



State Liability and Compensation for Environmental Damage Caused by Military Operations in International Armed Conflicts

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ABSTRACT: Environmental damage caused by international armed conflicts results in widespread and long-term ecological harm, yet mechanisms for state accountability still face serious obstacles to their implementation. This study aims to analyze the framework of state accountability for environmental damage resulting from military operations in international armed conflicts, focusing on the elements of state responsibility, relevant legal instruments, and the challenges to their implementation. This study employs an integrated literature review method in accordance with the PRISMA 2020 protocol to ensure transparency and reproducibility at every stage of the selection and synthesis of normative legal literature. The results show that the cumulative thresholds in Article 35(3) and Article 55 of Additional Protocol I to the 1977 Geneva Conventions are too high, meaning they have never been effectively applied in international judicial practice, while the difficulty of proving causality and the lack of pre-conflict environmental data are major obstacles to establishing state responsibility. Reparation mechanisms such as restitution and compensation face challenges because environmental damage is often irreversible and difficult to assess in monetary terms. This study concludes that strengthening the framework for state liability requires a reinterpretation of the damage thresholds, the development of better assessment methodologies, and the synchronization of state and individual liability mechanisms to create a holistic and effective system.

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1. INTRODUCTION

International armed conflicts not only result in loss of life and property damage, but also cause widespread, complex, and long-lasting ecological damage that extends into the post-conflict period. Such environmental damage includes soil and water contamination, loss of biodiversity, atmospheric pollution, and ecosystem degradation that threaten the survival of civilian populations (Mingashang & Banungana, 2024). Various modern conflicts, such as the war in Ukraine and the escalation in the Gaza Strip, demonstrate that the environment is often an overlooked component in international legal accountability mechanisms (Alexianu, 2026; Borba Casella, 2026). This reality underscores that environmental damage resulting from armed conflict is not merely a collateral effect, but rather a form of substantive harm that requires legal recognition and clearly defined mechanisms for reparations.

The urgency of strengthening state accountability for environmental damage is increasing as conflicts intensify and their impacts extend beyond the territorial boundaries of the warring states. Transboundary environmental damage, such as air and marine pollution, harms not only the states involved in the conflict but also neighboring states that are not directly involved (Tethool & Kainama, 2023). Failure to provide adequate accountability mechanisms will exacerbate the suffering of civilians, hinder post-conflict recovery, and create intergenerational injustice (Baskoro, 2025). Therefore, strengthening the legal framework for state

responsibility is an urgent imperative amid the increasing complexity of modern military operations and their systemic ecological impacts.

Although international humanitarian law and international environmental law normatively recognize environmental protection during conflicts, there is a significant discrepancy between existing norms and their implementation in state accountability practices. Additional Protocol I to the 1977 Geneva Conventions, through Article 35(3) and Article 55, prohibits methods of warfare that cause widespread, long-term, and severe environmental damage; however, this cumulative threshold is relatively high and has thus never been effectively applied in international courts (Pambudi et al., 2023). Furthermore, the lack of clarity regarding operational definitions and criteria for damage creates difficulties in proving and establishing state liability (Chammas, 2026). It is this gap between normative recognition and the reality of implementation that constitutes the primary obstacle to achieving reparative justice for environmental damage caused by conflict.

The United Nations International Law Commission, through its Principles on Environmental Protection in the Context of Armed Conflict (2022), has formulated 27 principles covering pre-conflict, during-conflict, and post-conflict obligations to bridge this gap (ILC, 2022). However, these principles remain soft law and require further incorporation into customary international law or legally binding treaties (Bradley et al., 2023). On the other hand, the Articles on the Responsibility of States for Internationally Wrongful Acts provide a general framework for reparations, but their application to cases of conflict-related environmental damage is hampered by the difficulties of assessing damages and proving causation (Klein, 2024). Thus, the development of operational and legally binding legal instruments has become an urgent need on the agenda for modernizing international law.

Practical challenges in holding the state accountable are further widening the gap between law and justice, particularly in terms of evidence, damage assessment, and access to dispute resolution mechanisms. The main obstacle lies in proving a causal link between specific military actions and the resulting environmental damage, given the complexity of ecosystems and non-military factors that also influence environmental conditions (Kong & Zhao, 2023). The lack of pre-conflict environmental data as a baseline for comparison, as well as the costs and time required for post-conflict assessments, pose substantial obstacles for states or victims in filing claims for reparations (Mingashang & Banungana, 2024). The limited jurisdiction of international courts and the reluctance of states to submit to dispute resolution also reinforce impunity for perpetrators of environmental damage in conflicts.

The International Criminal Court, through its Policy on Environmental Damage under the Rome Statute, opens the door to individual accountability for environmental crimes, but this mechanism remains limited to cases involving a substantial criminal threshold. The policy affirms that environmental damage can serve as a basis for war crimes, crimes against humanity, genocide, and aggression; however, its application faces interpretive and evidentiary challenges similar to those of the state liability mechanism (ICC, 2025). Furthermore, state and individual accountability mechanisms operate in parallel without adequate integration, leading to overlap and legal uncertainty for those affected (Anggusti & Saragih, 2026). Therefore, synchronization between these two mechanisms is necessary to create a holistic and effective accountability system.

Although various legal instruments are available, a significant gap remains between the normative framework and practical reality, particularly regarding access to justice for states and communities affected by environmental damage. Developing countries that are victims of environmental damage caused by conflict often lack the legal, technical, and financial capacity to file claims for reparations in international forums (Foster, 2025). Conversely, non-judicial dispute resolution mechanisms, such as negotiation and mediation, often result in compensation that is disproportionate to the actual extent of environmental damage (Kong & Zhao, 2023). These disparities in access and capacity underscore the need to develop mechanisms that are more inclusive and equitable for all affected parties.

This study aims to comprehensively analyze the framework of state liability for environmental damage caused by military operations in international armed conflicts, focusing on the elements of state liability, relevant legal instruments, and challenges in their implementation. Specifically, this study examines the provisions of Additional Protocol I of 1977, the 1976 ENMOD Convention, the principles of customary international law, and the contributions of the International Law Commission in shaping the framework of state liability. This study also explores available reparations mechanisms, including restitution, compensation, and fulfillment, and identifies legal gaps that require future improvement and strengthening. Ultimately, this study is expected to contribute to the development of international law that is more responsive to the reality of environmental damage in armed conflicts.

II. METHOD

This study employs an integrated literature review as the primary approach to synthesize various findings of normative law regarding state liability for environmental damage in armed conflicts. The integrated literature review method or integrative review was chosen for its ability to synthesize empirical and theoretical literature from various methodological approaches to produce a comprehensive understanding of a specific phenomenon or issue (Whittemore & Knafl, 2005). This approach allows the researcher to simultaneously integrate research findings from the disciplines of humanitarian law, international environmental law, and the law of state responsibility. By using this method, the research is not limited to a single type of legal source but encompasses primary legal materials such as international treaties and conventions, secondary legal materials such as legal doctrines and court decisions, and tertiary legal materials such as legal dictionaries and encyclopedias (Arifuddin et al., 2025). The integration of these various

sources enables a coherent, principle-based methodological reconstruction, thereby producing rational legal solutions that are scientifically accountable.

The literature search and selection procedures in this study followed the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency, reproducibility, and accuracy at every stage of the research. PRISMA 2020 is a reporting guideline consisting of 27 checkpoints covering the title, abstract, introduction, methods, results, discussion, and funding (Page et al., 2021). The application of PRISMA in this study began with the literature identification stage through searches in databases such as Scopus and Google Scholar using the keywords “**state responsibility**”, “**environmental damage**”, “**armed conflict**,” “**reparations**”, and “**international humanitarian law**”. Next, the screening phase was conducted based on inclusion criteria which included publications in English and Indonesian from 2000 to 2026 as well as exclusion criteria for non-academic articles and publications irrelevant to the study’s focus (Liberati et al., 2009). The eligibility stage involved a critical assessment of the full-text articles to ensure their relevance to the research questions, after which the inclusion stage established a core literature set for in-depth analysis.

Data analysis in this study employed a qualitative content analysis method tailored to the characteristics of normative legal materials, in which each legal instrument and doctrine was analyzed based on the structure of the norms, legal principles, and legal arguments contained therein. The data collected from 43 scientific articles selected through the PRISMA process were then thematically synthesized by grouping the findings based on three main pillars: (i) elements of state responsibility, (ii) legal instruments for environmental protection, and (iii) available reparation mechanisms. This thematic synthesis enabled the researchers to identify normative patterns, implementation gaps, and inconsistencies among the legal instruments that were the focus of the study (Whittemore & Knafl, 2005). In the final stage, all findings are critically analyzed using conceptual and comparative legal approaches to draw conclusions regarding the strengths and weaknesses of the existing state accountability framework (Marzuki, 2022). The results of the analysis are presented in the form of a systematic academic narrative, with each claim supported by normative evidence validated through a rigorous search and selection process in accordance with the PRISMA protocol.

III. RESULTS

Framework and Obstacles to State Liability for Environmental Damage Resulting from Military Operations

The normative framework for state responsibility for environmental damage in international armed conflicts is well-established, but its implementation faces significant structural obstacles. The United Nations International Law Commission has affirmed that the law of state responsibility applies in armed conflicts and encompasses environmental damage, whereby environmental damage may be compensated even in the absence of harm to persons or property (Dam-de Jong & Sjöstedt, 2023). This principle is reinforced by the Articles on the Responsibility of States for Internationally Wrongful Acts, which state that any act contrary to international law gives rise to state responsibility, including the responsibility to provide full reparation for all resulting losses (Hsiao, 2026). However, the International Law Commission also acknowledges that establishing state liability for conflict-related environmental damage is often difficult in practice, particularly due to the high evidentiary threshold required (Foster, 2025). The inherent gap between normative recognition and the reality of law enforcement at the operational level is a central issue identified through an examination of various applicable legal instruments.

The first element of state responsibility is the existence of an unlawful act attributable to the state, which, in the context of environmental damage, includes violations of the provisions of international humanitarian law and international environmental law. Tawurutubun et al. (2021) comprehensively analyzed that the main elements of state responsibility include duty, harm, and standards of conduct, all of which must be proven cumulatively to establish a state’s responsibility. In international humanitarian law, violations of Article 35(3) and Article 55 of Additional Protocol I to the 1977 Geneva Conventions which prohibit methods of warfare that cause widespread, long-term, and severe environmental damage constitute the primary basis for the emergence of state responsibility (Pambudi et al., 2023). However, this cumulative threshold is so high that it has never been successfully applied in international judicial practice.

In addition to violations of humanitarian law, environmental damage caused by armed conflict can also give rise to state liability under international environmental law, particularly through the “no-harm” principle and the duty of due diligence. The “no-harm” principle, which originated in the Trail Smelter Case, states that no state has the right to use or permit the use of its territory in such a way as to cause harm to the territory of another state or to the property and people within it (Prunella, 2014). This principle, as affirmed by the International Law Commission, applies not only in times of peace but also during armed conflicts, and requires states to exercise due diligence in preventing transboundary environmental damage (UNIDIR, 2026). The application of the “no-harm” principle not only broadens the normative basis for state liability but also raises new challenges regarding coordination among different legal frameworks.

The difficulty in proving a causal link between specific military actions and the resulting environmental damage constitutes the most serious obstacle to holding states accountable under all the instruments examined. Kong & Zhao (2023) note that the complexity of ecosystems and the presence of non-military factors that also influence environmental conditions make it difficult to establish causation conclusively before international courts. The inability to directly prove that specific damage was caused by specific military actions often results in claims for reparations being rejected or in the award of only very limited compensation

(Hartman, 2025). The high standard of proof in international law which requires “clear and convincing evidence,” as affirmed in the Trail Smelter Case poses a major obstacle for victim states seeking reparative justice for the environmental damage they have suffered, particularly in the absence of adequate legal precedents.

Another significant obstacle is the lack of pre-conflict environmental data that can serve as a baseline for assessing the extent of damage caused by the conflict. Rikiansyah et al. (2026) emphasize that without adequate data on pre-conflict environmental conditions, it is very difficult to accurately determine the extent of damage caused by specific military operations and the appropriate amount of compensation to be awarded. Jensen (2013) adds that the costs and time required to conduct post-conflict environmental assessments often pose substantial obstacles, particularly for developing countries with limited technical and financial capacity. The capacity gap between developed and developing countries creates inequitable access to accountability mechanisms available under the current international legal framework, a disparity that has been clearly evident in the practice of reparations claims over the past two decades.

The lack of clarity regarding the operational definitions and criteria for environmental damage required under various legal instruments is a primary source of legal uncertainty in determining state liability. Chammas (2026) notes that key terms such as “extensive,” “long-term,” and “severe” in Additional Protocol I lack uniform and operational definitions, leading to significant differences in interpretation among states and international courts. Interpretations of these standards remain contentious, with “extensive” understood to cover several hundred square kilometers, while “long-term” can refer to damage lasting up to several decades (Bradley et al., 2023). This definitional uncertainty creates an opening for states to evade responsibility by claiming that the damage caused does not meet the required thresholds, thereby undermining the overall effectiveness of an accountability framework built on a fragile normative foundation.

Table 1: State Responsibility and Barriers to Enforcing Liability for Environmental Damage in Armed Conflicts

Aspects of State Accountability	Legal Basis	Forms of Accountability	Enforcement Barriers
Unlawful acts attributable to the state	ARSIWA: Attribution and Breaches of International Obligations	Responsibility for State Acts That Violate International Obligations.	The complexity of military actors makes it difficult to establish attribution.
Environmental damage caused by methods or means of warfare	Articles 35(3) and 55 of Additional Protocol I of 1977	Liability for extensive, long-term, and severe damage.	High cumulative threshold.
Prevention of Transboundary Environmental Damage	“No-harm” in the Trail Smelter Arbitration and due diligence	The obligation to prevent transboundary environmental damage.	Potential for conflict with humanitarian law.
The causal relationship between military actions and environmental damage	ARSIWA and the Practice of Evidence in International Disputes	Proving the link between military actions and damage.	Ecosystem complexity, non-military factors, and baseline limitations.
Remediation of environmental damage	ARSIWA: Full Reparation and Principle 9 of the 2022 ILC	Full compensation for the damages caused.	Difficulties in assessing damages and limitations of enforcement mechanisms.

Source: Processed by Researchers, 2026.

The limited jurisdiction of international courts and states’ reluctance to submit to dispute resolution mechanisms are key factors that reinforce impunity in cases of war-induced environmental damage. Santos (2026) notes that although the International Court of Justice has jurisdiction to hear disputes between states, many states do not accept the Court’s compulsory jurisdiction or accept it only with reservations that limit the scope of disputes that can be brought before it. Singh (2025) adds that alternative dispute resolution mechanisms such as negotiation and mediation often result in compensation that is disproportionate to the extent of the damage incurred, primarily due to the imbalance in bargaining power between developed and developing countries. The procedural aspects of enforcement have proven to be just as important as the substantive aspects in determining the success of state liability claims, as seen in various environmental disputes brought before international forums.

State and individual accountability mechanisms operate in parallel without adequate integration, creating overlap and legal uncertainty for affected parties. Article 8(2)(b)(iv) of the 1998 Rome Statute states that widespread, long-term, and severe environmental damage caused intentionally during an international conflict may constitute a war crime. However, this provision is highly limited because it applies only to international conflicts and requires the element of intent as well as a high cumulative threshold (Chammas, 2026). The ICC has also demonstrated an interest in addressing environmental damage in certain situations, such as in the cases of Sudan and Libya, although no comprehensive formal policy has yet been established (Kong & Zhao, 2023).

The fragmented approach between state and individual responsibility fails to provide comprehensive justice and creates legal confusion for those filing claims for reparations.

Although various obstacles have been identified, developments in international customary law and state practice indicate a positive trend toward broader recognition of state responsibility for environmental damage in armed conflicts. The International Law Commission, through its 2022 Draft Principles on the Protection of the Environment in Relation to Armed Conflicts, has formulated 27 principles covering pre-conflict, during-conflict, and post-conflict obligations, including Principle 9, which explicitly states that a state whose unlawful acts cause environmental damage is obligated to provide full reparations. Although these principles are still considered “soft law,” they reflect a significant progressive development in international law regarding environmental protection in armed conflicts (United Nations, 2022). The legal framework for state liability is projected to continue strengthening as global awareness of the urgency of environmental protection grows amid an increasingly acute global ecological crisis.

The standard of proof applied by international courts in cases of environmental damage arising from conflict remains inconsistent and often depends on the procedural rules of each forum. Arbitration tribunals continue to apply the traditional burden of proof, which requires the claimant to present “clear and convincing” evidence, while the International Court of Justice tends to apply the more lenient “preponderance of evidence” standard in certain cases (Bills, 2025). This inconsistency creates uncertainty for states seeking to file claims, as their success depends largely on their choice of forum rather than the substantive strength of their case. As a result, many states opt for opaque bilateral negotiations that often result in compensation falling short of the full reparations mandated by international law, as documented in various case studies of conflicts in the Middle East and Africa (Fairman et al., 2011).

Reparation Mechanisms and Compensation Practices for Environmental Damage Resulting from International Armed Conflicts

The principle of full reparation is a fundamental pillar of the law of state responsibility, which requires the responsible state to “eliminate all consequences of the wrongful act and restore the situation that should have existed” (Kong & Zhao, 2023). This principle, as set forth in the Articles on the Responsibility of States for Internationally Wrongful Acts, encompasses three main forms of reparation: restitution, compensation, and satisfaction which may be granted separately or in combination depending on the nature and extent of the harm caused (Hsiao, 2026). In the context of environmental damage, restitution means restoring the environment to its pre-conflict condition; compensation means payment of damages for irreparable harm; and satisfaction means formal acknowledgment of fault and a guarantee not to repeat the act. The application of the principle of full reparation in cases of environmental damage faces significant challenges, primarily because environmental damage is often irreversible and difficult to assess monetarily under existing positive legal systems.

Environmental damage caused by armed conflict is recognized as a loss that can be compensated for independently, regardless of whether such damage has resulted in injury to people or damage to property. Fairman et al. (2011) assert that under the principle of full reparation, environmental damage “in and of itself” constitutes a sufficient basis for a claim for compensation, as recognized in the practice of the United Nations Compensation Commission following the 1990–1991 Gulf War. That Commission uniquely awarded reparations for pure environmental damage based on Iraq’s violation of Article 2, paragraph (4), of the UN Charter in invading Kuwait (Kong & Zhao, 2023). Recognition of the intrinsic value of the environment as an independent object of protection has been demonstrated in this precedent, although such recognition has not yet been consistently applied in other conflict cases that have occurred since then.

The practice of the UN Compensation Commission constitutes the most significant precedent in the history of international law regarding compensation for environmental damage caused by armed conflict. Cusato (2019) notes that Security Council Resolution 687 (1991) has been interpreted to permit claims for various losses or costs, including scientific assessments of environmental damage, preventive measures and environmental cleanup, as well as the restoration of depleted or damaged natural resources. This commission accepted claims not only from states but also from individuals and companies, and allocated more than 5.2 billion U.S. dollars for environmental claims (Chammas, 2026). However, the UNCC’s precedent has never been replicated in subsequent conflicts, despite repeated calls for the establishment of a standalone wartime environmental compensation mechanism (Afriansyah, 2012). This indicates that, although there has been normative progress, the implementation of reparations mechanisms remains heavily dependent on the case-by-case political will of the UN Security Council.

Although the UNCC sets an important precedent, this compensation mechanism has significant limitations that diminish its relevance as a model for contemporary conflicts. Crook (2017) notes that the UNCC’s unique legal basis—a violation of Article 2(4) of the UN Charter—means that compensation is awarded regardless of the legality of individual acts under international humanitarian law, thereby creating a compensation regime that cannot be easily replicated in conflicts where aggression has not been established. Afriansyah (2012) adds that the UNCC claims process has also faced criticism for its overly anthropocentric approach, in which environmental damage is assessed primarily based on economic losses or property damage, rather than intrinsic ecological value. Although the UNCC represents a significant step forward, the mechanism does not fully address the complexities of a holistic assessment of environmental damage, particularly for components such as air and water, which do not easily fit into the traditional property paradigm.

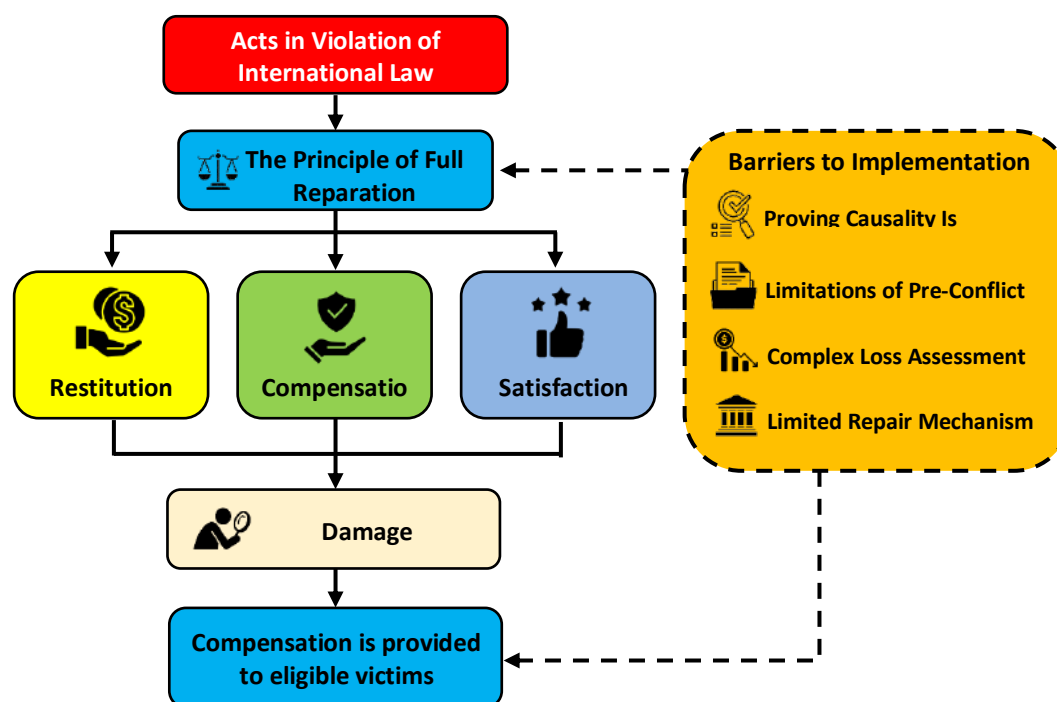


Figure 1. Framework for Remedying Environmental Damage in International Armed Conflicts
Source: Processed by Researchers, 2026.

Assessing environmental damage in the context of reparations still faces serious methodological challenges, particularly in terms of quantifying ecological losses and determining a fair monetary value. Baskoro (2025) developed an approach to assess wartime environmental damage that includes restoration costs, the value of lost ecosystem services, and the costs of the environmental assessment itself; however, the author acknowledges that this approach is still in the development stage and requires further refinement. Hartman (2025) notes that international courts often struggle to determine an appropriate compensation amount due to the lack of universally accepted methodologies and the unavailability of pre-conflict environmental data as a baseline for comparison. The technical aspects of damage assessment are one of the most fundamental obstacles to achieving full reparations and require the development of expertise and better international standards in this field.

In addition to monetary compensation, restitution or environmental restoration is the most ideal form of reparation but also the most difficult to achieve in practice, primarily because environmental damage is often irreversible. Klaus & Kiehl (2021) emphasize that restitution requires restoring the environment to its pre-conflict condition, which in many cases is impossible due to permanent ecosystem damage, such as the loss of biodiversity or severe soil contamination. ICRC (2025) adds that even when physical restitution is possible, the restoration process can take decades and entail enormous costs, which often exceed the responsible state's ability to pay. In practice, monetary compensation is often the only realistic form of reparation, even though such compensation does not fully restore lost ecosystem functions and thus does not meet the standard of "full reparation" as mandated by international law.

The "polluter pays" principle, which originates from international environmental law, has begun to be used as an interpretive lens to strengthen the accountability of states and other actors for environmental damage caused by conflict. Lindén et al. (2017) argue that this principle can complement the existing humanitarian legal framework by emphasizing that the party causing environmental pollution in this case, through the use of landmines or other weapons is responsible for the costs of remediation and restoration. This principle, as reflected in Principle 9(1) on the Protection of the Environment in the Context of Armed Conflict, affirms that a state whose unlawful acts cause environmental damage is obligated to provide full reparation for such damage (ILC, 2022). There is a convergence between international environmental law and international humanitarian law that can strengthen the normative basis for claims for reparations, although the application of this principle in the context of conflict still requires further clarification regarding the subjects and objects of liability.

Recognition of human rights as an additional basis for seeking environmental reparations in armed conflicts is growing, particularly through the link between a healthy environment and the rights to life, health, and a decent standard of living. Research on the Israeli-Palestinian conflict indicates that while specific humanitarian rules exist, human rights norms as general obligations can provide a meaningful basis for protecting the environment and seeking reparations for environmental damage in situations of armed conflict (Shayanmehr et al., 2026). This approach broadens the basis of legitimacy for claims for reparations beyond humanitarian law and environmental law by drawing on a human rights framework that is more universally accepted and has more diverse enforcement

mechanisms (IRCC, 2025). The integration of environmental law, humanitarian law, and human rights law can create a more holistic and effective approach to accountability and reparations at the operational level.

Although various instruments and mechanisms for reparations are available, access to justice remains a major challenge for developing countries and communities affected by conflict-induced environmental damage. Dehm (2025) notes that high legal costs, a lack of technical expertise, and the inability to access international forums are structural barriers that prevent many parties from effectively filing claims for reparations. Mingashang & Banungana (2024) add that developing countries that are victims of conflict-induced environmental damage often lack the legal, technical, and financial capacity to file reparations claims in international forums, while non-judicial dispute resolution mechanisms often result in disproportionate compensation. The capacity gap between developed and developing countries creates systemic injustice in access to available reparations mechanisms, as reflected in the low number of successful claims filed by countries of the Global South over the past two decades.

The application of the “polluter pays” principle in the context of armed conflict faces major obstacles when the actors responsible for environmental damage lack the financial capacity or when the very existence of the state itself is threatened with dissolution in the post-conflict period. Cases involving failed states or countries undergoing political transition demonstrate that claims for reparations are often unenforceable due to the absence of a legal entity capable of paying compensation or carrying out physical restitution (Southey, 2025). Addressing such situations requires an international trust fund mechanism financed by donor countries, as proposed in discussions on the legal reform of the Geneva Conventions. However, such funds are purely voluntary and have never reached a level sufficient to remedy the large-scale environmental damage caused by modern warfare, as evidenced by the failure of various post-conflict funding initiatives in Asia and Africa (Cusato, 2019).

IV. DISCUSSION

The law of state responsibility provides a normative foundation for reparations for environmental damage in armed conflicts; however, its application faces complexities arising from the tension between the principle of full reparation and the operational realities of conflict. The principle of full reparation requires the responsible state to eliminate all consequences of the unlawful act and restore the situation to what it should have been (Torres, 2026). As emphasized by Kong & Zhao (2023), it is unclear what form of reparation qualifies as “full” for environmental damage due to its often irreversible nature. This complexity arises because environmental damage transcends the traditional property paradigm that forms the basis for assessing damages in international law, where the value of ecosystems cannot be measured solely by economic value.

The cumulative threshold of “widespread, long-term, and severe” in Article 35(3) and Article 55 of Additional Protocol I establishes a standard of protection that is almost never met in international judicial practice. Okorie (2025) notes that these provisions, while representing a significant breakthrough as the first recognition of environmental protection in humanitarian law, have very limited effectiveness due to the cumulative nature of these three conditions. The coexistence of these three conditions severely limits the application of Additional Protocol I, as environmental damage in conflicts rarely meets all three simultaneously (CEOBS, 2026). Consequently, much environmental damage that is ecologically significant but does not meet these thresholds remains beyond the scope of legal accountability, creating a vast space for impunity.

Beyond humanitarian law, the “no-harm” principle and the duty of due diligence under international environmental law provide an additional normative basis for holding states accountable for transboundary environmental damage arising from armed conflict. Parrish (2009) asserts that the “no-harm” principle, derived from the Trail Smelter Case, states that no state has the right to use its territory in a manner that causes harm to the territory of another state. This principle, as affirmed by the International Law Commission, applies not only in peacetime but also during armed conflicts (Laisani & Choma, 2025). The application of this principle expands the scope of state responsibility beyond the provisions of humanitarian law, which are limited to the territory of military operations; however, the challenge of proving causality remains a serious obstacle to its implementation.

The UN Compensation Commission following the 1990–1991 Gulf War represents the most significant precedent in the history of international law regarding compensation for environmental damage caused by conflict; however, its unique characteristics limit its relevance as a model for subsequent conflicts. Afriansyah (2012) notes that the UNCC uniquely provided reparations for environmental damage based solely on Iraq’s violation of Article 2(4) of the UN Charter, meaning that all losses resulting from the illegal invasion could be compensated regardless of the legality of individual acts. This unique legal basis has not been replicated in subsequent conflicts, despite repeated calls for the establishment of a standalone wartime environmental compensation mechanism (Kong & Zhao, 2023). Furthermore, the UNCC’s overly anthropocentric approach has been criticized for assessing environmental damage primarily based on economic losses rather than intrinsic ecological value.

Assessing environmental damage for the purpose of remediation poses serious methodological challenges due to the lack of a universally accepted methodology and the unavailability of pre-conflict environmental data as a baseline for comparison. Laisani & Choma (2025) developed an assessment approach that includes restoration costs, the value of lost ecosystem services, and the costs of the environmental assessment itself, though they acknowledge that this approach still requires further refinement. Mohan & Kini (2021) add that international courts often struggle to determine an appropriate compensation amount because elements such as air and water cannot easily be incorporated into the traditional property paradigm. This overly property-oriented approach disregards

the intrinsic value of the environment and the rights of non-human entities, further complicating efforts to achieve fair and comprehensive reparations.

The polluter pays principle in international environmental law offers an interpretive lens for strengthening the accountability of states and other actors for environmental damage caused by conflict, but its application still requires significant clarification. ICRC (2025) argues that this principle can complement the humanitarian legal framework by emphasizing that the party causing environmental pollution is responsible for the costs of remediation and restoration, including cleanup operations and ecosystem restoration. This principle, as reflected in Principle 9(1) on the Protection of the Environment in the Context of Armed Conflict, affirms that a state whose unlawful acts cause environmental damage is obligated to provide full reparations (ILC, 2022). However, its application faces major obstacles when the responsible actor lacks financial capacity or when the state itself is at risk of disintegration in the post-conflict period.

Human rights have emerged as an increasingly important supplementary framework for seeking environmental reparations in armed conflicts, particularly through the connection between a healthy environment and the rights to life, health, and a decent standard of living. Research on the Israeli-Palestinian conflict shows that human rights norms, as general obligations, can provide a meaningful basis for protecting the environment and seeking reparations (Shayanmehr et al., 2026). This approach broadens the basis of legitimacy for claims for reparations beyond humanitarian law and environmental law by drawing on the more universally accepted framework of human rights (Pablo & Acevedo, 2024). The integration of these three legal regimes creates a more holistic approach to accountability, but it also poses challenges regarding coordination among different mechanisms and the potential for inconsistencies in enforcement practices.

Limited access to justice is a structural barrier that prevents many parties particularly developing countries and affected communities from effectively filing claims for reparations in international forums. Kong & Zhao (2023) note that high legal costs, a lack of technical expertise, and the inability to access international forums are barriers that prevent many parties from pursuing claims for reparations. Mingashang & Banungana (2024) add that developing countries that are victims of environmental damage often lack the legal, technical, and financial capacity to file claims for reparations. Meanwhile, non-judicial dispute resolution mechanisms such as negotiation and mediation often result in compensation that is disproportionate to the actual extent of the damage.

Recent developments in international jurisprudence, including the International Court of Justice's 2025 Advisory Opinion on climate change, open up new avenues for holding parties accountable for environmental damage in armed conflicts. The International Court of Justice emphasizes the need for states to report on and reduce wartime emissions, which inherently involves assessing, reporting, and addressing greenhouse gas emissions from armed conflicts (Santos, 2026). Recognition of the environmental impacts of conflict is expanding to encompass not only local damage but also contributions to global climate change. However, the International Court of Justice's advisory opinion is not legally binding; therefore, its impact on state accountability practices remains dependent on acceptance and implementation by member states, as well as future developments in case law.

Aligning state and individual accountability mechanisms is an urgent necessity for creating a holistic and effective system, given that the two mechanisms currently operate in parallel without adequate integration. The International Criminal Court's Policy on Environmental Damage, based on the 2025 Rome Statute, affirms that environmental damage can constitute the basis for war crimes, crimes against humanity, genocide, and aggression (ICC, 2025). However, the implementation of this policy faces interpretive and evidentiary challenges similar to those of state liability mechanisms, including difficulties in proving intent and causation (Chammas, 2026). This fragmented approach not only fails to provide comprehensive justice but also creates legal confusion for parties seeking to file claims through available channels.

V. CONCLUSION

The framework for state liability for environmental damage in international armed conflicts has been normatively recognized through various legal instruments, yet its implementation still faces significant structural obstacles. Additional Protocol I to the 1977 Geneva Conventions and the Principles on Environmental Protection in the Context of Armed Conflict (2022) have acknowledged the need for environmental protection, but the cumulative threshold of "widespread, long-term, and severe" is too high, so it has never been effectively applied in international judicial practice. The "no-harm" principle of international environmental law offers an additional normative basis through due diligence obligations; however, the difficulty of proving causality and the lack of pre-conflict data as a baseline of comparison remain major obstacles in establishing state liability. The lack of clarity in operational definitions, the limited jurisdiction of international courts, and the reluctance of states to submit to dispute resolution mechanisms further reinforce impunity for belligerent states that cause transboundary environmental damage.

The available mechanisms for reparations include restitution, compensation, and satisfaction. These three forms of reparations face serious challenges in their application to cases of environmental damage because the damage is often irreversible and difficult to assess in monetary terms. The precedent set by the UN Compensation Commission following the 1990–1991 Gulf War demonstrates that compensation for environmental damage is legally feasible, but the unique legal basis of that case limits its relevance as a model for subsequent conflicts. The "polluter pays" principle and the human rights framework are increasingly being used as additional lenses to strengthen claims for reparations, but their application still requires significant clarification regarding the subjects and objects of liability. The capacity gap between developed and developing countries creates systemic injustice in access to reparations

mechanisms available in international forums, necessitating comprehensive normative and institutional reforms. Strengthening the framework of state accountability requires a reinterpretation of the thresholds for harm, the development of better assessment methodologies, and synchronization between state and individual accountability mechanisms to create a holistic and effective system.

VI. DECLARATION OF THE USE OF AI ASSISTED TECHNOLOGIES

The authors used generative artificial intelligence (AI) tools to assist with language editing, clarity improvement, and structural refinement. These tools did not generate original research data, analysis, or interpretations. All arguments, empirical findings, and conclusions remain the sole responsibility of the authors, who have carefully reviewed and verified the final content of the manuscript.

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VIII. DISCLOSURE

The author reports no conflicts of interest in this work.

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