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The Silent Casualty: Environmental Destruction As a Systemic Consequence Of Ongoing Armed Conflict

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ABSTRACT

Armed conflict has always exacted a human toll, but the environmental dimensions of modern warfare have received comparatively scant attention in international legal scholarship and policy discourse. As of 2023, more than 170 active armed conflicts were recorded globally, each generating cascading environmental consequences that persist long after the guns fall silent. This paper examines the multidimensional environmental impact of ongoing wars, with particular focus on the conflicts in Ukraine and Gaza two of the most environmentally destructive armed conflicts of the contemporary era along with the ongoing Isreal and Iran war. Drawing on empirical data from the Initiative on GHG Accounting of War, the United Nations Environment Programme (UNEP), the International Committee of the Red Cross (ICRC), and other international organizations, the paper traces the environmental footprints of warfare across five principal domains: greenhouse gas emissions, soil and land contamination, destruction of water and sanitation infrastructure, deforestation and biodiversity loss, and the collapse of nuclear safety margins. The paper further interrogates the adequacy of the existing international legal framework encompassing Additional Protocol I to the Geneva Conventions, customary international humanitarian law (IHL), and the Rome Statute of the International Criminal Court to address the scale and permanence of war-induced environmental harm. It argues that the cumulative evidence from ongoing conflicts reveals a structural deficiency in international law: the threshold for criminalising environmental destruction during armed conflict is so exacting as to be practically unenforceable, leaving ecosystems without meaningful legal protection. The paper concludes by evaluating emerging reform proposals, including the codification of ecocide as a fifth international crime under the Rome Statute, and argues that genuine environmental accountability for war requires both doctrinal reform and institutional political will.

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1. Introduction

The legal and social discourse surrounding abortion in India has encouraged significant

When a missile strikes a city, the casualties listed in news reports are human. The buildings reduced to rubble, the hospitals shuttered by power failures, the agricultural fields carved into trenches, these attract varying degrees of international attention. What goes largely unrecorded, unquantified, and unanswered for is the harm inflicted upon the natural world: the soils poisoned by unexploded ordnance and heavy metals, the rivers running with untreated sewage from collapsed sanitation networks, the forests and wetlands consumed by combat-ignited wildfires, the greenhouse gases emitted at a scale that disrupts the global climate systems upon which all life depends. The environment i.e. air, water, land, biodiversity, climate is the silent casualty of every war. Unlike a human victim, it cannot testify before a tribunal. Unlike a destroyed hospital, it appears in no damage assessment. And yet its degradation threatens, over the long arc of time, more lives than the direct violence that produced it.1

The scale of this problem is considerable. As the United Nations has documented, over 170 armed conflicts were active in 2023 alone, displacing nearly 120 million people and destabilising ecosystems across multiple continents.2 The Russia-Ukraine war, now in its fourth year, has generated cumulative greenhouse gas emissions of 230 million tonnes of CO_2 equivalent more than the combined annual emissions of Austria, Hungary, the Czech Republic, and Slovakia.3 In Gaza, two years of intensive bombardment have created over 40 million tonnes of debris laced with hazardous materials, destroyed more than 88 percent of water wells, and reduced nearly all cropland to rubble or inaccessibility.4 These are not incidental by-products of conflict; they are structural features of how modern wars are waged, and they demand structural legal responses.

This paper proceeds in five substantive sections. Section II establishes the conceptual framework connecting armed conflict to environmental harm. Section III examines the empirical dimensions of war's environmental impact across five key domains. Section IV analyses the current international legal architecture for environmental protection in armed conflict, identifying critical deficiencies. Section V evaluates proposed reforms, including the ecocide proposal and the Paris Agreement's relationship to military emissions. Section VI concludes with reflections on the imperative of environmental accountability in the law of war.

2. Armed Conflict and Environmental Harm: The Conceptual Framework

2.1 The Tripartite Structure of War-Induced Environmental Harm

Environmental harm attributable to armed conflict does not arise from a single source or follow a linear causal pathway. Scholarship in the field identifies a tripartite structure of war-induced environmental harm: direct harm, arising from weapons use, military operations, and the

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deliberate targeting of environmental infrastructure; indirect harm, produced by the collapse of civilian governance systems that would ordinarily manage pollution, waste, and ecosystem conservation; and long-term harm, consisting of post-conflict contamination legacies landmines, unexploded ordnance (UXO), heavy metals, and radioactive residues that remain embedded in soil and water systems for decades after the cessation of hostilities.5

Each category raises distinct legal and scientific challenges. Direct harm is most readily attributable to specific actors and may, in principle, engage international criminal responsibility. Indirect harm is diffuse and systemic, arising from the unravelling of the civilian infrastructure that maintains environmental integrity: when sewage treatment plants are destroyed, raw effluent flows into groundwater without any single actor intending that specific outcome. Long-term harm poses perhaps the deepest challenge: its consequences unfold over generations, its causal chain linking specific military decisions to specific ecological injuries is technically complex, and the affected populations may include people not yet born at the time the damage was inflicted.

2.2 The Environment as a Weapon and a Victim

International legal discourse has historically distinguished between the environment as a victim of armed conflict collateral damage in the pursuit of military objectives and the environment as a weapon of warfare, deliberately targeted or manipulated to harm the adversary and the civilian population it sustains. The distinction has profound legal significance. The 1977 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD) addresses the weaponization of environmental processes,6 while Additional Protocol I to the Geneva Conventions of 1949 prohibits methods of warfare expected to cause widespread, long-term, and severe damage to the natural environment.7 In practice, the boundary between these categories is increasingly blurred in contemporary conflicts: the destruction of water desalination plants, the deliberate burning of agricultural land, and the contamination of aquifers are simultaneously acts of war against a civilian population and acts of destruction directed at the ecosystems that sustain that population.

Barry S. Levy, writing in Frontiers in Public Health in 2025, has characterised war's environmental effects as encompassing the contamination of soil, water and air; the destruction of critical infrastructure; the displacement of populations whose movement generates additional environmental stress; and the chilling of the institutional capacities environmental agencies, emergency response systems, conservation bodies necessary to manage ecological harm.8 This systemic character of war's environmental impact demands a holistic analytical lens, one that refuses to treat ecosystem destruction as a secondary matter subordinate to the humanitarian agenda and instead recognises that environmental degradation is itself a humanitarian catastrophe, implicating food security, water access, disease transmission, and long-term

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habitability.

3. The Empirical Dimensions of War's Environmental Impact

3.1 Greenhouse Gas Emissions and Climate Disruption

The relationship between armed conflict and greenhouse gas (GHG) emissions has only recently attracted the systematic empirical attention it deserves. Two developments in particular have driven this scholarly and policy turn: the publication of rigorous emission accounting studies by the Initiative on GHG Accounting of War, and the growing recognition that the Paris Agreement's national emission reporting frameworks are structurally incapable of capturing war-generated emissions.9

The Russia-Ukraine conflict provides the most extensively documented case study. An assessment published in the journal Science of the Total Environment in 2024, authored by researchers from IIASA, Oregon State University and partner institutions, estimated that the war generated substantial unaccounted greenhouse gas emissions through military vehicle fuel consumption, ammunition and explosives manufacture and use, infrastructure destruction, industrial collapse, and conflict-induced forest fires.10 The comprehensive three-year assessment by the Initiative on GHG Accounting of War, published in February 2025, placed total war-related emissions at 230 million tonnes of CO_2 equivalent from 24 February 2022 to 23 February 2025. Of this total, warfare activities encompassing the fuel consumption of tanks, fighter jets, and artillery, the manufacturing of munitions, and the construction of fortifications accounted for 82.1 Mt CO_2e, or 36 percent of the total11 Infrastructure reconstruction, representing 27 percent, and conflict-induced landscape fires, representing a share that doubled in 2024 alone, constituted the remaining primary categories. Applying the social cost of carbon at $185 per tonne, the climate-related liability attributable to Russia's invasion exceeds $42 billion.12

These figures carry a significance that extends beyond the bilateral Ukraine-Russia context. International policy frameworks for the net-zero transition presuppose, as the IIASA researchers observed, a world without large-scale armed conflict.13 The Paris Agreement, concluded in 2015, allowed countries to voluntarily report military emissions an exemption that traces its lineage to a deliberate political choice at the Kyoto Protocol negotiations in 1997 to exclude military activities from national emissions commitments.14 The practical consequence is that some of the largest and most rapidly growing sources of GHG emissions on the planet operate entirely outside the architecture of global climate governance. Ukraine's announcement at COP30 in November 2025 that it would seek $44 billion in climate damages from Russia the first such reparations claim in history marks the opening of a new front in the intersection of international climate law and the law of armed conflict.15

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3.2 Soil Contamination, Landmines, and Agricultural Destruction

Land contamination is among the most persistent and socially devastating of war's environmental consequences. The mechanisms are multiple: explosives, including artillery shells and air-dropped munitions, deposit heavy metals lead, mercury, arsenic, copper, tungsten directly into topsoil; unexploded ordnance (UXO) renders vast areas of agricultural and residential land physically inaccessible for decades; military vehicle tracks and fortification construction disrupt soil structure and accelerate erosion; and the combustion of military equipment and infrastructure releases organic pollutants that persist in soil matrices.16

Ukraine's agricultural landscape illustrates these dynamics with particular acuity. Agriculture constitutes 11 percent of Ukraine's GDP and accounted for 60 percent of its exports worth 23.3 billion euros in 2023.17 The Joint Research Centre of the European Commission documented in its 2025 environmental status report that Russian military operations have released toxic elements including lead, mercury, and arsenic into Ukrainian soils with potential to penetrate food chains and pose long-term public health risks. Approximately 40 percent of Ukraine's soils were already affected by erosion prior to the invasion; war-induced disturbance has compounded this vulnerability substantially.18 Ukraine's mine action authorities have estimated that land contamination from explosives affects a territory requiring clearance costs projected at $34.6 billion, with a timeframe for completion measured in decades rather than years.19

In Gaza, the agricultural devastation has been still more comprehensive and still more swiftly inflicted. A geospatial assessment by the Food and Agriculture Organization and the United Nations Satellite Centre published in May 2025 reported that less than five percent of Gaza's total cropland area remained cultivable, with more than 80 percent of the total 15,053 hectares damaged and 77.8 percent inaccessible to farmers.20 By late July 2025, 86 percent of Gaza's agricultural land had sustained damage. In the Gaza governorate itself, every greenhouse had been destroyed.21 Satellite imagery analysed by Forensic Architecture at Goldsmiths, University of London documented that by the end of February 2024, Israeli military forces had destroyed over 65 square kilometres of farms and orchards 38 percent of Gaza's total agricultural area with tractors, tanks, and vehicles used directly to uproot crops and orchards, and over 2,000 agricultural sites replaced with military earthworks.22

3.3 Water and Sanitation Infrastructure

Access to safe water is both a human right and an ecological foundation. When armed conflict destroys water and sanitation infrastructure desalination plants, sewage treatment facilities, pumping stations, pipelines the consequences are simultaneously humanitarian and environmental: populations are denied safe drinking water, disease transmission accelerates, and untreated wastewater flows directly into surface water bodies and aquifers, generating contamination that may persist for years.23

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Gaza's water crisis, deepened dramatically by the conflict that began in October 2023, represents one of the most severe documented cases of wartime destruction of hydrological infrastructure. By mid-2024, 88 percent of Gaza's water wells and all desalination plants had been destroyed or rendered non-operational.24 In 2025 assessment published in the American Journal of Public Health documented that restrictions on water access, combined with infrastructure destruction, had produced a 94 percent decrease in total water volume available to Gaza's population compared to the pre-war baseline. Up to 70 percent of the population reported consuming contaminated or salinised water, with consequent surges in dehydration, diarrhoeal disease, jaundice, and waterborne illness.25 The environmental dimension of this crisis extended to the Mediterranean Sea: the Norwegian Refugee Council documented that the closure of sewage treatment plants in October 2023, following fuel supply blockades, resulted in over 130,000 cubic metres of untreated sewage being discharged daily into the sea.26 By February 2025, 73 of Gaza's 84 sewage pumping stations had been destroyed.27

In Ukraine, the destruction of water infrastructure has been documented across industrial and civilian sectors. The Kakhovka dam breach of June 2023 resulting from the destruction of the dam triggered a humanitarian and ecological catastrophe, flooding vast tracts of agricultural and wetland territory, disrupting water supplies for millions, and inflicting long-term damage to the delta ecosystems of the Dnipro River.28 The Joint Research Centre's 2025 assessment further documented chemical contamination of inland waterways and marine infrastructure with likely long-term consequences for biodiversity in the Black Sea and Sea of Azov.29

3.4 Deforestation, Biodiversity Loss, and Landscape Fires

Forested ecosystems serve as carbon sinks, biodiversity reservoirs, hydrological regulators, and buffers against soil erosion. Armed conflict attacks forests through multiple pathways: direct fire from munitions ignites landscapes; military activity removes the governance capacity that prevents and suppresses wildfires; and the heat stress of climate change itself partly driven by war emissions renders fire-prone landscapes more combustible. The interaction of these factors in Ukraine in 2024 produced record-breaking wildfire activity.30

According to data compiled by the European Forest Fire Information System and analysed in the 2025 Joint Research Centre status report, Ukraine suffered its most severe wildfire season on record in 2024, with 965,000 hectares burned more than twice the area burned across the entire European Union over the same period. Most major fires occurred along or near the frontlines, where shelling, exploding munitions, crashing drones, and campfires created ignition points in landscapes that emergency services could not safely access to suppress.31 The Initiative on GHG Accounting of War estimated that landscape fire emissions in Ukraine in 2024 more than doubled compared to the wartime annual average for prior years, reaching 25.8 million tonnes of CO_2 equivalent a 118 percent increase.32

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In Gaza, satellite data examined by UNOSAT determined that between 7 October 2023 and 21 March 2024 alone, 48 percent of Gaza's total tree cover had been lost or damaged by military operations and by civilians forced to cut trees for fuel in the absence of electricity. By January 2025, this figure had risen to 80 percent a near-total loss of tree cover in one of the world's most densely populated territories.33 UNEP's September 2025 assessment confirmed that soil, freshwater, and coastal ecosystems in Gaza had experienced unprecedented degradation, with recovery from certain categories of damage projected to require decades even under optimal post-conflict conditions.34

3.5 Nuclear Safety Risks and Toxic Contamination

Perhaps the most existentially consequential environmental dimension of the Ukraine conflict is the unprecedented threat to nuclear infrastructure in an active war zone. Ukraine operates four nuclear power plants, and the Zaporizhzhia Nuclear Power Plant Europe's largest, with a generating capacity of 6 gigawatts has remained under Russian military occupation since March 2022. All six of its reactors are shut down, and the International Atomic Energy Agency has consistently documented conditions that fall below the safety standards required for the secure maintenance of a nuclear facility in close proximity to active combat operations.35 Military strikes have occurred within proximity of multiple Ukrainian nuclear facilities: a 2022 missile strike detonated 300 metres from the South Ukraine Nuclear Power Plant, and the Khmelnytskyi plant sustained blast-wave damage from adjacent explosions in 2023. The potential for a nuclear incident at any of these sites with consequences for air, soil, and water quality across an enormous geographic radius represents a category of environmental risk without precedent in the history of armed conflict.36

Beyond nuclear risks, both the Ukraine and Gaza conflicts have generated substantial toxic contamination from conventional munitions, white phosphorus, and the destruction of industrial facilities. In Gaza, UNEP has estimated that 40 million tonnes of debris 57 percent more than at the time of the June 2024 preliminary assessment, and 20 times the total debris generated by all conflicts in Gaza since 2008 contain human remains, unexploded ordnance, asbestos, and other hazardous materials.37 The use of white phosphorus, documented by human rights organisations, is particularly concerning from an environmental perspective: its combustion properties destroy organic material across wide areas, contaminate crops and soil, and introduce toxic compounds into the food chain.38

4. The International Legal Framework: Architecture and Deficiencies

4.1 Treaty Provisions: Additional Protocol I and ENMOD

The primary treaty-law instruments addressing environmental protection in armed conflict are Articles 35(3) and 55 of Additional Protocol I to the Geneva Conventions of 1977, and the

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ENMOD Convention. Articles 35(3) and 55 of AP I prohibit methods or means of warfare which are intended, or may be expected, to cause widespread, long-term, and severe damage to the natural environment. Article 55 further prohibits using the destruction of the natural environment as a weapon of warfare and prohibits environmental reprisals.39 The ENMOD Convention prohibits the military or any other hostile use of environmental modification techniques having widespread, long-lasting, or severe effects.

The key limitation of these provisions lies in the cumulative and demanding character of the threshold they establish. Under AP I, the prohibited damage must be simultaneously widespread, long-term, and severe a tripartite conjunctive requirement that legal commentators have characterised as among the highest damage thresholds in international humanitarian law.40 The ICRC's 2020 Guidelines on the Protection of the Natural Environment in Armed Conflict acknowledged that Rule 45 of the Customary IHL Study reflecting these principles has customary law status binding all parties to armed conflict, including in non-international armed conflicts, though some states deny the customary character of certain elements.41 The practical effect is that a great deal of documented environmental destruction in contemporary conflicts individually significant but perhaps not simultaneously 'widespread, long-term and severe' falls beneath the threshold at which the prohibition is engaged.

4.2 The Rome Statute: Article 8(2)(b)(iv) and Its Limitations

The Rome Statute of the International Criminal Court criminalises, under Article 8(2)(b)(iv), the intentional launching of an attack in the knowledge that it 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.42 This provision imports a proportionality qualification the 'clearly excessive' standard that further narrows the circumstances in which environmental destruction constitutes a war crime under the Statute. As international law scholars have observed, the requirement that the environmental damage be both 'widespread, long-term and severe' and 'clearly excessive' in relation to anticipated military advantage imposes a threshold so exacting that no prosecution under this provision has yet been brought before the ICC.43

The Office of the Prosecutor of the ICC, in its 2016 Policy Paper on Case Selection and Prioritisation, signalled an intention to give particular attention to environmental crimes, including land grabbing and the exploitation of natural resources, as potential matters for prosecution under existing Rome Statute provisions.44 This represented an acknowledgment that the current statutory framework, though formally applicable, is structurally under-utilised as a vehicle for environmental accountability in armed conflict. Ukraine has since opened 247 cases of alleged environmental war crimes against Russia in Ukrainian domestic courts and before the ICC, in what represents the most extensive wartime environmental criminal accountability effort

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in history.45

4.3 International Environmental Law in Armed Conflict: Persistent Gaps

A further dimension of the legal deficiency lies in the relationship between international environmental law (IEL) and international humanitarian law. While the ILC's Draft Principles on the Protection of the Environment in Relation to Armed Conflicts, adopted in 2022, affirm the continuing applicability of international environmental law obligations during armed conflict,46 the practical reach of instruments such as the Convention on Biological Diversity, UNCLOS, and the Paris Agreement is severely constrained in active conflict zones. Environmental monitoring agencies are incapacitated, compliance reporting ceases, and the institutional infrastructure for environmental governance collapses along with the civilian infrastructure it depends upon. The United Nations Environment Assembly's 2024 consensus decision, recognising the urgency of protecting the environment in armed conflict, represents a statement of political will; it does not, however, create new enforceable obligations.47

The military emission exclusion in the Paris Agreement framework is emblematic of this structural gap. When the Kyoto Protocol was negotiated, military activities were deliberately excluded from national emissions commitments at the insistence of major military powers. The Paris Agreement's voluntary reporting architecture for military emissions perpetuates this exclusion, with the consequence that war now one of the most carbon-intensive activities on the planet operates outside the world's primary climate governance instrument.48 This cannot be sustained indefinitely as climate science continues to document the aggregate scale of military and conflict-related emissions.

5. Reform Proposals and the Path Forward

5.1 The Ecocide Proposal

The most significant reform proposal currently before the international community is the codification of ecocide as a fifth international crime under the Rome Statute. In 2021, an Independent Expert Panel convened by Stop Ecocide International proposed a definition of ecocide as unlawful or wanton acts committed with knowledge that there is a substantial likelihood of severe and either widespread or long-term damage to the environment.49 In September 2024, Vanuatu, Fiji, and Samoa formally proposed considering ecocide as a fifth Rome Statute crime, bringing to the diplomatic plane a reform agenda that had previously been confined to civil society and academic debate.

The proposed ecocide definition offers several advantages over the current Article 8(2)(b)(iv) war crimes provision. First, it would apply in peacetime as well as armed conflict, addressing the corporate exploitation of natural resources and industrial pollution that similarly destroy

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ecosystems. Second, its alternative threshold 'widespread or long-term' rather than 'widespread and long-term and severe' is significantly more practically achievable. Third, the 'wanton' mens rea standard, reflecting recklessness rather than specific intent, is better suited to the realities of large-scale military operations in which environmental harm is a predictable consequence of operational choices, even where it is not the primary objective.50 Fifteen countries had criminalised ecocide specifically in domestic law as of January 2025, and the European Parliament has issued a Directive treating ecocide as a crime evidence of a growing international consensus that the existing legal framework is inadequate.

Opposition to the ecocide proposal has come from states concerned about the breadth of individual criminal liability and the potential exposure of corporate and governmental decision-makers to prosecution for environmental harm associated with industrial activity. These concerns are not without substance, but they do not constitute principled objections to the core proposition that deliberate or recklessly indifferent large-scale environmental destruction whether in war or peacetime should engage individual criminal responsibility. The history of international criminal law is, after all, a history of expanding the reach of accountability to match the scale of atrocity.51

5.2 Reforming Military Emission Accounting

A complementary reform agenda targets the structural exclusion of military and conflict-related emissions from international climate governance frameworks. Researchers at IIASA and partner institutions have argued persuasively that the net-zero transition cannot be credibly pursued while the climate costs of armed conflict remain unaccounted and unaddressed.52 Ukraine's decision to seek climate damages from Russia through international legal processes, announced at COP30, represents a novel and potentially transformative legal strategy: if such a claim can be successfully pursued whether through international arbitration, the International Court of Justice, or the ICC's complementary civil damages framework it would establish a precedent in which the climate costs of war are internalised into the legal liability of the aggressor state.

Reform of the Paris Agreement's voluntary military emission reporting standard would require political will from major military powers, including the United States, China, Russia, and NATO member states, whose defence establishments collectively represent a substantial share of global military greenhouse gas emissions. While this political obstacle is formidable, the scientific and normative case for inclusion is compelling: emissions are emissions regardless of their source, and a climate governance framework that systematically excludes some of the largest emitters has an analytical and moral gap at its centre.

5.3 Environmental Reparations and Post-Conflict Recovery

A third dimension of reform concerns the legal framework for environmental reparations and

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post-conflict ecological recovery. The UN General Assembly resolution of 14 November 2022, establishing in principle that Russia owes reparations to Ukraine, provides a foundation upon which environmental claims can be constructed.53 UNEP's work in post-conflict assessment and recovery including the Kakhovka Dam breach environmental assessment, the June 2024 preliminary environmental assessment of Gaza, and the September 2025 second Gaza assessment exemplifies the institutional capacity that exists for environmental damage quantification. The challenge lies in translating these assessments into legally actionable compensation claims through the mechanisms of state responsibility and international adjudication.

The experience of post-Gulf War environmental reparations provides an instructive precedent. The United Nations Compensation Commission (UNCC), established after the 1990-91 Gulf War, processed a substantial volume of claims for environmental damage arising from Iraq's invasion of Kuwait, including claims related to the deliberate ignition of Kuwaiti oil wells. The UNCC ultimately awarded several billion dollars in environmental compensation. While the specific legal vehicle available in the Ukraine and Gaza contexts differs, the normative principle established in the Gulf War reparations process that environmental destruction in armed conflict generates compensable state liability is well established in international law and provides a platform for future claims.54

5. Conclusion

War has always had environmental consequences. What distinguishes the current moment is the combination of empirical precision the capacity to measure those consequences with satellite imagery, atmospheric monitoring, and scientific accounting and legal inadequacy the gap between what the evidence reveals and what international law is prepared to do about it. The conflicts in Ukraine and Gaza, among the most extensively documented in environmental terms of any wars in history, lay bare the structural limits of a legal framework designed in an era when the mechanisms and scale of environmental destruction in war were less well understood.

The evidence is unambiguous on several points. Modern armed conflict generates greenhouse gas emissions at a scale that materially undermines global climate commitments. It destroys agricultural land, water systems, and forest ecosystems in ways that affect the food security and habitability of affected territories for generations. It creates toxic contamination legacies heavy metals, unexploded ordnance, hazardous debris that outlast the conflict by decades. And it operates, in the domain of its climate impact, largely outside the architecture of international environmental governance.

International law's response to these realities is structurally insufficient. The high and conjunctive threshold of AP I Articles 35(3) and 55, the 'clearly excessive' qualification in Article 8(2)(b)(iv) of the Rome Statute, the voluntary military emission reporting standard under the Paris Agreement framework, and the persistent gap between IEL's formal applicability in

armed conflict and its practical unenforceability in active war zones collectively ensure that some of the most consequential environmental destruction occurring anywhere on the planet proceeds without meaningful legal accountability.

The reform agenda is demanding but not intractable. The ecocide proposal, backed by a growing coalition of small island and climate-vulnerable states and supported by the 2021 Independent Expert Panel definition, offers a doctrinal pathway to genuine environmental criminal accountability that operates without the restrictive threshold currently embedded in the Rome Statute. Mandatory military emission reporting within the UNFCCC framework would close the most glaring accountability gap in global climate governance. And the development of a robust environmental reparations practice, building on the UNCC precedent and the General Assembly's establishment of the Ukraine Damage Assessment Register, would create financial incentives to internalise the environmental costs of aggression into the calculations of belligerent states.

The environment cannot speak for itself before any tribunal. It cannot file a complaint, retain counsel, or give evidence. But the communities in Kherson, in Rafah, in the Dnipro delta, in the coastal waters of Gaza whose livelihoods, health, and futures depend upon the natural world that war has destroyed, can and increasingly do. The task of international environmental law and the law of armed conflict, in this generation, is to ensure that when those voices are raised, the legal architecture of the international community is capable of hearing them and of responding with something more than condemnation and more than silence.55

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UNOSAT and FAO data on debris volume and water infrastructure destruction).

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7. Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts arts. 35(3), 55, June 8, 1977, 1125 U.N.T.S. 3 [hereinafter AP I].

8. Levy, supra note 5 (characterising war's environmental effects as structurally encompassing infrastructure collapse, population displacement, governance incapacitation and contamination legacies).

9. Reinhard Bun et al., Tracking Unaccounted Greenhouse Gas Emissions Due to the War in Ukraine Since 2022, 914 SCI. TOTAL ENV'T 169879 (2024) (establishing methodology for attributing war-generated GHG emissions outside national reporting frameworks).

10. Id. (estimating substantial unaccounted GHG emissions across military vehicle fuel consumption, munitions manufacture, infrastructure destruction, and conflict-induced fires).

11. THREE-YEAR GHG ASSESSMENT, supra note 3, at 4–6 (providing sectoral breakdown with warfare activities at 82.1 $MtCO_2e$, infrastructure reconstruction at 27%, and conflict-induced landscape fires constituting an additional major category).

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16. EUR. JOINT RESEARCH CENTRE (JRC), STATUS OF ENVIRONMENT AND CLIMATE IN UKRAINE 28–33 (Apr. 11, 2025) [hereinafter JRC UKRAINE STATUS REPORT] (documenting mechanisms of soil contamination through heavy metal deposition, unexploded ordnance, and military vehicle-induced erosion).

17. Id. at 11 (noting agriculture constitutes 11% of Ukraine's GDP and accounted for EUR 23.3 billion in exports in 2023).

18. Id. at 31–33 (documenting release of lead, mercury and arsenic through military activities with potential for food chain penetration, and noting 40% of Ukraine's soils were erosion-affected prior to invasion).

19. United Nations, The Environmental Toll of Conflict, supra note 2 (citing Ukrainian government projections of $34.6 billion for explosive land contamination clearance).

20. FAO & UNOSAT, Agricultural Damage Assessment of the Gaza Strip (May 2025) (reporting less than 5% of Gaza cropland remaining cultivable, with 80.4% of 15,053 total hectares damaged and 77.8% inaccessible).

21. Systemic Ecocide: Israel's 2-Year War Devastates Gaza's Environment, PRESS TV (Sept. 15, 2025), https://www.presstv.co.uk/Detail/2025/09/15/755057/ (reporting FAO-UNOSAT findings and noting destruction of every greenhouse in the Gaza governorate by April 2025).

22. Forensic Architecture, No Traces of Life: Ecocide in Gaza 2023–2024, GOLDSMITHS UNIV. LONDON (2024) (documenting via satellite imagery the destruction of 65+ km² of farms and orchards by February 2024 and characterising the agricultural destruction as deliberate ecocide).

23. See Abdullah Muratoglu & Fatma Wassar, Water at the Intersection of Human Rights and Conflict: A Case Study of Palestine, 6 FRONTIERS IN WATER (Dec. 2024), https://doi.org/10.3389/frwa.2024.1470201 (analysing the dual humanitarian and environmental dimensions of wartime water infrastructure destruction).

24. The Ecocide of Gaza, THE CANARY (Oct. 3, 2025), https://www.thecanary.co/global/world-analysis/2025/10/03/ (reporting 88% of Gaza's water wells and all desalination plants destroyed or non-operational by mid-2024).

25. Yara Asi et al., The Ongoing Environmental Destruction and Degradation of Gaza: The Resulting Public Health Crisis, 115 AM. J. PUB. HEALTH 1078, 1079–81 (2025) (documenting 94% decrease in total water volume and up to 70% of population consuming contaminated water).

26. Environmental Impact of the Gaza War, WIKIPEDIA, supra note 4 (citing Norwegian Refugee Council data on daily discharge of 130,000+ cubic metres of untreated sewage into the Mediterranean from October 2023 following fuel supply blockade).

27. UNEP GAZA SECOND ASSESSMENT, supra note 4, ¶ 15 (reporting 73 of 84 sewage pumping stations destroyed by February 2025).

28. ICRC, From Crisis to Recovery: Managing the Environmental Impacts of Armed Conflict, ICRC LAW & POLICY BLOG (Dec. 2, 2025), https://blogs.icrc.org/law-and-policy/2025/12/02/ (referencing the Kakhovka Dam Breach Environmental Assessment among UNEP's recent conflict-related assessments).

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29. JRC UKRAINE STATUS REPORT, supra note 16, at 42–45 (documenting chemical contamination of inland waterways and marine infrastructure with long-term biodiversity consequences for Black Sea and Sea of Azov ecosystems).

30. THREE-YEAR GHG ASSESSMENT, supra note 3, at 8 (attributing 2024 wildfire escalation to combination of conflict-generated ignition points, climate-driven drought conditions, and hampered firefighting capacity).

31. JRC UKRAINE STATUS REPORT, supra note 16, at 22–25 (citing European Forest Fire Information System data showing 965,000 hectares burned in Ukraine in 2024, more than twice the EU total over the same period).

32. Euronews, Three Years of War in Ukraine: 'Environmental Damage Knows No Borders' as Emissions Rise to New High (Feb. 24, 2025), https://www.euronews.com/2025/02/24/ (reporting 118% increase in landscape fire emissions for 2024 reaching 25.8 $MtCO_2e$).

33. Environmental Impact of the Gaza War, WIKIPEDIA, supra note 4 (compiling UNOSAT data showing 48% tree cover loss by March 2024, rising to 80% by January 2025).

34. UNEP GAZA SECOND ASSESSMENT, supra note 4, ¶¶ 20–28 (finding unprecedented deterioration of soil, freshwater and coastal ecosystems compared to June 2024 baseline, with recovery timelines measured in decades).

35. Counting the Cost: The Environmental Toll on Ukraine from the Russian Invasion, HUM. RTS. RESEARCH (Oct. 2025), https://www.humanrightsresearch.org/post/ (reporting all Zaporizhzhia reactors shut due to Russian occupation, removing 6 GW of capacity and citing IAEA reports on persistent safety risks).

36. Id. (documenting 2022 missile strike detonated 300 metres from South Ukraine NPP and 2023 blast-wave damage to Khmelnytskyi NPP, with IAEA reports on ongoing drone activity near Rivne NPP).

37. UNEP GAZA SECOND ASSESSMENT, supra note 4, ¶ 9 (estimating 40 million tonnes of debris representing 57% increase from June 2024 assessment and 20 times total debris from all Gaza conflicts since 2008).

38. Systemic Ecocide, PRESS TV, supra note 21 (reporting scientific warnings on white phosphorus contamination of crops, soil and food chain, with links to birth defects already documented in Gaza).

39. AP I arts. 35(3), 55, supra note 7; see also ICRC CASEBOOK, The Protection of the Natural Environment in Armed Conflict, https://casebook.icrc.org/highlight/protection-natural-environment-armed-conflict (summarising treaty and customary law framework including Rules 45, 139 and 140 of the ICRC Customary IHL Study).

40. Michael Bothe, Carl Bruch, Jordan Diamond & David Jensen, International Law Protecting the Environment During Armed Conflict: Gaps and Opportunities, 92 INT'L REV. RED CROSS 569, 577–79 (2010) (characterising the tripartite conjunctive threshold as 'one of the highest damage thresholds in

international humanitarian law').

41. ICRC, Guidelines on the Protection of the Natural Environment in Armed Conflict ¶¶ 45–49 (2020) [hereinafter ICRC GUIDELINES] (affirming customary law status of Rule 45 while noting some states deny customary character of certain elements in non-international armed conflicts).

42. Rome Statute of the International Criminal Court art. 8(2)(b)(iv), July 17, 1998, 2187 U.N.T.S. 90 [hereinafter ROME STATUTE].

43. Iryna Rekrut, Environmental Destruction in Conflict: Broadening Accountability in War, ICRC LAW & POLICY BLOG (Mar. 20, 2025), https://blogs.icrc.org/law-and-policy/2025/03/20/ (noting that the high threshold of Art. 8(2)(b)(iv) has so far prevented any prosecution under the provision).

44. ICC Office of the Prosecutor, Policy Paper on Case Selection and Prioritisation 13–14 (Sept. 15, 2016) (indicating ICC Prosecutor's intention to give attention to environmental crimes as potential Rome Statute matters).

45. TIME, supra note 14 (reporting Ukraine's 247 environmental war crime cases against Russia in domestic courts and before the ICC as of April 2025).

46. International Law Commission, Draft Principles on the Protection of the Environment in Relation to Armed Conflicts, U.N. Doc. A/77/10 annex (2022) (affirming in Principle 13 that obligations under international environmental law continue to apply in armed conflict).

47. ICRC, From Crisis to Recovery, supra note 28 (citing UNEA 2024 consensus decision as reflecting growing political recognition that environmental protection in armed conflict is integral to peace and recovery, while noting it does not create new binding obligations).

48. Weir, quoted in TIME, supra note 14 (explaining that military emission exclusion in Paris Agreement reproduces the Kyoto Protocol architecture and leaves war as a major unaccounted emissions source within global climate governance).

49. Independent Expert Panel for the Legal Definition of Ecocide, Commentary and Core Text (June 2021), in STOP ECOCIDE INTERNATIONAL, https://www.stopecocide.earth (defining ecocide as 'unlawful or wanton acts committed with knowledge that there is a substantial likelihood of severe and either widespread or long-term damage to the environment').

50. Rekrut, supra note 43 (comparing alternative threshold structure and mens rea standard of proposed ecocide definition favourably against Art. 8(2)(b)(iv) of the Rome Statute for purposes of environmental accountability in armed conflict).

51. See id. (noting that as of January 2025, fifteen countries had criminalised ecocide in domestic law and the European Parliament had issued a Directive treating ecocide as a crime, evidencing growing international consensus).

52. Bun et al., supra note 9 (arguing that accurate accounting for war-generated GHG emissions is crucial

and that international policy frameworks for net-zero transition 'presuppose a world without conflict which unfortunately is not the reality we are facing').

53. G.A. Res. 77/352, 3, U.N. Doc. A/RES/77/352 (Nov. 14, 2022) (establishing in principle that Russia should make reparations to Ukraine for damage caused by the invasion, providing a foundation for environmental compensation claims).

54. See UNEP, From Conflict to Peacebuilding, supra note 1, at 42–45 (reviewing the UNCC Gulf War reparations process, including the environmental claims component, as a precedent for post-conflict environmental compensation).

55. See UNEP GAZA SECOND ASSESSMENT, supra note 4, statement of Executive Director Inger Andersen ('The situation is going from bad to worse. If this continues, it will leave a legacy of environmental destruction that could affect the health and wellbeing of generations of Gaza residents.').