to adequately address these injustices reflects a broader crisis of accountability in international governance. While agreements such as the UNFCCC and the Paris Agreement have laid important groundwork, they remain limited in their capacity to deliver enforceable compensation or justice to those affected.

Legal accountability, although essential, must be complemented by mechanisms that go beyond litigation and liability. A reimagined reparations framework must include predictable and sustained climate finance, structured around the principle that those who have contributed most to the climate crisis must play a proportionate role in addressing its effects. However, reparations are not simply about money. They must also include the recognition of historical and ongoing injustices, the restoration of rights and lands, and the participation of affected communities in shaping their own futures.

Equally important is the role of multilateral cooperation and inclusive global dialogue. No single country or institution can resolve the climate crisis in isolation. A fair and effective reparations model depends on genuine collaboration across geopolitical lines, with meaningful representation from the Global South, Indigenous peoples, and climate-vulnerable communities. Civil society organizations and youth-led movements play a vital role in holding decision-makers accountable, advocating for systemic change, and ensuring that the principles of justice and equity are not lost in bureaucratic or political processes.

The path forward requires courage, innovation, and a willingness to confront uncomfortable truths about responsibility, power, and privilege. Climate reparations are not a gift or a favor—they are a necessary response to a legacy of exploitation and a step toward a more just and sustainable global order. Building an integrated framework that unites legal, financial, and restorative elements is not only possible but essential for ensuring that climate justice is not just a slogan, but a lived reality for present and future generations.

Authors' Contributions

Authors contributed equally to this article.

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In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

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