



THE ENVIRONMENT IMPACT OF ARMED CONFLICTS: CHALLENGES AND LEGAL RESPONSES UNDER INTERNATIONAL HUMANITARIAN LAW

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Abstract

The armed conflict has far-reaching consequences, extending beyond human suffering to inflict devastating environmental damage and disrupt ecosystems. Long-term ecological harm, deforestation, soil degradation, water pollution, and biodiversity loss are all dire outcomes, despite the existence of frameworks like the Additional Protocol to the Geneva Convention and the Environmental Modification Convention (ENMOD). Enforcement, however, remains a significant challenge due to complex political dynamics and limitations in accountability mechanisms. This research article delves into the environmental impact of warfare and assesses the adequacy of existing legal instruments under International Humanitarian Law (IHL). It examines how armed conflicts contribute to environmental destruction and evaluates the effectiveness of international treaties and customary laws in mitigating such damage. Furthermore, the study highlights the crucial role of international organizations, including the United Nations and the International Committee of the Red Cross, in advocating for enhanced environmental protection during armed conflicts. The research paper also discusses the challenges faced in enforcing environmental protection laws in war zones, including the lack of monitoring mechanisms, state sovereignty issues, and difficulties in holding violators accountable. Additionally, it explores potential legal and policy reforms to strengthen environmental safeguards in conflict situations. Through the analysis of past and present case studies, this study underscores the urgent need for more robust legal measures and international cooperation to prevent and mitigate the environmental consequences of war.

Key words: Armed Conflicts- Environmental Impact- Ecological Harm- International Humanitarian Law (IHL)

Introduction:

Frequently asked questions often focus on how armed conflicts harm the environment. In this article, I will provide a variety of examples of environmental damage caused by war. Environmental harm begins even before the conflict, as the military often uses vast resources. Beyond the loss of life, armed conflicts lead to the destruction of ecosystems, pollution of natural resources, and degradation of landscapes—consequences that can last for many years. However, the environmental impacts of war have often been

overlooked, with legal frameworks failing to adequately address the long-term damage to natural resources. In recent decades, the growing recognition of this environmental harm has led to calls for stronger legal responses and greater accountability. This paper will examine the environmental impact of armed conflicts, exploring the challenges of assessing and mitigating environmental damage during war. It will also analyse the current legal frameworks under International Humanitarian Law that address these issues and evaluate whether they are sufficient to respond to the ecological consequences of warfare. Furthermore, the



paper will discuss the potential for future legal reforms to better protect the environment during conflicts, ensuring the protection of both human and environmental rights.

1.Environmental Impact of Armed Conflicts

Armed conflicts not only affect human life but also cause significant damage to the environment. The environmental impacts of war extend to future generations, who will also suffer from these long-term damages. During warfare, many natural resources are destroyed, which negatively affects wildlife and disrupts livelihoods. The use of chemical products in armed conflicts contaminates water resources, impacting both humans and animals that depend on them. Additionally, air and soil pollution caused by the use of chemical weapons and harmful gases further exacerbates the damage. These pollutants degrade the soil, making it less fertile and leading to long-term agricultural challenges and food insecurity in the affected regions.

2.Types of Environmental Damage During Armed Conflicts



Habitat destruction not only harms wildlife but also disrupts the fragile balance of ecosystems. Habitat destruction during armed conflict is a tragic consequence that affects both the environment and the communities that rely on these ecosystems for their livelihood.

ii. Climate Change

Greenhouse gas emissions: Release of greenhouse gases from military activities, such as fuel consumption and explosives.

iii. Displacement of Wildlife

This displacement presents several challenges for the animals, including habitat

destruction, a lack of suitable new habitats, increased human-wildlife conflict, and difficulties in migration. The displacement of wildlife not only threatens their survival but also leads to new challenges related to competition for resources, human-wildlife conflict, and changes in their natural behaviours.

iv. Air and Soil Pollution



Armed conflicts contribute significantly to air and soil pollution. The use of chemical weapons, explosives, and burning materials releases harmful gases and particulate matter into the atmosphere. These pollutants not only contribute to air pollution but can also have long-term health consequences for the population living in conflict zones. Additionally, the chemicals and toxic substances used in warfare can contaminate the soil, making it less fertile and unusable for agricultural purposes. This creates long-term food security challenges for affected regions.

v. Water Resource Contamination

One of the most critical forms of environmental damage during armed conflict is the contamination of water resources. The destruction of water infrastructure (e.g., dams, pipes, and water treatment plants) makes clean water scarce. The use of toxic chemicals, oil, and other hazardous materials during



military operations can also contaminate rivers, lakes, and groundwater sources. This poses serious health risks to both humans and wildlife that depend on these water sources for survival



vi. Land Degradation and Desertification

The use of heavy artillery, landmines, and other military equipment can cause extensive land degradation. Explosions and the presence of military vehicles can damage the land's structure, reducing its ability to support plant life. Land that was once fertile may become barren and unsuitable for agriculture. Over time, this can lead to desertification, particularly in arid and semi-arid regions, turning once-productive land into lifeless desert areas.

3.Pre-War Environmental Impact: Military Preparations and Resource Consumption



Military preparations before a conflict can have a significant impact on the environment, often in ways that are less visible but equally destructive. As countries gear up for war, the need for various resources escalates, and the environmental consequences are profound. The military, in many cases, becomes one of the largest consumers of natural resources and contributors to ecological degradation. **Resource Extraction and Manufacturing:** To prepare for war, nations require vast amounts of raw materials such as metals, oil, and other resources needed to build weapons, vehicles, ammunition, and other military infrastructure. This leads to large-scale mining operations, which can result in habitat destruction, soil degradation, and water pollution. The extraction

process often disturbs ecosystems, harms biodiversity, and generates toxic waste. For instance, mining for minerals like tin, copper, or aluminium can release harmful chemicals into nearby water sources, impacting both wildlife and communities. **Increased Carbon Footprint:** As military forces engage in exercises, build infrastructure, and deploy resources, the carbon footprint increases significantly. The production of weapons and military equipment, the transportation of goods and personnel, and the operation of various military vehicles all contribute to higher greenhouse gas emissions. This exacerbates global climate change and can lead to long-lasting environmental effects, even before the onset of direct combat. **Energy Consumption and Fossil Fuel Use:** The military's reliance on fossil fuels is another major environmental concern. To power tanks, planes, ships, and other military vehicles, a significant amount of energy is required. This energy demand leads to high levels of fuel consumption, contributing to air pollution and climate change. The extraction, refinement, and transportation of oil and gas also carry environmental risks, such as spills and contamination of surrounding environments. These activities often occur in ecologically sensitive areas, such as forests, oceans, or the Arctic, where the impact on local ecosystems can be especially devastating.

4.Challenges in Assessing Environmental Harm During Armed Conflicts

Assessing the environmental harm during armed conflicts is a complex and challenging task. While the immediate effects of war—such as casualties and infrastructure destruction—are often visible and quantifiable, the environmental impact tends to be less direct, sometimes invisible, and harder to measure. Several key challenges complicate the process of evaluating environmental damage during wars: **Destruction of Monitoring Infrastructure:** During armed conflicts, critical environmental monitoring systems and infrastructure, such as weather stations, research facilities, and water quality monitoring equipment, are often



damaged or destroyed. Without these tools, it becomes difficult to gather accurate data on pollution levels, biodiversity loss, or the extent of habitat destruction. In conflict zones, the ongoing destruction hampers the collection of environmental data, which limits the ability to assess the full extent of environmental harm.

Limited Access to Affected Areas: Many conflict zones are difficult or impossible to access due to the presence of active fighting, landmines, or the danger of unexploded ordnance. These hazards make it physically dangerous for environmental experts, researchers, and organizations to enter and assess affected areas. Without proper access, environmental assessments are often incomplete or based on limited information, leading to gaps in understanding the full impact of the conflict.

Lack of Baseline Data: In many conflict areas, especially those that are less developed or in remote regions, there is a lack of baseline environmental data to compare against. Without pre-conflict environmental data, it is challenging to quantify how much damage has occurred. For instance, in the case of deforestation or pollution, assessing the scale of the damage requires data from before the conflict, which may not be readily available or may not have been collected systematically.

Complexity of Environmental Damage: The environmental consequences of war are often multifaceted and difficult to track. They can include chemical contamination, destruction of ecosystems, pollution of air and water, disruption of wildlife, and long-term soil degradation. Each type of damage may have different long-term effects that are difficult to assess in real-time. Furthermore, some environmental impacts, such as biodiversity loss, may not be immediately apparent and might take years or decades to manifest fully.

Use of Environmental Weapons and Tactics: Certain weapons or military tactics used during war can cause severe, lasting environmental harm. Examples include the use of chemical agents, incendiary bombs, and defoliants, as seen in the Vietnam War. The widespread use of

such weapons can contaminate vast areas, making them uninhabitable or ecologically devastated for years. Identifying the full extent of these damages is particularly challenging because the long-term effects of chemical contamination on ecosystems and human populations are not always immediately visible and may persist for decades.

Conflicting Political Interests and Lack of Transparency: In conflict zones, different parties may have conflicting interests, and information about environmental harm may be intentionally withheld or manipulated for political or military reasons. Governments or military forces may downplay the environmental impact to avoid international scrutiny or to maintain morale. Conversely, opposition groups or NGOs may exaggerate environmental damage to gain political support. The lack of objective, transparent, and independent assessments makes it difficult to get an accurate picture of the environmental toll of war.

Long-Term Effects and Delayed Consequences: The environmental consequences of armed conflicts may not be immediately evident. For instance, chemical pollutants, radioactive materials, or destroyed ecosystems can have long-term effects on both the environment and human health. These consequences may only become apparent years or even decades after the conflict have ended. Monitoring these delayed effects requires ongoing assessments that can be difficult to fund or coordinate, especially after the conflict has ceased.

Environmental Degradation and Human Suffering: Environmental harm during armed conflict is often intertwined with human suffering, as communities may be displaced or face serious health risks due to pollution, contaminated water, or destroyed infrastructure. This complicates the assessment of environmental harm, as it must be considered within the broader context of human rights violations and social instability. In such scenarios, it is challenging to separate the environmental consequences from the human



toll, leading to difficulties in prioritizing environmental restoration efforts.

5. The Role of International Humanitarian Law (IHL) in Protecting the Environment

International Humanitarian Law (IHL) regulates the conduct of armed conflicts, primarily focusing on protecting individuals who are not directly participating in hostilities, as well as limiting the methods and means of warfare. Traditionally, the primary concern of IHL has been the protection of human life and dignity, but there is increasing recognition of the environmental damage caused by warfare. As a result, IHL's role in protecting the environment during armed conflict has gained more attention in recent years. This paper examines the key aspects of IHL in relation to environmental protection during armed conflicts.

I. 1. Fundamental Principles of IHL and Their Impact on Environmental Protection

IHL is based on several key principles that indirectly contribute to environmental protection. These principles include **distinction**, **proportionality**, and **necessity**.

1. **Distinction** requires parties to a conflict to differentiate between military objectives and civilian objects. This includes the natural environment, which must not be intentionally targeted unless it directly contributes to military objectives.
2. **Proportionality** ensures that any damage to the environment does not outweigh the military advantage gained. This principle aims to prevent excessive environmental harm in relation to the military objectives.
3. **Necessity** dictates that military actions should be essential for achieving legitimate military objectives, discouraging unnecessary destruction, including of the environment.

By adhering to these principles, IHL seeks to minimize environmental destruction during armed conflicts while prioritizing the protection of civilians and civilian property.

II. 2. Protection of Natural Resources under IHL

IHL provides protections for civilian objects, which can extend to natural resources such as forests, water, and agricultural land. While IHL does not explicitly address environmental protection, the Geneva Conventions and their Additional Protocols prohibit the destruction of civilian property unless it is imperative for military purposes. This can include the protection of natural resources during conflict, ensuring that they are not destroyed unless absolutely necessary for the conduct of hostilities.

For example, **Additional Protocol I** of 1977 explicitly prohibits the use of methods of warfare that cause "widespread, long-term and severe damage" to the natural environment. This provision aims to protect essential natural resources from unnecessary harm during conflict and emphasizes the importance of safeguarding the environment during warfare.

III. 3. Specific Provisions Addressing Environmental Protection

Some provisions within IHL directly address the protection of the environment during armed conflicts. **Article 35(3)** of Additional Protocol I, for example, prohibits the use of warfare methods or means that would result in widespread, long-term, and severe damage to the natural environment. This is a key element in preventing environmental destruction during war.²⁷⁵

Additionally, **Article 55** of the same protocol protects works and installations containing dangerous forces, such as dams, nuclear plants, or oil refineries, from being attacked, as their destruction could result in catastrophic environmental consequences.

²⁷⁵ Additional Protocol I to the Geneva Conventions, 1977, Article 35(3).



These provisions highlight the increasing recognition within IHL that warfare's environmental impact should be limited and that destruction of the environment cannot be justified purely for military advantage.²⁷⁶

IV. Challenges in Enforcing Environmental Protection

Despite the legal provisions in place, enforcing environmental protection under IHL remains a significant challenge. One of the main difficulties lies in proving that environmental damage was caused intentionally or directly related to military necessity. Environmental harm during warfare is often the result of indirect effects, such as the destruction of infrastructure or the pollution of water supplies, which makes it difficult to attribute the damage to a specific military action.

Moreover, in protracted conflicts, the chaos of war can make it difficult to assess the environmental impact, and states may be unwilling to prioritize environmental protection over military objectives. This lack of accountability makes it challenging to implement and enforce environmental safeguards during conflict.

V. Role of International Organizations and NGOs

International organizations, such as the **United Nations (UN)**, the **International Committee of the Red Cross (ICRC)**, and non-governmental organizations (NGOs), play a crucial role in monitoring environmental harm and advocating for the protection of the environment during armed conflicts. The **UN Environment Programme (UNEP)**, for example, has conducted environmental assessments in post-conflict regions and provided support for the recovery of damaged ecosystems.²⁷⁷

NGOs also work on the ground to document environmental violations, provide assistance in post-conflict environmental rehabilitation, and

advocate for stronger enforcement of IHL to prevent environmental harm. The role of these organizations is essential in raising awareness about the environmental consequences of warfare and pushing for more comprehensive legal protections.

VI. The Need for a Modernized Approach to Environmental Protection

While IHL provides some level of protection for the environment during conflict, there is a growing consensus that the framework needs to be updated to address the unique environmental challenges posed by modern warfare. With the rise of new technologies, such as drones, cyber warfare, and environmental manipulation techniques, the traditional methods of warfare pose new threats to the environment. As such, there is an increasing need for a more robust and specific legal framework that addresses environmental protection during armed conflict.

VII. Environmental Recovery Post-Conflict

In addition to preventing environmental harm during conflict, IHL also plays a role in the recovery and restoration of the environment after the conflict has ended. **Article 55 of Additional Protocol I** obligates occupying powers to protect and preserve the natural resources of the territory they control. This responsibility includes ensuring that natural resources are used in a manner that supports the recovery of the region and that displaced populations can return to their homes in safety. International aid organizations often play a key role in post-conflict environmental recovery, working to restore ecosystems, rebuild infrastructure, and address environmental degradation caused by the conflict.

6. Case Studies: Environmental Damage in Past Conflicts

Armed conflicts have historically resulted in significant environmental damage, both as deliberate tactics and as collateral effects of warfare. This analysis examines several key case studies that demonstrate the varied

²⁷⁶ **Additional Protocol I** to the Geneva Conventions, 1977, Article 55.

²⁷⁷ United Nations Environment Programme (UNEP), *Post-conflict Environmental Assessment Reports*.



environmental impacts of warfare and their lasting consequences.

Vietnam War (1955–1975)



This photograph is featured on the cover of the Associated Press' new book 'Vietnam: The Real War' (Abrams, Oct.

The Vietnam War represents one of the most documented cases of deliberate environmental modification for military purposes. Operation Ranch Hand, conducted from 1962 to 1971, involved the aerial spraying of approximately 20 million gallons of herbicides, including the infamous Agent Orange, over Vietnamese forests and agricultural lands.²⁷⁸ This campaign defoliated approximately 20% of South Vietnam's forests and 36% of its mangrove areas.²⁷⁹

The environmental consequences included: Destruction of 14% of South Vietnam's forest cover, Near elimination of coastal mangrove ecosystems, Soil erosion and nutrient depletion, Bioaccumulation of dioxin in the food chain, Long-term ecological succession disruption. The environmental damage in Vietnam prompted the creation of the ENMOD Convention, which prohibits the hostile use of environmental modification techniques.²⁸⁰

²⁷⁸ Stelman, J.M., et al. (2003). "The extent and patterns of usage of Agent Orange and other herbicides in Vietnam." *Nature*, 422(6933), 681-687.

²⁷⁹ Westing, A.H. (2013). "The Environmental Aftermath of Warfare in Vietnam." In A.H. Westing (Ed.), *Ecological Effects of Warfare* (pp. 73-89). Stockholm International Peace Research Institute.

²⁸⁰ Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, Dec. 10, 1976, 1108 U.N.T.S. 151.

Gulf War (1990–1991)

During the 1991 Gulf War, Iraqi forces deliberately released approximately 4-8 million barrels of crude oil into the Persian Gulf and set fire to over 600 Kuwaiti oil wells.²⁸¹ The oil well fires burned for nearly nine months, releasing an estimated 500 million tons of carbon dioxide and producing smoke plumes that reached 10,000 feet high.²⁸²

Environmental impacts included: Severe air pollution across the region, Oil lakes covering 5% of Kuwait's land surface, Contamination of groundwater aquifers, Destruction of desert ecosystems, Marine ecosystem damage affecting fisheries. This conflict highlighted gaps in international humanitarian law regarding environmental protection, as existing legal thresholds failed to adequately address this type of deliberate environmental damage.²⁸³

Kosovo Conflict (1998–1999)



Credit: David Longstreath

NATO bombing of industrial facilities in Serbia during the Kosovo conflict resulted in significant environmental contamination. The bombing of the Pančevo industrial complex released thousands of tons of toxic chemicals into the air, soil, and Danube River.²⁸⁴

²⁸¹ United Nations Environment Programme. (2003). "Desk Study on the Environment in Iraq." UNEP, Nairobi.

²⁸² Husain, T. (1998). "Kuwaiti Oil Fires: Regional Environmental Perspectives." Elsevier Science Ltd.

²⁸³ Austin, J.E., & Bruch, C.E. (Eds.). (2000). "The Environmental Consequences of War: Legal, Economic, and Scientific Perspectives." Cambridge University Press

²⁸⁴ United Nations Environment Programme and United Nations Centre for Human Settlements. (1999). "The Kosovo Conflict: Consequences for the Environment and Human Settlements." UNEP, Geneva.



Photographs by Wade Goddard July 17 - 31 Oct 2018

Key environmental impacts included: Release of 2,100 tons of ethylene dichloride and 460 tons of vinyl chloride monomer, Mercury contamination of the Danube River, Elevated levels of carcinogens in surrounding communities, Destruction of biodiversity in affected waterways. The United Nations Environment Programme (UNEP) conducted post-conflict environmental assessments in Kosovo, establishing an important precedent for environmental monitoring in conflict zones.²⁸⁵

Democratic Republic of Congo Conflict (1996–Present)

The ongoing conflict in the Democratic Republic of Congo (DRC) demonstrates how protracted warfare affects protected areas and wildlife. The conflict has driven illegal resource exploitation in Virunga National Park and other protected areas.²⁸⁶

Environmental consequences include: Deforestation for charcoal production, poaching of endangered wildlife, including mountain gorillas, Illegal mining causing water contamination, Displacement of communities into ecologically sensitive areas This conflict illustrates how governance breakdown during warfare enables environmental exploitation that would otherwise be regulated in peacetime.²⁸⁷

²⁸⁵ Schulz, C. (2009). "Environmental service-provision in post-conflict peacebuilding." *International Peacekeeping*, 16(4), 485-498.

²⁸⁶ Gaynor, K.M., et al. (2016). "War and wildlife: linking armed conflict to conservation." *Frontiers in Ecology and the Environment*, 14(10), 533-542.

²⁸⁷ Baral, N., & Heinen, J.T. (2005). "The Maoist people's war and conservation in Nepal." *Politics and the Life Sciences*, 24(1), 2-11.

Syrian Civil War (2011–Present)

The Syrian conflict has resulted in multifaceted environmental damage across urban and rural landscapes. Particularly concerning has been the targeting of oil infrastructure and damage to water supply systems.²⁸⁸

Notable impacts include: Contamination from makeshift oil refining operations, Agricultural land abandonment leading to desertification, Collapse of environmental governance systems, Damage to historical sites with cultural and ecological significance

The Syrian case demonstrates the complex interplay between environmental damage, cultural heritage destruction, and humanitarian crises.²⁸⁹



Kurdish Syrian girls among destroyed buildings in the Syrian Kurdish town of Kobane, also known as Ain al-Arab, 22 March 2015. Photograph: Yasin Akgul/AFP/Getty Images

7. Legal Responses to Environmental Harm in Armed Conflicts

The legal framework addressing environmental harm during armed conflicts has evolved significantly over the past century. This evolution reflects growing awareness of warfare's ecological impacts and the need for accountability mechanisms. This analysis examines the key legal instruments, principles, and enforcement mechanisms that govern environmental protection in the context of armed conflict.

²⁸⁸ Gleick, P.H. (2014). "Water, Drought, Climate Change, and Conflict in Syria." *Weather, Climate, and Society*, 6(3), 331-340.

²⁸⁹ United Nations Environment Programme. (2018). "Environmental Issues in Areas Retaken from ISIL: Mosul, Iraq." UNEP, Nairobi.



arrival of United Nations Under-Secretary-General for Peace Operations Jean Pierre Lacroix in Bunia, eastern Congo, on Tuesday, February 22, 2022. |

Geneva Conventions and Additional Protocols

The foundational documents of international humanitarian law (IHL) contain provisions that indirectly protect the environment through the protection of civilian objects. Additional Protocol I to the Geneva Conventions (1977) marks the first explicit protection of the environment in armed conflict through two key provisions: **Article 35(3)** prohibits "methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment."²⁹⁰

Article 55 further establishes that "care shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage." These provisions established the "triple standard" threshold that requires environmental damage to be widespread, long-term, and severe to constitute a violation—a standard that has proven difficult to apply in practice.

ENMOD Convention the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (1976) emerged as a direct response to environmental warfare tactics used during the Vietnam War. ENMOD prohibits the hostile use of environmental modification techniques having "widespread, long-lasting or severe effects."²⁹¹ Unlike Additional Protocol I, ENMOD uses a

disjunctive formulation ("or" rather than "and"), creating a lower threshold for violations.

Rome Statute of the International Criminal Court the Rome Statute represents a significant development by establishing individual criminal responsibility for environmental war crimes. Article 8(2)(b)(iv) criminalizes: "Intentionally launching an attack in the knowledge that such attack will cause... widespread, long-term and severe damage to the natural environment which would be clearly excessive in relation to the concrete and direct overall military advantage anticipated."²⁹² This provision incorporates the principle of proportionality while maintaining the high threshold of Additional Protocol I.

Customary International Humanitarian Law the International Committee of the Red Cross (ICRC) has identified several rules of customary international law relevant to environmental protection: **Rule 43:** The general principles on the conduct of hostilities apply to the natural environment. **Rule 44:** Methods and means of warfare must be employed with due regard to the protection and preservation of the natural environment. **Rule 45:** The use of methods or means of warfare designed to cause widespread, long-term and severe damage to the natural environment is prohibited.²⁹³ These customary rules apply to all states, regardless of treaty ratification, thus broadening the scope of environmental protections.

Principles of International Environmental Law Several principles of international environmental law have increasingly been applied to armed conflict situations:

Precautionary Principle: This principle requires that where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a

²⁹⁰ Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), June 8, 1977, 1125 U.N.T.S. 3, art. 35(3).

²⁹¹ Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, Dec. 10, 1976, 1108 U.N.T.S. 151, art. 1

²⁹² Rome Statute of the International Criminal Court, July 17, 1998, 2187 U.N.T.S. 90, art. 8(2)(b)(iv).

²⁹³ Henckaerts, J.M., & Doswald-Beck, L. (2005). Customary International Humanitarian Law, Volume I: Rules. Cambridge University Press.



reason to postpone cost-effective measures to prevent environmental degradation.²⁹⁴

Polluter Pays Principle This principle establishes that the party responsible for pollution should bear the costs of containment and remediation. In the context of armed conflict, this principle has informed reparations frameworks, such as the United Nations Compensation Commission following the 1991 Gulf War.

Principle of Sustainable Development This principle emphasizes the need to balance present needs with the ability of future generations to meet their own needs, even in post-conflict reconstruction contexts.²⁹⁵

Enforcement Mechanisms

1. International Courts and Tribunals

The International Court of Justice (ICJ) has addressed environmental damage in armed conflict in advisory opinions and contentious cases. In its 1996 Advisory Opinion on the Legality of the Threat or Use of nuclear weapons, the ICJ recognized that "the environment is not an abstraction but represents the living space, the quality of life and the very health of human beings, including generations unborn."²⁹⁶ The International Criminal Court (ICC) has jurisdiction over environmental war crimes under the Rome Statute, though no cases focusing primarily on environmental damage have been prosecuted to date.

2. UN Compensation Commission

Following the 1991 Gulf War, the United Nations Compensation Commission (UNCC) processed claims for environmental damage resulting from Iraq's invasion and occupation of Kuwait. The UNCC awarded approximately \$5.2 billion for environmental remediation and restoration, establishing an

important precedent for post-conflict environmental reparations.²⁹⁷

Recent Developments

1. ILC Draft Principles

The International Law Commission's Draft Principles on Protection of the Environment in Relation to Armed Conflicts (2019) represent the most comprehensive attempt to clarify and develop the legal framework. These principles address environmental protection before, during, and after armed conflicts, including provisions on: Preventive measures, Corporate due diligence, Environmental assessments in occupation, post-conflict environmental restoration²⁹⁸

2. ICRC Updated Guidelines

The ICRC's 2020 updated Guidelines on the Protection of the Natural Environment in Armed Conflict provide practical guidance on implementing existing IHL provisions. These guidelines clarify how general IHL principles apply to environmental protection and offer specific recommendations for military manuals and training.²⁹⁹

Challenges and Limitations Despite these advancements, significant challenges remain:

1. Threshold Problem

The "widespread, long-term and severe" standard presents a high threshold that is difficult to meet in practice. The terms lack precise definition, with "long-term" variously interpreted as spanning decades or generations.

2. Attribution Difficulties

Establishing causation between specific military actions and environmental damage presents scientific and legal challenges, particularly in complex conflict environments with multiple actors.

²⁹⁴ Rio Declaration on Environment and Development, June 14, 1992, UN Doc. A/CONF.151/26 (Vol. I), principle 15.

²⁹⁵ Report of the World Commission on Environment and Development, "Our Common Future," Dec. 11, 1987, UN Doc. A/42/427.

²⁹⁶ Legality of the Threat or Use of nuclear weapons, Advisory Opinion, 1996 I.C.J. 226, 29 (July 8).

²⁹⁷ United Nations Compensation Commission, Report and Recommendations made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims, UN Doc. S/AC.26/2005/10 (2005).

²⁹⁸ International Law Commission, Draft Principles on Protection of the Environment in Relation to Armed Conflicts, UN Doc. A/74/10 (2019).

²⁹⁹ International Committee of the Red Cross. (2020). Guidelines on the Protection of the Natural Environment in Armed Conflict. ICRC, Geneva



3. Implementation Gaps

Many states have not incorporated specific environmental protection provisions into their military manuals or domestic legislation, creating implementation gaps.

4. Non-International Armed Conflicts

The legal framework for environmental protection in non-international armed conflicts remains less developed than that for international armed conflicts, despite the prevalence of civil wars. The legal framework addressing environmental harm in armed conflicts has evolved significantly but remains a work in progress. While explicit protections now exist in treaty and customary law, challenges in implementation, enforcement, and threshold definition persist. Recent developments like the ILC Draft Principles and updated ICRC Guidelines signal a growing recognition of the need to strengthen environmental protections before, during, and after armed conflicts. Effective environmental protection in wartime ultimately requires a combination of clear legal standards, political will, and practical implementation mechanisms.

8. Challenges in Enforcing Environmental Protection Laws During Conflicts

The enforcement of environmental protection laws during armed conflicts presents unique and substantial challenges that extend beyond typical peacetime environmental governance. While the legal framework addressing environmental harm in warfare has evolved considerably, implementation and enforcement remain problematic. This analysis examines the primary obstacles to effective enforcement of environmental protections during conflict situations.

Legal Framework Challenges

1. Definitional Ambiguities

A fundamental challenge lies in the ambiguous terminology used in key legal instruments. The threshold of "widespread, long-term and

severe" damage required by Additional Protocol I to the Geneva Conventions lacks precise definition.³⁰⁰ This ambiguity creates several enforcement problems: "Long-term" has been variously interpreted as spanning decades (according to ICRC commentary) or a season (according to ENMOD understanding), "Widespread" lacks specific geographic parameters, "Severe" provides no quantitative benchmarks for assessment. These definitional gaps create difficulties for tribunals and courts attempting to determine violations, effectively raising the bar for prosecution.

2. Fragmented Legal Regime

Environmental protection during armed conflict is governed by a patchwork of legal regimes: International humanitarian law (IHL), International environmental law (IEL), International human rights law, International criminal law, Laws of state responsibility. This fragmentation creates jurisdictional gaps and overlaps. For instance, while IHL primarily applies during conflict, certain IEL principles may be suspended or modified during hostilities, creating uncertainty about which standards apply.³⁰¹ The relationship between these regimes remains contentious and unclear in practice.

3. Principle of Military Necessity

Environmental protection frequently confronts the principle of military necessity, which permits actions that would otherwise be prohibited if deemed necessary to achieve military objectives. The balancing of environmental concerns against military advantage creates a subjective standard that favors military considerations.³⁰² Military actors often invoke this principle to justify actions with environmental consequences, making enforcement difficult

³⁰⁰ Bothe, M., Bruch, C., Diamond, J., & Jensen, D. (2010). "International law protecting the environment during armed conflict: gaps and opportunities." *International Review of the Red Cross*, 92(879), 569-592.

³⁰¹ Vöneky, S. (2000). "A New Shield for the Environment: Peacetime Treaties as Legal Restraints of Wartime Damage." *Review of European Community & International Environmental Law*, 9(1), 20-32.

³⁰² Dinstein, Y. (2016). "The Principle of Proportionality." In M.N. Schmitt & L. Arimatsu (Eds.), *The Law of Armed Conflict: Past, Present, and Future* (pp. 261-288). Martinus Nijhoff Publishers.



when legitimate military objectives can be claimed.

Institutional and Practical Challenges

1. Evidence Collection and Attribution

Gathering evidence of environmental violations presents significant practical difficulties: Access barriers to conflict zones for environmental experts, Security concerns preventing timely assessment, Destruction of evidence through continued hostilities, Difficulty distinguishing conflict-related damage from pre-existing environmental degradation, Attribution challenges in multi-actor conflicts. Scientific uncertainty regarding causation further complicates enforcement. Environmental damage often results from cumulative actions rather than singular events, making individual responsibility difficult to establish.³⁰³

2. Jurisdictional Limitations

Courts and tribunals face jurisdictional constraints when addressing environmental violations: The International Criminal Court (ICC) can only prosecute nationals of state parties or crimes committed on their territory, unless the UN Security Council refers a situation, Ad hoc tribunals have limited temporal and geographic jurisdiction, Domestic courts may lack capacity during conflict or face sovereignty barriers when addressing transboundary harm. These limitations create accountability gaps, particularly when violations occur in non-state party territories or involve powerful states with UN Security Council veto power.³⁰⁴

3. Prioritization Challenges

During armed conflicts, environmental concerns are frequently subordinated to immediate humanitarian needs and security considerations. This de-prioritization manifests in several ways: Resource allocation favouring immediate humanitarian response over environmental assessment, Media and political attention focusing on human casualties rather

than environmental damage, Limited funding for environmental monitoring and remediation, Institutional focus of peacekeeping operations on security rather than environmental protection. This systemic deprioritization results in delayed responses to environmental damage, often until the post-conflict phase when remediation becomes more difficult and costly.³⁰⁵

Implementation Gaps

4. Lack of Domestic Integration:

Many states have not adequately incorporated environmental protection provisions into: Military manuals and training, Domestic legislation criminalizing environmental war crimes, Rules of engagement for armed forces, Contingency planning for environmental emergencies during conflict. This lack of integration means that even when international law provides theoretical protection, operational guidance at the field level may be absent.³⁰⁶

Limited Monitoring Capacity : Effective enforcement requires robust monitoring mechanisms, which are often lacking in conflict situations: Destruction of environmental monitoring infrastructure during conflict, Evacuation of technical personnel, Lack of baseline environmental data for comparison, Limited satellite and remote sensing capabilities in many regions, Absence of established protocols for environmental damage assessment during active conflict. Without effective monitoring, violations may go undetected until significant and potentially irreversible damage has occurred.³⁰⁷

Enforcement Asymmetries

Enforcement capabilities vary significantly between states and conflicts, creating asymmetric application of environmental protections: Well-resourced states may have

³⁰³ Jensen, D., & Lonergan, S. (Eds.). (2012). "Assessing and Restoring Natural Resources in Post-Conflict Peacebuilding." Routledge.

³⁰⁴ Freeland, S. (2015). "Addressing the Intentional Destruction of the Environment during Warfare under the Rome Statute of the International Criminal Court." Intersentia.

³⁰⁵ United Nations Environment Programme. (2009). "Protecting the Environment During Armed Conflict: An Inventory and Analysis of International Law." UNEP, Nairobi.

³⁰⁶ International Committee of the Red Cross. (2020). "Guidelines on the Protection of the Natural Environment in Armed Conflict." ICRC, Geneva.

³⁰⁷ Weir, D. (2015). "The Conflict Pollution Monitoring Conundrum." In G. Machlis et al. (Eds.), *The Environmental Consequences of War* (pp. 93-109). Cambridge University Press.



greater capacity to document violations by adversaries, Powerful states may avoid accountability through political influence, Non-state armed groups typically lack formal accountability mechanisms, "Victors' justice" may emphasize violations by defeated parties These asymmetries undermine the normative force of environmental protections by creating perceptions of selective enforcement.³⁰⁸

Post-Conflict Challenges

5. Reparations and Liability

Establishing liability for environmental damage and securing appropriate reparations presents significant challenges: Valuation difficulties for environmental damage, Limited precedent beyond the UN Compensation Commission for Iraq-Kuwait, Absence of dedicated funding mechanisms for environmental remediation, Competition with other reconstruction priorities for limited resources The lack of standardized approaches to environmental reparations creates uncertainty and inconsistency in post-conflict accountability.³⁰⁹

6. Continuity of Enforcement

Environmental damage often persists long after conflicts end, yet enforcement mechanisms may be temporally limited: Ad hoc tribunals typically have defined temporal mandates, Attention to accountability often diminishes as conflicts recede from public awareness, Statute of limitations issues for environmental crimes in domestic jurisdictions, Political pressure to "move on" during reconciliation processes. This temporal disconnects between environmental harm (which may manifest over decades) and accountability mechanisms (which often operate in shorter timeframes) creates enforcement gaps.³¹⁰

³⁰⁸ Hulme, K. (2004). "War Torn Environment: Interpreting the Legal Threshold." Martinus Nijhoff Publishers.

³⁰⁹ Payne, C. (2016). "Legal Liability for Environmental Damage: The United Nations Compensation Commission and the 1990-1991 Gulf War." In C. Stahn et al. (Eds.), *Environmental Protection and Transitions from Conflict to Peace* (pp. 329-366). Oxford University Press.

³¹⁰ Drumbl, M.A. (1998). "Waging War Against the World: The Need to Move from War Crimes to Environmental Crimes." *Fordham International Law Journal*, 22(1), 122-153.

Emerging Approaches and Potential Solutions

7. Enhanced Prevention Mechanisms

Preventive approaches that may strengthen enforcement include: Designation of protected environmental zones during conflict, Pre-conflict environmental baseline assessments, Integration of environmental protection into military planning and training, Development of environmental early warning systems Preventive mechanisms can reduce the need for after-the-fact enforcement by limiting damage proactively.³¹¹

8. Strengthened

Coordination

Improved coordination among relevant institutions could address fragmentation challenges: Joint assessment protocols between humanitarian and environmental agencies, Inclusion of environmental experts in peacekeeping missions, Coordination between international courts and environmental treaty bodies, Enhanced role for UN Environment Programme in conflict situations These coordination mechanisms can leverage existing capabilities more effectively.³¹²

Institutional

9. Normative Development

Ongoing normative development may clarify enforcement standards: ILC Draft Principles on Protection of the Environment in Armed Conflicts, updated military manuals incorporating environmental protection, Development of specialized environmental courts or tribunals, Integration of environmental considerations into transitional justice mechanisms. These developments may gradually strengthen the normative framework governing environmental protection during armed conflict.³¹³ Enforcing environmental protection laws during armed conflicts presents multifaceted challenges spanning legal, institutional, practical, and post-conflict

³¹¹ Bruch, C., Muffett, C., & Nichols, S.S. (Eds.). (2016). "Governance, Natural Resources, and Post-Conflict Peacebuilding." Routledge

³¹² Rayfuse, R. (Ed.). (2014). "War and the Environment: New Approaches to Protecting the Environment in Relation to Armed Conflict." Brill Nijhoff.

³¹³ Jacobsson, M. (2017). "Report of the Special Rapporteur on the Protection of the Environment in Relation to Armed Conflicts." International Law Commission, A/CN.4/700.



dimensions. While significant progress has been made in developing the normative framework, implementation and enforcement remain problematic. Addressing these challenges requires a comprehensive approach that includes legal clarification, institutional strengthening, capacity building, and political commitment. As environmental security becomes increasingly recognized as an integral component of human security, strengthening enforcement mechanisms for environmental protection during armed conflicts represents a critical frontier in the development of international humanitarian law.

9. The Future of Legal Protections for the Environment in Armed Conflicts

As the international community becomes more aware of the devastating effects of armed conflict on the environment, the future of legal protections for the environment in warfare is expected to be shaped by several key trends and developments.

1. **Strengthening of Existing Legal Frameworks:** Existing international laws, like the Geneva Conventions and their Additional Protocols, already include some environmental protections, but these are often seen as insufficient. Future efforts may involve refining these laws to explicitly address environmental damage caused by armed conflict, expanding protections to cover broader aspects of environmental harm, such as the destruction of natural resources and the long-term effects of military operations.
2. **Recognition of Environmental Damage as a War Crime:** There is growing recognition of the environmental consequences of war, leading to calls for more specific legal provisions. In the future, environmental destruction during armed conflict could be treated more seriously, potentially being classified as a war crime, as seen in the case of the destruction of the environment being

linked to crimes against humanity. This could encourage states to adopt stricter measures to minimize environmental harm in warfare.

3. **Incorporation of Environmental Law into Military Doctrine:** As environmental issues become more central to global security, it is likely that military forces will adopt stricter guidelines and operational strategies to minimize environmental destruction. This could include modifying tactics to avoid harm to ecosystems and reducing the use of weapons that cause lasting environmental damage, such as landmines and chemical weapons.
4. **Expansion of Monitoring and Accountability Mechanisms:** Advances in technology, including satellite imagery and environmental sensors, are increasingly being used to monitor environmental damage in conflict zones. In the future, these technologies could play a pivotal role in documenting violations of environmental protection laws, improving accountability and ensuring that perpetrators of environmental harm are held responsible. International courts may also see a greater role for environmental damage claims.
5. **Integration of Environmental Protection into Peacebuilding and Post-Conflict Reconstruction:** Post-conflict reconstruction often overlooks environmental restoration. Moving forward, there is likely to be a stronger emphasis on incorporating environmental protection into peacebuilding efforts, ensuring that damaged ecosystems are restored and that the environment is prioritized in rebuilding efforts. This could be part of a broader effort to promote sustainable development in post-conflict areas.



6. **Engagement of Non-Governmental Organizations and Civil Society:**

The role of non-governmental organizations (NGOs) and civil society in advocating for stronger environmental protections during conflict is expected to grow. These groups are increasingly involved in raising awareness, documenting environmental damage, and pushing for legal reform. In the future, NGOs might play a crucial role in holding states and other actors accountable for environmental destruction during armed conflict.

The future of legal protections for the environment in armed conflicts will likely see a more integrated and robust legal approach. International law will evolve to better address environmental harm caused by warfare, with stronger enforcement mechanisms, greater accountability, and a focus on sustainability and restoration in post-conflict settings. The growing recognition of the links between environmental protection, human rights, and international security will drive these changes forward.

10. **Conclusion: Moving Forward with Stronger Legal Frameworks**

The environmental impact of armed conflicts presents a pressing challenge that demands more robust legal frameworks under international humanitarian law (IHL). While existing laws, such as the Geneva Conventions and the Environmental Modification Convention, provide some level of protection, they are often insufficient in addressing the full scope of environmental damage caused by modern warfare. As armed conflicts evolve and their environmental consequences become increasingly devastating, there is a critical need for stronger, more comprehensive legal instruments. Moving forward, the international community must prioritize the development of clear and enforceable legal provisions that specifically address environmental harm in conflict zones. This could include the creation of

new treaties or the expansion of existing protocols to explicitly protect natural resources, ecosystems, and biodiversity during warfare. Enhanced accountability mechanisms should also be put in place, ensuring that all parties—state and non-state actors alike—are held responsible for any environmental destruction. In addition, greater emphasis should be placed on the restoration of the environment in post-conflict scenarios. Integrating environmental protection into peacebuilding and reconstruction efforts is essential to ensure long-term stability and sustainable recovery. As the role of climate change as a driver of conflict grows, the connection between environmental sustainability and global security will become even more apparent, making the protection of the environment in warfare a critical issue. Ultimately, the future of environmental protections in armed conflicts will rely on a multi-faceted approach that combines legal reforms, stronger enforcement mechanisms, and a commitment to sustainable practices. By recognizing the far-reaching consequences of environmental destruction during war, and acting collectively to address them, the international community can foster a more just and sustainable global order where the environment is safeguarded, even in times of conflict.

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