

ENVIRONMENTAL DESTRUCTION AS A WEAPON OF WAR: A HUMAN RIGHTS AND HUMANITARIAN LAW PERSPECTIVE

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Abstract

Environmental destruction as a war tactic poses significant challenges under international law. This study explores the intersection of International Humanitarian Law (IHL) and International Human Rights Law (IHRL) in addressing war-induced ecological harm, emphasizing “environcide” as a human rights violation. Using a normative juridical method, this research examines legal frameworks, including the ENMOD Convention, Geneva Conventions, and Rome Statute, alongside case studies from Vietnam, Ukraine-Russia, and Gaza. Employing a statute approach and Critical Legal Studies (CLS) analysis, the study reveals structural inequalities and power dynamics that hinder legal enforcement. It also identifies opportunities to strengthen accountability, recognize environcide, and promote participatory legal reforms. Aligning IHL and IHRL through these mechanisms can enhance environmental protection during and after conflict, ensuring a more just and sustainable approach to war’s ecological consequences.

Keywords: Critical Legal Studies; Environcide; Environmental destruction; International Humanitarian Law; International Human Rights Law.

Abstrak

Kerusakan lingkungan sebagai taktik perang merupakan tantangan kompleks dalam hukum internasional. Penelitian ini mengkaji hubungan antara Hukum Humaniter Internasional (IHL) dan Hukum Hak Asasi Manusia Internasional (IHRL) dalam menangani dampak ekologis perang, menyoroti konsep “environcide” sebagai pelanggaran hak asasi manusia. Metode penelitian ini menggunakan penelitian yuridis normatif, data meliputi instrumen hukum seperti Konvensi ENMOD, Konvensi Jenewa, dan Statuta Roma maupun literatur lainnya yang relevan. Pendekatan secara statute approach dan studi kasus konflik di Vietnam, Ukraina-Rusia, dan Gaza. Analisis digunakan secara deskriptif-kualitatif dengan kaca mata critical legal studies. Hasil studi ini mengungkap ketimpangan struktural dan dinamika kekuasaan yang menghambat penegakan hukum. Selain itu juga peluang untuk menyelaraskan IHL dan IHRL melalui mekanisme akuntabilitas yang diperkuat, pengakuan environcide, dan reformasi hukum partisipatif guna mendukung perlindungan lingkungan yang lebih adil dan berkelanjutan selama dan setelah konflik.

Kata Kunci: Critical legal studies; Environcide; Kerusakan lingkungan; Hukum Humaniter Internasional; Hukum HAM Internasional.

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INTRODUCTION

The deliberate destruction of the environment as a tactic of warfare represents a complex and multifaceted challenge within contemporary international and environmental law.¹ While often overshadowed by visible human suffering and other atrocities during conflicts, this practice has far-reaching consequences that persist long after hostilities cease.² The damage inflicted is frequently irreparable, affecting not only ecosystems but also global efforts to address environmental crises.³ In this context, environmental destruction during warfare not only exacerbates ecological degradation but also triggers humanitarian crises, accelerates climate change, and threatens the sustainability of essential resources upon which affected communities depend.

Historically, the weaponization of the environment has been employed to weaken adversaries, disrupt civilian livelihoods, and create long-term instability.⁴ Examples such as the widespread deforestation caused by the use of Agent Orange during the Vietnam War,⁵ and the deliberate burning of oil wells during the Gulf War illustrate the enduring ecological and public health consequences of such tactics.⁶ Moreover, this practice, often referred to as “enviromicide” or “military ecocide,” has a long history, from ancient conflicts to modern warfare. Strategies targeting irrigation systems, crops, and forests have been used intentionally to undermine opponents.⁷ Notable examples include the large-scale environmental devastation during World War I, the atomic bombings in World War II, and the use of defoliants in Vietnam, all of which resulted in famine, disease, mass migration, and prolonged societal disruption.⁸

¹ Alberto Costi, “Reverberating Effects in Armed Conflict: An Environmental Analysis,” *Ariz. J. Int’l & Comp. L.* 39 (2022): 317, <https://repository.arizona.edu/handle/10150/667964>; Richard A Falk, *Legal Order in a Violent World* (Princeton University Press, 2019); Richard Skiba, *Urban Warfare: Emergence, Evolution, Strategies and Mastery of the Modern Conflict Landscape* (After Midnight Publishing, 2024).

² David Andersen-Rodgers and Kerry F Crawford, *Human Security: Theory and Action* (Rowman & Littlefield, 2022); Michael Keating and Matt Waldman, *War and Peace in Somalia: National Grievances, Local Conflict and Al-Shabaab* (Oxford University Press, 2019).

³ Peter J Stoett, *Global Ecopolitics: Crisis, Governance, and Justice* (University of Toronto Press, 2019).

⁴ Richard Black et al., *Environment of Peace: Security in a New Era of Risk* (Stockholm International Peace Research Institute, May 2022), accessed January 11, 2025, <https://www.sipri.org/publications/2022/other-publications/environment-peace-security-new-era-risk>; Emmanuel Kreike, *Scorched Earth: Environmental Warfare as a Crime against Humanity and Nature* (Princeton University Press, 2021), accessed January 11, 2025, <http://www.jstor.org/stable/10.2307/j.ctv11hprdz>.

⁵ Charles Closmann, “Environmental Destruction During War,” in *Routledge Handbook of Environmental Security* (Routledge, 2021), 95–106; Nobuaki Yamashita and Trong-Anh Trinh, “Long-Term Effects of Vietnam War: Agent Orange and the Health of Vietnamese People After 30 Years,” *Asian Economic Journal* 36, no. 2 (June 2022): 180–202, <https://doi.org/10.1111/asej.12265>.

⁶ Massaab Al-Aloosy, “Ripples of Negligence: Unravelling Iraq’s Descent from Water Abundance to Scarcity,” *Democracy and Security* (August 19, 2024): 1–22, 10.1080/17419166.2024.2389448; Hogr Tarkhani, “Guns, Bombs, and Pollution: Unraveling the Nexus between Warfare, Terrorism, and Ecological Devastation in Iraq,” *The Journal of Social Encounters* 8, no. 1 (March 3, 2024): 29–48, 10.69755/2995-2212.1240.

⁷ Closmann, “Environmental Destruction During War”; Nicolas Schneider and Elizabeth Sprout, “Scorched Earth: Environmental Warfare as a Crime against Humanity and Nature: By Emmanuel Kreike, Princeton & Oxford, Princeton University Press, 2021, 521 Pp., \$39.95, £34.00 (Hc), ISBN 978-0-691-1374-21; eISBN 978-0-691-1890-17,” *International Journal of Environmental Studies* 79, no. 3 (May 4, 2022): 573–574, 10.1080/00207233.2021.1911100.

⁸ Schneider and Sprout, “Scorched Earth.”

Prolonged conflicts and wars have profound and multifaceted consequences, particularly on the environment and public health.⁹ The ongoing Russia-Ukraine war, for instance, has caused significant environmental damage, including water contamination, air quality deterioration, soil degradation, deforestation, and the potential risk of radiation leakage.¹⁰ Similarly, conflicts in the Middle East and North Africa have led to widespread environmental pollution, especially in urban war zones, while exacerbating food insecurity and deepening poverty in already vulnerable regions.¹¹ These ecological crises are not merely localized phenomena, their ripple effects extend globally, influencing commodity prices, disrupting trade, and hindering progress toward climate change mitigation and the achievement of sustainable development goals.¹²

The long-term effects of such conflicts also manifest in public health crises, particularly in the form of mental health challenges.¹³ Predictable patterns of psychological and behavioral problems emerge in populations exposed to prolonged warfare, often as a result of the compounded stress of displacement, resource scarcity, and environmental degradation.¹⁴ These mental health burdens highlight the intricate interconnection between environmental destruction and human well-being, emphasizing the need for comprehensive strategies that address both ecological and psychological dimensions of conflict. Evidence-based interventions are critical not only for supporting affected individuals and communities but also for rebuilding the socio-ecological systems upon which their resilience depends.¹⁵

Recent conflicts, such as the ongoing war in Ukraine and the recent escalation in Gaza, underscore the dual ecological and humanitarian toll of armed violence.¹⁶ As of December 2023, the total estimated war damage in Ukraine reached approximately \$16 billion, with significant damage recorded across key sectors such as housing, transportation, energy, and agriculture. Notably, the environmental and forestry sectors have suffered approximately \$4 billion in damages, highlighting the

⁹ Amir Khorram-Manesh, Krzysztof Goniewicz, and Frederick M Burkle Jr, "Social and Healthcare Impacts of the Russian-Led Hybrid War in Ukraine—a Conflict with Unique Global Consequences," *Disaster medicine and public health preparedness* 17 (2023): e432, doi:10.1017/dmp.2023.91; A Shorrab et al., "Health in the Crossfire—Analysing and Mitigating the Multifaceted Health Risks of the 2023 War on Gaza," *Public Health Research* 14, no. 1 (2024): 1–11, DOI: 10.5923/j.phr.20241401.01.

¹⁰ Daniel Hryhorczuk et al., "The Environmental Health Impacts of Russia's War on Ukraine," *Journal of occupational medicine and toxicology* 19, no. 1 (2024): 1, <https://doi.org/10.1186/s12995-023-00398-y>; Deepak Rawtani et al., "Environmental Damages Due to War in Ukraine: A Perspective," *Science of The Total Environment* 850 (2022): 157932, <https://doi.org/10.1016/j.scitotenv.2022.157932>.

¹¹ Jeannie Sowers and Erika Weinthal, "Health and Environmental Tolls of Protracted Conflicts in the Middle East and North Africa," *Current History* 120, no. 830 (2021): 339–345, <https://doi.org/10.1525/curh.2021.120.830.339>.

¹² Rawtani et al., "Environmental Damages Due to War in Ukraine: A Perspective."

¹³ Joshua C Morganstein and Robert J Ursano, "Ecological Disasters and Mental Health: Causes, Consequences, and Interventions," *Frontiers in psychiatry* 11 (2020): 1, <https://doi.org/10.3389/fpsy.2020.00001>; Seggane Musisi and Eugene Kinyanda, "Long-Term Impact of War, Civil War, and Persecution in Civilian Populations—Conflict and Post-Traumatic Stress in African Communities," *Frontiers in psychiatry* 11 (2020): 20, <https://doi.org/10.3389/fpsy.2020.00020>.

¹⁴ Morganstein and Ursano, "Ecological Disasters and Mental Health: Causes, Consequences, and Interventions."

¹⁵ Ibid.; Rawtani et al., "Environmental Damages Due to War in Ukraine: A Perspective."

¹⁶ Abdo Hassoun et al., "From Acute Food Insecurity to Famine: How the 2023/2024 War on Gaza Has Dramatically Set Back Sustainable Development Goal 2 to End Hunger," *Frontiers in Sustainable Food Systems* 8 (2024): 1402150, <https://doi.org/10.3389/fsufs.2024.1402150>; Iryna Rekrut, "Environmental Damage Is a War Crime: Analyzing the Legal Implications of the Russian Armed Invasion's Environmental Impact on Ukraine," *J. Crim. L. & Crimin. Online* 114 (2023): 93, https://scholarlycommons.law.northwestern.edu/jcllc_online/30.

ecological toll of the conflict.¹⁷ This alarming data underscores the necessity of examining environmental destruction as a weapon of war through the lens of international law and humanitarian principles. More details can be seen in Figure 1 below:

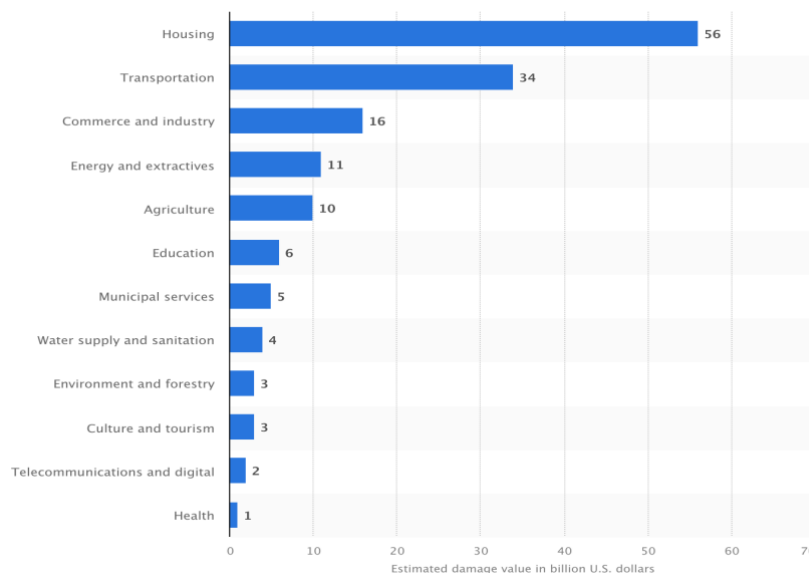


Figure 1. Estimated Sectoral Breakdown of War Damage in Ukraine, 2022-2023.

Source: Statista (2023).¹⁸

Similarly, in Gaza, the repeated destruction of infrastructure, agricultural lands, and water systems has precipitated a severe environmental and humanitarian crisis.¹⁹ Prolonged blockades, recurring airstrikes, and the deliberate targeting of essential resources have displaced countless communities, exacerbated water and soil contamination, and created significant obstacles to recovery efforts.²⁰ A study by Weinthal and Sowers (2019) documented 297 incidents of resource targeting during conflicts, with the majority occurring in the agricultural sector (145 incidents, or 49%) and the water sector (129 incidents, or 43%), while a smaller number of cases (23 incidents, or 8%) were reported in the energy sector.²¹ These incidents are not evenly distributed over time but tend to surge during periods of heightened violence, as illustrated in Figure 2, which visualizes the frequency and sectoral distribution of these attacks. In the West Bank, findings highlight similar patterns of targeting

¹⁷ Statista, “Estimated Total War Damage Value in Ukraine from February 24, 2022 to December 31, 2023, by Sector,” *Statista*, last modified 2023, accessed January 8, 2025, <https://www.statista.com/statistics/1303344/ukraine-infrastructure-war-damage/>.

¹⁸ *Ibid.*

¹⁹ Omar Jabary Salamanca, “Unplug and Play: Manufacturing Collapse in Gaza,” *Human Geography* 4, no. 1 (2011): 22–37, <https://doi.org/10.1177/194277861100400103>; Erika Weinthal and Jeannie Sowers, “Targeting Infrastructure and Livelihoods in the West Bank and Gaza,” *International Affairs* 95, no. 2 (2019): 319–340, <https://doi.org/10.1093/ia/iiz015>.

²⁰ James Fergusson, *In Search of the River Jordan: A Story of Palestine, Israel and the Struggle for Water* (Yale University Press, 2023); Human Rights Watch, “*Hopeless, Starving, and Besieged*”: Israel’s Forced Displacement of Palestinians in Gaza (United States of America: Human Rights Watch, 2024), accessed January 8, 2025, <https://www.hrw.org/report/2024/11/14/hopeless-starving-and-besieged/israels-forced-displacement-palestinians-gaza>.

²¹ Weinthal and Sowers, “Targeting Infrastructure and Livelihoods in the West Bank and Gaza.”

across the water, energy, and agriculture/fisheries sectors, underscoring the widespread environmental and economic impacts of these actions.²²

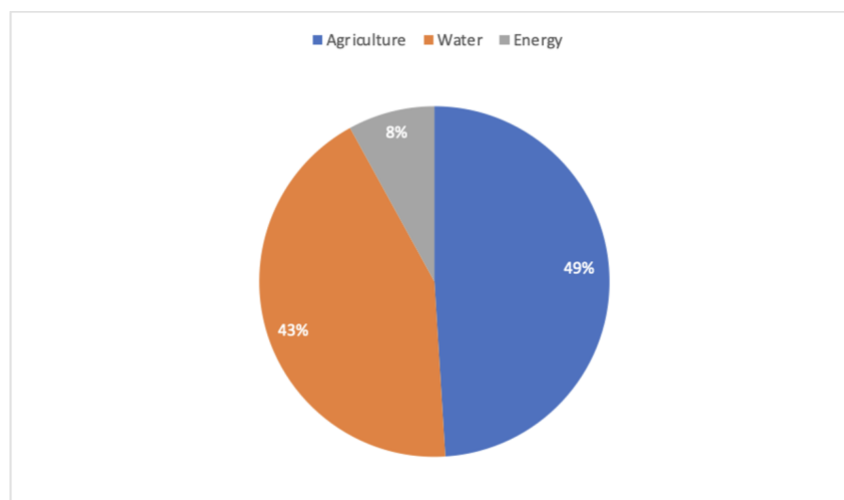


Figure 2. Distribution of Targeting Incidents by Sector in Gaza.

Source: compiled by the authors from the Weinthal & Sowers, (2019).

The deliberate destruction of ecosystems and critical resources during armed conflicts exacerbates pre-existing vulnerabilities, disproportionately impacts marginalized communities, and undermines efforts toward achieving sustainable development²³. The consequences extend far beyond the immediate casualties of war, destabilizing ecosystems and disrupting livelihoods that depend heavily on natural resources.²⁴ Despite the gravity of these outcomes, international legal frameworks remain insufficient to adequately address environmental destruction during warfare. The Environmental Modification (ENMOD) Convention, for instance, prohibits the hostile use of environmental modification techniques.²⁵ However, it suffers from weak enforcement mechanisms and fails to address ecological damage caused by non-state actors or unintended environmental consequences of warfare.²⁶ Similarly, while the Rome Statute of the International Criminal Court identifies specific acts of environmental destruction as war crimes,²⁷ its implementation has been hindered by political opposition

²² *Ibid.*

²³ Shaadee Ahmadnia et al., *Defueling Conflict: Environment and Natural Resource Management as a Pathway to Peace* (World Bank, 2022); Paola Vesco et al., “The Impacts of Armed Conflict on Human Development: A Review of the Literature” (2024), <https://doi.org/10.1016/j.worlddev.2024.106806>.

²⁴ Juliane Schillinger, Gül Özerol, and Michiel Heldeweg, “A Social-Ecological Systems Perspective on the Impacts of Armed Conflict on Water Resources Management: Case Studies from the Middle East,” *Geoforum* 133 (2022): 101–116, <https://doi.org/10.1016/j.geoforum.2022.05.001>.

²⁵ Joanna Jarose, “A Sleeping Giant? The ENMOD Convention as a Limit on Intentional Environmental Harm in Armed Conflict and Beyond,” *American Journal of International Law* 118, no. 3 (2024): 468–511, doi:10.1017/ajil.2024.15.

²⁶ Karen Hulme and Doug Weir, “Environmental Protection in Armed Conflict,” in *Research Handbook on International Environmental Law* (Edward Elgar Publishing, 2021), 392–411.

²⁷ Ammar Bustami and Marie-Christine Hecken, “Perspectives for a New International Crime against the Environment: International Criminal Responsibility for Environmental Degradation under the Rome Statute,” *Goettingen J. Int’l L.* 11 (2021): 145, doi: 10.3249/1868-1581-bustami-hecken.

and evidentiary challenges, limiting its efficacy in prosecuting environmental violations during armed conflicts.²⁸

The limitations of existing international legal instruments reveal a critical need for more robust and comprehensive mechanisms to protect the environment during armed conflicts. While international humanitarian law (hereinafter referred to as IHL) provides some safeguards, its primarily anthropocentric orientation is insufficient to address the broader ecological implications of warfare.²⁹ Scholars have increasingly called for the recognition of “environcide” as a distinct violation of human rights and even as a crime against humanity.³⁰ However, current legal frameworks such as the Fourth Geneva Convention and the Rome Statute remain inadequate in preventing or addressing environmental degradation during conflict, highlighting significant gaps in enforcement and scope.³¹ The International Law Commission has attempted to bridge these gaps by drafting principles that integrate international environmental law into IHL, yet the practical implementation of these principles remains uncertain.³²

The intentional targeting of ecosystems and natural resources during warfare—whether through deforestation in Vietnam or the destruction of agricultural lands in Gaza—demands a comprehensive approach to environmental justice in conflict zones.³³ Such acts result in long-term ecological devastation, food insecurity, and societal disruption, with vulnerable populations bearing the brunt of these consequences.³⁴ Additionally, these actions exacerbate global challenges such as climate change and biodiversity loss, further compounding their impact. Addressing these issues requires bridging the gaps between IHL and international human rights law (hereinafter referred to as IHRL) and advocating for innovative legal and policy measures that prioritize ecological preservation and human rights in conflict settings. By proposing actionable strategies to enhance environmental protections during warfare, this study contributes to the academic discourse on environmental justice and underscores the urgency of integrating ecological considerations into international legal and humanitarian frameworks.

Recent scholarly works have delved into the intricate relationship between armed conflicts and environmental degradation, offering valuable insights while also highlighting significant gaps and limitations. Ide et al. (2023) emphasize the importance of interdisciplinary approaches to understanding the intersections of environmental issues, peace, and conflict.³⁵ However, while their work establishes the necessity of such approaches, it falls short of providing actionable pathways for integrating these

²⁸ Muath Mohammed Alashqar, Asmar Abdul Rahim, and Ahmad Shamsul Abd Aziz, “War Crimes in Gaza Strip from Year 2008 2021: Individual Criminal Responsibility Under the Legal Framework of Rome Statute of the International Criminal Court,” *Journal of International Studies (JIS)* 19, no. 1 (2023): 61–93, <https://doi.org/10.32890/jis2023.19.1.3>.

²⁹ Agnieszka Szpak, Monika Bar, and Eric Kemp, “PROTECTION OF THE ENVIRONMENT – INTERNATIONAL HUMAN RIGHTS AND INTERNATIONAL HUMANITARIAN LAW PERSPECTIVES,” *Torun International Studies* 1, no. 19 (September 30, 2024): 33–52, <https://doi.org/10.12775/TIS.2024.003>.

³⁰ Schneider and Sprout, “Scorched Earth.”

³¹ Sayed Qudrat Hashimy, “The Agonising Narrative of Environmental Dilapidation in the Tussle of Armed Conflict; From the Lens of International Humanitarian Laws,” *Journal of Global Ecology and Environment* (March 10, 2023): 45–59, DOI: 10.56557/jogee/2023/v17i28145.

³² Marja Lehto, “Armed Conflicts and the Environment: The International Law Commission’s New Draft Principles,” *Review of European, Comparative & International Environmental Law* 29, no. 1 (April 2020): 67–75, <https://doi.org/10.1111/reel.12324>.

³³ Weinthal and Sowers, “Targeting Infrastructure and Livelihoods in the West Bank and Gaza”; Yamashita and Trinh, “Long-Term Effects of Vietnam War.”

³⁴ Mahreen Khan, *The Environmental Impacts of War and Conflict* (Institute of Development Studies, March 25, 2022), accessed January 10, 2025, <https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/17466>.

³⁵ Tobias Ide et al., “The Future of Environmental Peace and Conflict Research,” *Environmental Politics* 32, no. 6 (September 19, 2023): 1077–1103, DOI:10.1080/09644016.2022.2156174.

disciplines into policy and practice.³⁶ Similarly, Wirthová (2023) critiques the limitations of International Humanitarian Law (IHL) in protecting the environment during warfare, identifying four critical areas for improvement: mainstreaming environmental protection, enhancing enforcement mechanisms, increasing accountability for environmental destruction, and fostering greater integration with other legal regimes.³⁷ While these proposals are thought-provoking, their practical implementation and feasibility in the current geopolitical climate remain underexplored.³⁸ Further, Hulme (2023) investigates the role of international environmental law in safeguarding biodiversity during warfare, arguing that these legal frameworks could complement and strengthen IHL protections.³⁹ However, the study does not sufficiently consider the political and institutional barriers to such integration, nor does it explore how biodiversity protection could be harmonized with broader environmental and human rights concerns during conflicts.⁴⁰ Here is a comparative table summarizing the previous study's focus:

Table 1. Comparative Table Summarizing the Previous Studies

Study	Focus	Key Findings	Limitations
Ide et al. (2023)	Interdisciplinary approaches to environmental issues, peace, and conflict.	Highlighted the importance of integrating environmental, peace, and conflict studies.	Did not provide actionable strategies for integrating interdisciplinary approaches into policy and practice.
Wirthová (2023)	Limitations of International Humanitarian Law (IHL) in protecting the environment during war.	Identified four areas for improvement: mainstreaming environmental protection, enhancing enforcement, increasing accountability, and legal regime integration.	Did not explore the feasibility of these proposals in current geopolitical contexts.
Hulme (2023)	Role of international environmental law in biodiversity protection during armed conflicts.	Suggested that international environmental law could complement and strengthen IHL protections.	Overlooked political and institutional barriers to integration and the broader harmonization of biodiversity protection with human rights and environmental concerns.

Source: compiled by author.

³⁶ *Ibid.*

³⁷ Lucia Wirthová, "From Kuwait to Ukraine: Conflict's Implications on the Natural Environment and the Responses of International Humanitarian Law," *International and Comparative Law Review* 23, no. 1 (August 1, 2023): 117–138, <https://doi.org/10.2478/iclr-2023-0006>.

³⁸ *Ibid.*

³⁹ Karen Hulme, "Using International Environmental Law to Enhance Biodiversity and Nature Conservation During Armed Conflict," *Journal of International Criminal Justice* 20, no. 5 (February 16, 2023): 1155–1190, <https://doi.org/10.1093/jicj/mqac060>.

⁴⁰ *Ibid.*

These studies collectively highlight the urgent necessity for more comprehensive legal frameworks and interdisciplinary approaches to address the environmental impacts of warfare. However, they expose significant limitations, particularly in practical implementation, harmonization of diverse legal systems, and the mobilization of international cooperation. These gaps form the basis for this research, which aims to build on existing scholarship by proposing actionable strategies to address these deficiencies. The environmental devastation caused by armed conflicts poses a severe threat to ecosystems, human rights, and global sustainability. Despite increasing awareness of these impacts, current legal and institutional mechanisms remain insufficient to prevent, mitigate, or address the environmental destruction linked to warfare.

Therefore, this research is guided by the following questions: *First*, what current legal frameworks address environmental destruction during warfare? *Second*, how do human rights law and humanitarian law intersect to prevent or address this destruction? *Third*, what strategies can be proposed to strengthen the legal and institutional mechanisms for protecting the environment during armed conflicts? To tackle these challenges, this study aims to pursue the following objectives: *First*, to analyze existing legal frameworks dealing with environmental destruction during war. *Second*, to examine the intersections between human rights law and humanitarian law in preventing or addressing environmental destruction. *Third*, to propose actionable strategies for integrating international environmental law, IHL, and human rights law to enhance accountability and protection mechanisms.

METHOD

The research methodology adopted in this study involves a series of systematic and technical steps to ensure the rigor and validity of the findings. This section outlines the approach, type of research, data sources, data collection methods, and techniques used to verify the validity of the data. This study utilizes a qualitative research design, employing a combination of doctrinal legal research and an interdisciplinary analytical approach.⁴¹ Doctrinal legal research focuses on analyzing legal texts to identify gaps, ambiguities, and areas for improvement in existing legal frameworks.⁴² This approach is complemented by interdisciplinary analysis, which integrates perspectives from law, human rights, and environmental studies to provide a holistic understanding of the issue.⁴³ Such a methodology allows the research to address complex legal and policy questions related to environmental destruction during warfare.⁴⁴

The study relies on both primary and secondary data sources.⁴⁵ Primary data sources include international legal instruments, such as the ENMOD Convention, Geneva Conventions, and the Rome Statute. Case law and official documents related to environmental destruction in warfare are also analyzed to assess legal and policy gaps. Secondary Data Sources consist of academic articles, policy reports, and books that discuss the intersection of international humanitarian law (IHL), human rights law, and environmental protection during armed conflicts. These sources provide contextual and theoretical insights to support the analysis. Then, the data collection process involves the following methods. *First*, legal text analysis. This method involves a comprehensive examination of international

⁴¹ P Ishwara Bhat, *Idea and Methods of Legal Research* (Oxford University Press, 2019).

⁴² Komang Ayu Henny Achjar et al., *Metode Penelitian Kualitatif: Panduan Praktis Untuk Analisis Data Kualitatif Dan Studi Kasus* (PT. Sonpedia Publishing Indonesia, 2023); *Ibid*.

⁴³ Ani Ani Purwati et al., *Metode Penelitian Hukum Teori Dan Praktek* (Jakad Media Publishing, 2020).

⁴⁴ Mark Kanazawa, *Research Methods for Environmental Studies: A Social Science Approach* (Routledge, 2023).

⁴⁵ Bhat, *Idea and Methods of Legal Research*.

legal frameworks, treaties, conventions, and case law.⁴⁶ Documents such as the Geneva Conventions and ENMOD Convention are scrutinized to identify their strengths and limitations in addressing environmental destruction during armed conflicts. *Second*, case studies. Selected case studies focus on real-world instances of environmental destruction during warfare, such as the ecological impacts of Agent Orange in Vietnam and the environmental consequences of conflicts in Gaza.⁴⁷ These case studies are critical for contextualizing the research findings and illustrating the practical implications of legal and policy gaps. *Third*, academic literature review. This method involves analyzing scholarly works that discuss IHL, human rights law, and environmental justice.⁴⁸ It helps to situate the study within the broader academic discourse and identify existing knowledge gaps.

The research employs a robust analytical framework that integrates multiple theoretical and methodological perspectives. *First*, doctrinal legal analysis. This component focuses on identifying inconsistencies and gaps in the application of IHL and human rights law to address environmental destruction during warfare. It examines the scope, enforcement mechanisms, and limitations of existing legal instruments.⁴⁹ *Second*, critical legal studies (CLS). The CLS perspective is used to critique the political and institutional barriers that hinder the effective implementation of international legal protections for the environment.⁵⁰ It also highlights the power dynamics and structural inequalities that shape these legal frameworks.⁵¹ *Third*, environmental justice theory. This theory is applied to assess the disproportionate impact of environmental destruction on marginalized and vulnerable communities during conflicts.⁵² It emphasizes the need for equitable and inclusive legal solutions that address both environmental and human rights concerns.⁵³

To ensure the reliability and validity of the data, the study employs the following techniques. The study cross-verifies findings by integrating data from multiple sources, including legal texts, case studies, and academic literature. This triangulation technique helps to reduce bias and enhance the credibility of the analysis.⁵⁴ Preliminary findings are reviewed by experts in international law and environmental studies to ensure the accuracy and robustness of the interpretations.⁵⁵ All data sources,

⁴⁶ Ilias Chalkidis and Dimitrios Kampas, "Deep Learning in Law: Early Adaptation and Legal Word Embeddings Trained on Large Corpora," *Artificial Intelligence and Law* 27, no. 2 (2019): 171–198, <https://doi.org/10.1007/s10506-018-9238-9>.

⁴⁷ Catherine Welch et al., "Theorising from Case Studies: Towards a Pluralist Future for International Business Research," *Research methods in international business* (2020): 171–220, <https://doi.org/10.1057/jibs.2010.55>.

⁴⁸ Raphael Van Steenberghe, "International Environmental Law as a Means for Enhancing the Protection of the Environment in Warfare: A Critical Assessment of Scholarly Theoretical Frameworks," *International Review of the Red Cross* 105, no. 924 (2023): 1568–1599, doi:10.1017/S1816383123000358.

⁴⁹ Sanne Taekema, "Methodologies of Rule of Law Research: Why Legal Philosophy Needs Empirical and Doctrinal Scholarship," *Law and philosophy* 40, no. 1 (2021): 33–66, <https://doi.org/10.1007/s10982-020-09388-1>.

⁵⁰ Manas Divetia and Arjun Chaudhary, "Legal Pluralism: Re-Engaging the Narrative to Solve Global Problems," *Indian J. Integrated Rsch. L.* 3 (2023): 1, DOI: IJIRL/V3-I3/A106.

⁵¹ Duncan Kennedy and Karl E Klare, "A Bibliography of Critical Legal Studies," *Yale Law Journal* (1984): 461–490, <https://www.jstor.org/stable/796234>; Daria Roithmayr, "Introduction to Critical Race Theory in Educational Research and Praxis," in *Race Is... Race Isn't* (Routledge, 2019), 1–6.

⁵² Adrian Martin et al., "Environmental Justice and Transformations to Sustainability," *Environment: Science and Policy for Sustainable Development* 62, no. 6 (2020): 19–30, <https://doi.org/10.1080/00139157.2020.1820294>.

⁵³ Van Steenberghe, "International Environmental Law as a Means for Enhancing the Protection of the Environment in Warfare: A Critical Assessment of Scholarly Theoretical Frameworks," *International Review of the Red Cross*, 105(924), 1568–1599. doi:10.1017/S1816383123000358.

⁵⁴ Rebecca S Natow, "The Use of Triangulation in Qualitative Studies Employing Elite Interviews," *Qualitative research* 20, no. 2 (2020): 160–173, <https://doi.org/10.1177/1468794119830077>.

⁵⁵ Samiaji Sarosa, *Analisis Data Penelitian Kualitatif* (Pt Kanisius, 2021).

including legal documents and scholarly works, are meticulously documented to maintain transparency and enable replication of the study. By combining these methodologies and techniques, the research aims to provide a comprehensive, valid, and interdisciplinary understanding of the legal and humanitarian challenges posed by environmental destruction during armed conflicts.

RESULT AND DISCUSSION

1. First Environmental Destruction as a Weapon of War: Scope and Implications

The deliberate and collateral environmental damage caused by armed conflicts significantly disrupts ecosystems, diminishes biodiversity, and depletes natural resources.⁵⁶ These impacts arise through both intentional strategies, such as scorched-earth tactics, and unintended consequences, including the release of hazardous pollutants and destruction of critical infrastructure.⁵⁷ For instance, scorched-earth policies devastate agricultural lands, forests, and water supplies, depriving adversaries of resources while leaving enduring ecological damage.⁵⁸ This dual nature of environmental harm underscores its complexity as both a strategic tool and a collateral outcome of modern warfare.

Historical and contemporary conflicts provide stark illustrations of the environmental toll of war. The use of Agent Orange during the Vietnam War, spanning from 1961 to 1971, led to massive deforestation and long-lasting soil contamination, with ecological disruptions persisting to this day.⁵⁹ Similarly, the Gulf War saw the intentional ignition of oil wells in Kuwait, resulting in widespread air and soil pollution that irreparably harmed terrestrial and marine ecosystems.⁶⁰ Recent conflicts in Ukraine and Gaza demonstrate how environmental destruction remains weaponized. In Ukraine, the targeting of water infrastructure has exacerbated ecological and humanitarian crises.⁶¹ Ukraine, a significant producer and exporter of cereal crops (corn, wheat, barley) and vegetable oils (sunflower oil), faces a substantial decline in agricultural output, projected by the FAO to range from 20-30% due to the ongoing conflict.⁶² This disruption severely jeopardizes the food security of European nations reliant on Ukrainian agricultural imports. Furthermore, the widespread environmental contamination resulting from the war poses significant long-term challenges. Contaminated land leads to the absorption of toxic substances by crops, while air and water sources are also heavily polluted.⁶³ The proximity of the Zaporizhzhia nuclear power plant to the intense military offensive further exacerbates environmental risks.

While the ongoing conflict in Gaza has created a humanitarian crisis with severe health and environmental consequences. The destruction of critical infrastructure, including water systems and

⁵⁶ Marina Malamud, "The Environment as a Factor in Small Wars," *Small Wars & Insurgencies* 29, no. 2 (2018): 245–268, <https://doi.org/10.1080/09592318.2018.1433505>.

⁵⁷ Zvonko Krajnović and Andrej Smolek, "Impact of Military Activities on the Environment," *Strategos*: 8, no. 2 (2024): 89–124, <https://hrcak.srce.hr/324164>.

⁵⁸ Titilayo Aishat Otukoya, "The Scars beyond Bullets: Recognizing the Environmental Toll of War," *International Journal of Science and Research Archive* 11, no. 1 (February 28, 2024): 1721–1746, DOI:10.30574/ijrsra.2024.11.1.0224.

⁵⁹ Matthew Gillett, "Criminalizing Reprisals against the Natural Environment," *International Review of the Red Cross* 105, no. 924 (December 2023): 1463–1496, doi:10.1017/S1816383123000255.

⁶⁰ Mahreen Khan, *The Environmental Impacts of War and Conflict* (Institute of Development Studies, March 25, 2022), accessed January 10, 2025, <https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/17466>.

⁶¹ Ramil Akhundov, "Environmental Warfare – Modern Global Challenge," *Modeling, Control and Information Technologies*, no. 7 (December 7, 2024): 332–335, <https://doi.org/10.31713/MCIT.2024.103>.

⁶² Pradhipta Oktavianto, "Kerusakan Lingkungan Akibat Perang Rusia-Ukraina," last modified 2023, accessed January 10, 2025, <https://www.forestdigest.com/detail/2163/perang-ukraina>.

⁶³ *Ibid.*

healthcare facilities, has led to widespread displacement and overcrowding.⁶⁴ This situation has created ideal conditions for infectious disease outbreaks, with over 700,000 reported cases.⁶⁵ The collapse of sanitation systems and accumulation of waste have increased vector populations, further exacerbating disease spread.⁶⁶ Mental health issues, particularly among children and adolescents, have surged due to trauma.⁶⁷ The conflict has disproportionately affected women and children, who make up 70% of casualties.⁶⁸ Historically, such conflict-induced conditions have led to death rates from infectious diseases equaling or exceeding those from direct violence.⁶⁹ Urgent international action is needed to address the multifaceted health crises, improve sanitation, and provide humanitarian aid to prevent further deterioration of the situation.⁷⁰

The United Nations Environment Programme (UNEP) has reported that human remains are intermingled with the massive amounts of building debris in Gaza, presenting a significant challenge for cleanup and recovery efforts.⁷¹ The estimated cost of addressing this issue is approximately \$647 million, and the process could take up to 15 years to complete.⁷² Of the debris, nearly 800,000 tons may qualify as hazardous waste due to contamination with asbestos, a material known for its severe health risks when disturbed.⁷³ Furthermore, UNEP highlighted the environmental hazards posed by munitions, which often contain heavy metals and explosive chemicals. These substances can leach into the soil and water, causing long-term contamination.⁷⁴ Soil samples collected from bomb craters in agricultural areas revealed elevated concentrations of nickel, copper, and lead, raising concerns about the impact on both human health and agricultural productivity.⁷⁵

Another alarming source of pollution comes from the destruction of solar panels, which may release approximately 1,675 kilograms of lead and other toxic heavy metals into the environment. UNEP has also mapped the distribution of debris across Gaza, identifying an astonishing 39,200,978 tons of rubble.⁷⁶ This extensive environmental damage underscores the urgent need for coordinated international efforts to mitigate the risks and ensure the region's ecological and public health recovery.

⁶⁴ Zuhair Dardona et al., "Health and Environmental Impacts of Gaza Conflict (2023-2024): A Review," *One Health Bulletin* (October 11, 2024), accessed January 10, 2025, https://journals.lww.com/10.4103/ohbl.ohbl_42_24.

⁶⁵ Safin Hussein et al., "Infectious Diseases Threat amidst the War in Gaza," *Journal of Medicine, Surgery, and Public Health* 2 (April 2024): 100067, <https://doi.org/10.1016/j.glmedi.2024.100067>.

⁶⁶ Dardona et al., "Health and Environmental Impacts of Gaza Conflict (2023-2024)."

⁶⁷ Fatemeh Beiraghdar et al., "Health Crisis in Gaza: The Urgent Need for International Action," *Iranian Journal of Public Health* (December 8, 2023), accessed January 10, 2025, <https://publish.kne-publishing.com/index.php/ijph/article/view/14309>.

⁶⁸ Dardona et al., "Health and Environmental Impacts of Gaza Conflict (2023-2024)."

⁶⁹ John E. Kearney et al., "Conflicts in Gaza and around the World Create a Perfect Storm for Infectious Disease Outbreaks," ed. Julia Robinson and Madhukar Pai, *PLOS Global Public Health* 4, no. 2 (February 7, 2024): e0002927, <https://doi.org/10.1371/journal.pgph.0002927>.

⁷⁰ Beiraghdar et al., "Health Crisis in Gaza"; Hussein et al., "Infectious Diseases Threat amidst the War in Gaza."

⁷¹ Stefan Anderson, "War May Cause 'irreversible' Damage to Gaza," *Arete News*, last modified June 18, 2024, accessed January 10, 2025, <https://www.areteneews.com/risks-of-irreversible-damage-in-gaza/>.

⁷² *Ibid.*

⁷³ *Ibid.*

⁷⁴ UNEP, ed., *Environmental Impact of the Conflict in Gaza: Preliminary Assessment of Environmental Impacts* (Nairobi, Kenya: UN Environment Programme, 2024).

⁷⁵ *Ibid.*

⁷⁶ *Ibid.*

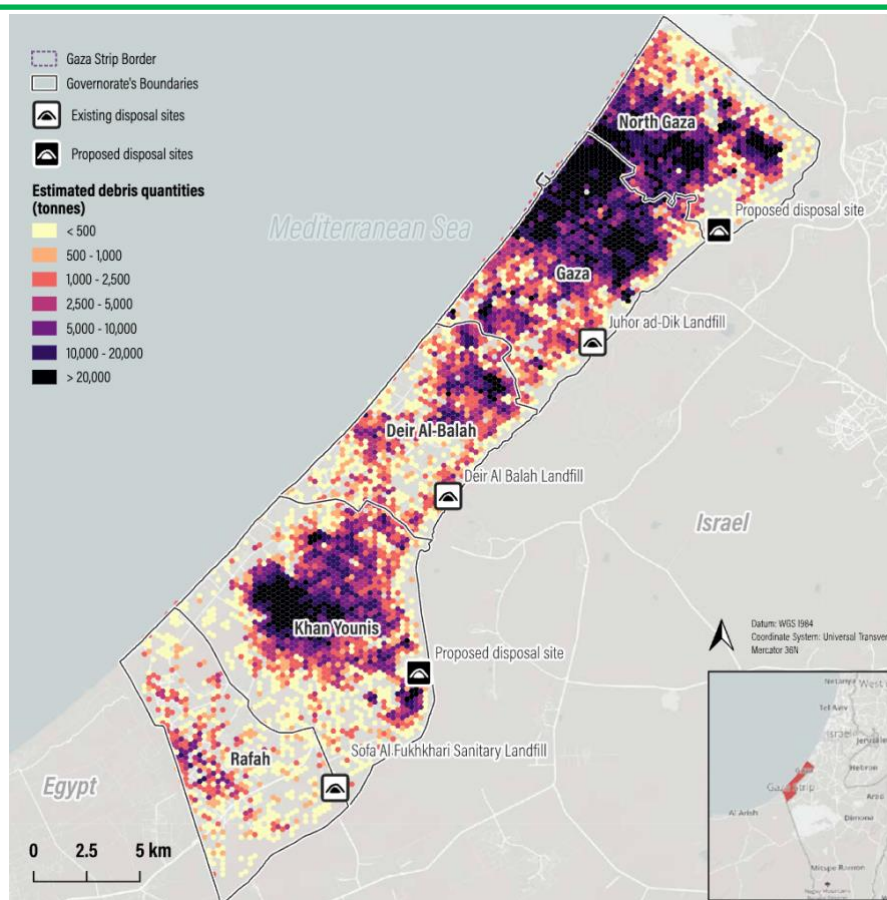


Figure 2. Distribution of Debris Across Gaza

Source: UNEP (2024).⁷⁷

The humanitarian consequences of environmental destruction in war zones are equally profound, disproportionately affecting already vulnerable populations. Habitat degradation, pollution, deforestation, and water scarcity often render affected areas uninhabitable, forcing mass migrations.⁷⁸ Displacement strains host communities, escalating resource competition, deforestation, and pollution.⁷⁹ Moreover, the long-term ecological consequences extend beyond immediate conflict zones, disrupting global biodiversity and ecological balance, as seen in regions of Africa and West Asia where conflict-driven migrations have compounded environmental challenges.⁸⁰ Sustainable resource management and

⁷⁷ Ibid.

⁷⁸ Erin McFee and Jonathan Röders, *Research Brief: Conflict, Climate Change and Environmental Degradation* (Trust After Betrayal, February 2023), accessed January 10, 2025, <https://www.trustafterbetrayal.org/research-briefs/february-2023>.

⁷⁹ Evgenia Nizkorodov and Paroma Wagle, "Population Displacement and the Environment During War," in *Routledge Handbook of Environmental Security*, by Richard Matthew et al., 1st ed. (London: Routledge, 2021), 129–145, accessed January 10, 2025, <https://www.taylorfrancis.com/books/9781315107592/chapters/10.4324/9781315107592-13>.

⁸⁰ Adam Paweł Olechowski, "Impact of Armed Conflicts on the State of Ecological Security," *Confrontation and Cooperation: 1000 Years of Polish-German-Russian Relations* 6, no. 1 (December 1, 2020): 32–39, DOI: 10.2478/conc-2020-0004.

context-sensitive recovery initiatives are essential to address these interconnected crises and empower displaced populations to rebuild their lives.⁸¹

Legal and institutional frameworks provide limited protection for the environment during armed conflicts. The Environmental Modification Convention (ENMOD) and Protocol I of the Geneva Conventions establish baseline protections but are hindered by narrow definitions and inadequate enforcement mechanisms.⁸² The Rome Statute of the International Criminal Court recognizes severe environmental destruction as a war crime, yet prosecutions under this provision are rare due to evidentiary and political challenges.⁸³ The principle of military necessity further complicates efforts to safeguard the environment, allowing states to justify ecologically destructive actions for strategic purposes.⁸⁴

The enduring nature of environmental damage from warfare underscores its broader implications for global sustainability and climate resilience. For instance, the Gulf War oil fires not only caused immediate ecological damage but also contributed to long-term environmental degradation, including soil and water contamination that hindered recovery for decades.⁸⁵ Such incidents exacerbate climate change, disrupt ecological processes, and undermine progress toward international sustainable development goals.⁸⁶

To mitigate the environmental consequences of war, comprehensive reforms are imperative. Strengthening international legal frameworks, expanding the jurisdiction of bodies like the ICC to prioritize environmental crimes, and embedding environmental justice into post-conflict recovery strategies are critical steps. Military doctrines should incorporate environmental protection as a central tenet, and humanitarian organizations must address their operational environmental impacts.⁸⁷ Recognizing and addressing the long-term environmental implications of armed conflicts is essential for fostering global cooperation, promoting sustainable development, and ensuring resilience in the face of future crises.⁸⁸

2. *The Intersection of Human Rights Law and Humanitarian Law*

To mitigate the environmental consequences of war, comprehensive reforms are imperative. Strengthening international legal frameworks, expanding the jurisdiction of bodies like the ICC to prioritize environmental crimes, and embedding environmental justice into post-conflict recovery strategies are critical steps. Military doctrines should incorporate environmental protection as a central tenet, and humanitarian organizations must address their operational environmental impacts.⁸⁹ Recognizing and addressing the long-term environmental implications of armed conflicts is essential

⁸¹ Nizkorodov and Wagle, "Population Displacement and the Environment During War."

⁸² Gillett, "Criminalizing Reprisals against the Natural Environment."

⁸³ Shah Maruf, "Environmental Damage in Ukraine as Environmental War Crime under the Rome Statute: The Kakhovka Dam Breach in Context," *Journal of International Criminal Justice* (2024): mqae004, <https://doi.org/10.1093/jicj/mqae004>.

⁸⁴ Jürgen Scheffran, "Limits to the Anthropocene: Geopolitical Conflict or Cooperative Governance?," *Frontiers in Political Science* 5 (2023): 1190610, <https://doi.org/10.3389/fpos.2023.1190610>.

⁸⁵ Otukoya, "The Scars beyond Bullets."

⁸⁶ Akhundov, "Environmental Warfare – Modern Global Challenge."

⁸⁷ Scheffran, "Limits to the Anthropocene: Geopolitical Conflict or Cooperative Governance?"

⁸⁸ Otukoya, "The Scars beyond Bullets."

⁸⁹ Scheffran, "Limits to the Anthropocene: Geopolitical Conflict or Cooperative Governance?"

for fostering global cooperation, promoting sustainable development, and ensuring resilience in the face of future crises.⁹⁰

Human Rights Law (IHRL) and International Humanitarian Law (IHL) intersect to address the environmental destruction caused by armed conflict, offering a complementary framework for both prevention and redress.⁹¹ While IHL provides rules specific to wartime conduct, including the protection of natural environments under the principles of distinction, necessity, proportionality, and precaution, IHRL emphasizes the continuous obligations of states to safeguard fundamental human rights, even during conflict.⁹² Environmental destruction, which directly undermines the right to life, health, and adequate living conditions, falls squarely within the purview of both legal frameworks.⁹³ The recognition of environmental rights as integral to human dignity highlights the relevance of IHRL in addressing war-induced ecological harm.

The concept of “environcide,” or the systematic destruction of the environment, has emerged as a significant violation of human rights in conflict scenarios.⁹⁴ Environcide not only devastates ecosystems but also leads to long-term harm to human communities reliant on these resources for survival.⁹⁵ For instance, scorched-earth tactics that destroy agricultural lands directly infringe upon the right to food and water, while chemical contamination violates the right to health. These actions underscore the need for stronger integration of IHRL into conflict resolution and recovery processes.⁹⁶ Recognizing environcide as a violation of both IHL and IHRL may offer new avenues for accountability, bridging gaps in enforcement and emphasizing the environmental dimension of human security.

Despite their complementary roles, harmonizing IHL and IHRL faces several challenges. IHL traditionally governs armed conflicts, operating through treaties like the 1977 Additional Protocol I and the Environmental Modification Convention (ENMOD), but enforcement mechanisms are weak, and accountability often falls short.⁹⁷ On the other hand, IHRL operates continuously, applying to states and, increasingly, to non-state actors, but its frameworks may lack specificity in addressing wartime destruction.⁹⁸ Legal doctrines like military necessity and state sovereignty further complicate the alignment of these regimes, as they may justify actions leading to environmental harm.⁹⁹ A

⁹⁰ Otukoya, “The Scars beyond Bullets.”

⁹¹ Anne Dienelt, “Complementing the Laws of Armed Conflict with Human Rights Law and International Environmental Law,” in *Armed Conflicts and the Environment: Complementing the Laws of Armed Conflict with Human Rights Law and International Environmental Law* (Springer, 2022), 257–322, https://doi.org/10.1007/978-3-030-99339-9_5.

⁹² Raphael Van Steenberghe, “The Interplay between International Humanitarian Law and International Environmental Law: Towards a Comprehensive Framework for a Better Protection of the Environment in Armed Conflict,” *Journal of International Criminal Justice* 20, no. 5 (2022): 1123–1154, <https://doi.org/10.1093/jicj/mqac062>.

⁹³ Nathan Bellinger and Roger Sullivan, “A Judicial Duty: Interpreting and Enforcing Montanans’ Inalienable Right to a Clean and Healthful Environment,” *Pub. Land & Resources L. Rev.* 45 (2022): 1, <https://scholarworks.umt.edu/cgi/viewcontent.cgi?article=1772&context=plrlr>.

⁹⁴ Emmanuel Kreike, “Scorched Earth: Environmental Warfare as a Crime against Humanity and Nature” (2021).

⁹⁵ Akhundov, “Environmental Warfare – Modern Global Challenge.”

⁹⁶ Closmann, “Environmental Destruction During War.”

⁹⁷ Hulme and Weir, “Environmental Protection in Armed Conflict.”

⁹⁸ Ziv Bohrer, “Divisions over Distinctions in Wartime International Law,” *Ziv Bohrer, Janina Dill & Helen Duffy, the Applicability of International Humanitarian Law—Part 2* (2019): 19–13, <https://ssrn.com/abstract=3397623> or <http://dx.doi.org/10.2139/ssrn.3397623>.

⁹⁹ Gillett, “Criminalizing Reprisals against the Natural Environment.”

comprehensive approach is required to reconcile these tensions, integrating environmental considerations into both IHL and IHRL enforcement mechanisms.

The intersection of International Humanitarian Law (IHL) and International Human Rights Law (IHRL) offers significant potential to enhance environmental protection during armed conflicts. Both frameworks emphasize the intrinsic value of the natural environment and its critical role in safeguarding human welfare. A comparative analysis reveals that IHRL's emphasis on state obligations to uphold human rights can complement and strengthen IHL's preventive measures, ensuring accountability for actions that harm ecosystems and the communities reliant on them. For example, expanding the jurisdiction of international bodies such as the International Criminal Court (ICC) to include environcide as a prosecutable offense could effectively combine principles from both legal regimes to address environmental destruction more comprehensively.¹⁰⁰

However, disparities in the application of environmental protections highlight systemic challenges within these frameworks. Critical Legal Studies (CLS) demonstrates how reparations, restoration efforts, and accountability mechanisms disproportionately benefit wealthier states or regions with stronger political influence, leaving marginalized communities with limited recourse for ecological or human rights violations.¹⁰¹ This inequity is exacerbated by the fragmented nature of IHL and IHRL, which undermines the creation of a cohesive legal response to environcide and other forms of environmental harm. Legal ambiguities and jurisdictional gaps enable states and non-state actors to evade responsibility for their actions, further compounding vulnerabilities in affected regions.¹⁰²

Efforts to integrate environmental protections into post-conflict recovery and military doctrines highlight potential synergies.¹⁰³ Strengthened cooperation between legal scholars, policymakers, and international organizations can advance innovative frameworks that address the multifaceted nature of environmental destruction. By harmonizing IHL and IHRL, the international community can move toward more comprehensive solutions that uphold human rights and protect ecosystems, fostering resilience and sustainable development in the aftermath of armed conflicts. Here's a structured table to illustrate the intersection of Human Rights Law (IHRL) and International Humanitarian Law (IHL) in addressing environmental destruction during armed conflict:

Table 2. Comparison of IHRL and IHL in Addressing Environmental Destruction

Aspect	Human Rights Law (IHRL)	International Humanitarian Law (IHL)
Purpose	Continuous protection of fundamental human rights	Rules for wartime conduct, including environmental protection
Key Principles	Right to life, health, and adequate living conditions	Distinction, necessity, proportionality, and precaution
Focus	Safeguarding human dignity and rights, even during conflict	Protecting natural environments during warfare
Enforcement Challenges	May lack specificity in wartime contexts	Weak enforcement mechanisms, accountability issues

¹⁰⁰ Van Steenberghe, "The Interplay between International Humanitarian Law and International Environmental Law: Towards a Comprehensive Framework for a Better Protection of the Environment in Armed Conflict."

¹⁰¹ Divetia and Chaudhary, "Legal Pluralism: Re-Engaging the Narrative to Solve Global Problems."

¹⁰² Roithmayr, "Introduction to Critical Race Theory in Educational Research and Praxis."

¹⁰³ Hulme, "Using International Environmental Law to Enhance Biodiversity and Nature Conservation During Armed Conflict."

Concept of Environcide	Viewed as a human rights violation impacting communities	Recognized as a breach of wartime conduct rules
Opportunities for Integration	Strengthens preventive aspects of IHL	Potential for accountability through IHRL frameworks
Potential Avenues for Accountability	Expanding ICC scope to include environcide	Bridging enforcement gaps with IHRL principles
Post-Conflict Recovery	Emphasizes sustainable development and human rights	Integrates environmental considerations into military doctrines

Source: compiled by author.

3. *Strengthening Legal and Institutional Mechanisms for Environmental Protection During Armed Conflicts*

The application of Environmental Justice Theory provides a critical lens for analyzing the disproportionate impact of environmental destruction on marginalized and vulnerable communities during armed conflicts.¹⁰⁴ This theory highlights the intersection of environmental harm and social inequities, emphasizing the need for equitable and inclusive legal solutions that address both environmental and human rights concerns.¹⁰⁵

a. Strengthening Legal Protections through Environmental Justice

From an environmental justice perspective, strengthening legal protections must focus on the inclusion of marginalized communities in both the formulation and implementation of environmental protection mechanisms.¹⁰⁶ A comprehensive international treaty addressing environmental destruction during armed conflicts should explicitly incorporate principles of equity and inclusivity.¹⁰⁷ For example, provisions ensuring that indigenous peoples, minority groups, and conflict-affected communities have access to justice and reparations for environmental harm could bridge existing gaps between International Humanitarian Law (IHL) and International Human Rights Law (IHRL).

Additionally, the precautionary principle under IHL should be expanded to prioritize the prevention of environmental harm in areas predominantly inhabited by vulnerable communities. Similarly, the codification of the right to a healthy and sustainable environment within IHRL must address the specific needs of these communities during conflict situations. Modernizing existing treaties, such as the ENMOD Convention and Additional Protocol I of the Geneva Conventions, should include mechanisms for assessing and mitigating environmental harm that disproportionately affects marginalized populations.

¹⁰⁴ Martin et al., “Environmental Justice and Transformations to Sustainability.”

¹⁰⁵ Van Steenberghe, “International Environmental Law as a Means for Enhancing the Protection of the Environment in Warfare: A Critical Assessment of Scholarly Theoretical Frameworks.”

¹⁰⁶ Martin et al., “Environmental Justice and Transformations to Sustainability.”

¹⁰⁷ Mary Menton et al., “Environmental Justice and the SDGs: From Synergies to Gaps and Contradictions,” *Sustainability science* 15 (2020): 1621–1636, <https://doi.org/10.1007/s11625-020-00789-8>.

b. Promoting Accountability Mechanisms with an Equity Focus

Accountability mechanisms for environmental war crimes must incorporate environmental justice principles to ensure reparative and distributive justice.¹⁰⁸ Specialized international tribunals for prosecuting environmental war crimes should prioritize cases where the most vulnerable populations bear the brunt of ecological damage. Reparations should be tailored to address both the human suffering and environmental degradation experienced by these communities, integrating their voices into the process of ecosystem restoration and recovery. For post-conflict rebuilding, environmental impact assessments must consider the socio-economic vulnerabilities of affected populations. These assessments can help design reconstruction efforts that prioritize sustainable livelihoods and community resilience, ensuring equitable recovery for all.

c. Integrating Environmental Concerns in Conflict Prevention and Resolution through Justice Frameworks

Environmental justice theory underscores the importance of proactive strategies that prevent environmental harm and its disproportionate effects.¹⁰⁹ Peace agreements should include specific provisions to protect ecologically sensitive areas, particularly those supporting the livelihoods of marginalized communities. Early warning systems for environmental threats during conflicts must integrate participatory approaches, ensuring that local communities are involved in monitoring and response mechanisms. Incorporating environmental justice into peace negotiation frameworks could help establish binding commitments to equitable resource management and post-conflict restoration, minimizing the risk of further marginalization of vulnerable groups.

d. Strengthening Institutional Frameworks for Equitable Environmental Protection

The role of international organizations, such as the United Nations, is pivotal in institutionalizing environmental justice.¹¹⁰ Mandates for monitoring and responding to environmental destruction must prioritize areas with high concentrations of vulnerable populations.¹¹¹ For instance, peacekeeping missions could deploy environmental monitoring units equipped to document harm and advocate for targeted interventions that address inequities. Civil society organizations (CSOs) and non-governmental organizations (NGOs) are instrumental in advancing environmental justice by amplifying the voices of marginalized communities. These organizations can document evidence of disproportionate environmental harm and advocate for the recognition of “ecocide” as an international crime, with provisions that emphasize justice for the most affected communities.

e. Strengthening International Cooperation for Environmental Justice

International cooperation should be guided by environmental justice principles to ensure equitable outcomes.¹¹² Regional coalitions addressing cross-border environmental impacts of conflicts must prioritize the needs of vulnerable populations in affected areas.¹¹³ States and international organizations should collaborate to provide technical assistance and capacity-building

¹⁰⁸ Ben Almassi, *Reparative Environmental Justice in a World of Wounds* (Rowman & Littlefield, 2020).

¹⁰⁹ Martin et al., “Environmental Justice and Transformations to Sustainability.”

¹¹⁰ *Ibid.*; Franz Xaver Perrez, “The Role of the United Nations Environment Assembly in Emerging Issues of International Environmental Law,” *Sustainability* 12, no. 14 (2020): 5680, <https://doi.org/10.3390/su12145680>.

¹¹¹ Martin et al., “Environmental Justice and Transformations to Sustainability.”

¹¹² *Ibid.*

¹¹³ Graham Haughton, “Environmental Justice and the Sustainable City,” in *The Earthscan Reader in Sustainable Cities* (Routledge, 2021), 62–79.

programs that empower local communities to participate in environmental governance and restoration. The private sector must also be held accountable for its role in perpetuating environmental harm in conflict zones.¹¹⁴ Corporate due diligence requirements should incorporate environmental justice criteria, ensuring that companies operating in these areas prioritize sustainable practices and address the concerns of marginalized populations.

f. Promoting Public Awareness and Advocacy for Justice

Public advocacy campaigns emphasizing the disproportionate impacts of environmental destruction during armed conflicts on vulnerable groups can drive political will for inclusive and equitable reforms.¹¹⁵ Platforms for global dialogue, such as international conferences, can bring together diverse stakeholders to discuss strategies for integrating environmental justice into legal and institutional frameworks. Such efforts would ensure that the voices of the most affected are heard and that justice is central to environmental protection during armed conflicts.

Here is a figure of strengthening legal and institutional mechanisms for environmental protection during armed conflict:

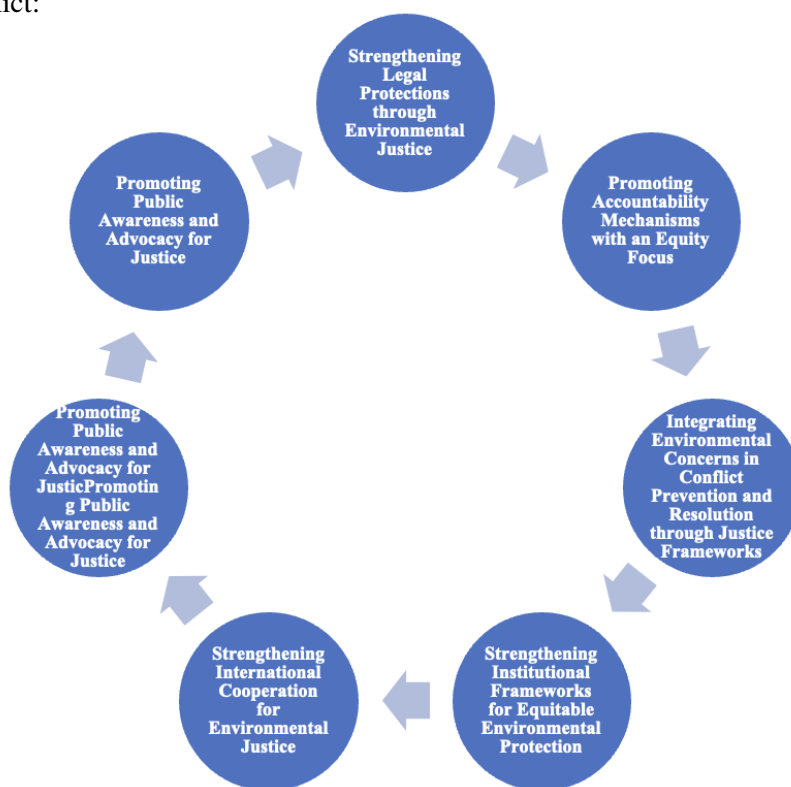


Figure 2. Strengthening Legal and Institutional Mechanisms for Environmental Protection During Armed Conflict

Source: compiled by author.

¹¹⁴ John M Luiz, Brian Ganson, and Achim Wennmann, “Business Environment Reforms in Fragile and Conflict-Affected States: From a Transactions towards a Systems Approach,” *Journal of International Business Policy* 2 (2019): 217–236, <https://doi.org/10.1057/s42214-019-00030-z>.

¹¹⁵ Ahmadnia et al., *Defueling Conflict: Environment and Natural Resource Management as a Pathway to Peace*.

By embedding the principles of environmental justice into the proposed strategies, this approach not only strengthens the legal and institutional mechanisms for protecting the environment but also ensures that the needs and rights of marginalized communities are at the forefront of these efforts. This holistic framework recognizes the intertwined nature of environmental and social justice, offering a path toward more equitable and sustainable solutions.

CONCLUSION

This study has examined the intersection of legal and institutional mechanisms for protecting the environment during armed conflicts and proposed strategies to strengthen these frameworks. The findings highlight the urgent need for integrating environmental protection into the fabric of both International Humanitarian Law (IHL) and International Human Rights Law (IHRL). By addressing gaps in enforcement, accountability, and institutional capacity, a more comprehensive and cohesive approach to environmental protection in conflict zones can be developed. Theoretically, this research advances the understanding of “environocide” as a multifaceted issue that transcends legal categorizations, advocating for its recognition as a distinct crime under international law. This perspective underscores the need for a paradigm shift in family law and environmental law, where ecological sustainability becomes central to safeguarding intergenerational equity and the collective well-being of communities. It also challenges existing notions of justice and accountability by emphasizing environmental restoration as an integral aspect of post-conflict reconciliation and reparation processes.

Future research should explore the integration of environmental concerns into domestic legal frameworks, particularly in conflict-prone regions. Comparative studies across jurisdictions could illuminate best practices for aligning national laws with international standards on environmental protection during armed conflicts. Furthermore, interdisciplinary research involving legal scholars, environmental scientists, and policymakers is essential to develop innovative solutions for monitoring and mitigating environmental damage in real-time. Finally, this study calls for empirical investigations into the socio-economic impacts of environmental destruction on vulnerable communities, particularly families. Such research would provide a critical lens for evaluating how legal mechanisms can better address the intersection of environmental harm and human rights violations, ensuring more equitable outcomes for affected populations. Through these efforts, the scientific field of family law can evolve to encompass broader ecological dimensions, fostering resilience and sustainability in the face of conflict and environmental crises.

REFERENCES

- Achjar, Komang Ayu Henny, Muhamad Rusliyadi, A Zaenurrosyid, Nini Apriani Rumata, Iin Nirwana, Ayuliamita Abadi, and others. *Metode Penelitian Kualitatif: Panduan Praktis Untuk Analisis Data Kualitatif Dan Studi Kasus*. PT. Sonpedia Publishing Indonesia, 2023.
- Ahmadnia, Shaadee, Agathe Marie Christien, Phoebe Spencer, Tracy Hart, and Caio Cesar De Araujo Barbosa. *Defueling Conflict: Environment and Natural Resource Management as a Pathway to Peace*. World Bank, 2022.
- Akhundov, Ramil. “Environmental Warfare – Modern Global Challenge.” *Modeling, Control and Information Technologies*, no. 7 (December 7, 2024): 332–335. <https://doi.org/10.31713/MCIT.2024.103>.

- Al-Aloosy, Massaab. "Ripples of Negligence: Unravelling Iraq's Descent from Water Abundance to Scarcity." *Democracy and Security* (August 19, 2024): 1–22. 10.1080/17419166.2024.2389448.
- Almassi, Ben. *Reparative Environmental Justice in a World of Wounds*. Rowman & Littlefield, 2020.
- Andersen-Rodgers, David, and Kerry F Crawford. *Human Security: Theory and Action*. Rowman & Littlefield, 2022.
- Anderson, Stefan. "War May Cause 'irreversible' Damage to Gaza." *Arete News*. Last modified June 18, 2024. Accessed January 10, 2025. <https://www.areteneews.com/risks-of-irreversible-damage-in-gaza/>.
- Ani Purwati, Ani, CPL MH, CCMs CPCLE, CTL CLA, CMe CLI, and others. *Metode Penelitian Hukum Teori Dan Praktek*. Jakad Media Publishing, 2020.
- Beiraghdar, Fatemeh, Javad Momeni, Elham Hosseini, Yunes Panahi, and Sajad Sahab Negah. "Health Crisis in Gaza: The Urgent Need for International Action." *Iranian Journal of Public Health* (December 8, 2023). Accessed January 10, 2025. <https://publish.kne-publishing.com/index.php/ijph/article/view/14309>.
- Bellinger, Nathan, and Roger Sullivan. "A Judicial Duty: Interpreting and Enforcing Montanans' Inalienable Right to a Clean and Healthful Environment." *Pub. Land & Resources L. Rev.* 45 (2022): 1. <https://scholarworks.umt.edu/cgi/viewcontent.cgi?article=1772&context=plrlr>.
- Bhat, P Ishwara. *Idea and Methods of Legal Research*. Oxford University Press, 2019.
- Black, Richard, Joshua Busby, Geoffrey D. Dabelko, Cedric De Coning, Hafsa Maalim, Claire McAllister, Melvis Ndiloseh, et al. *Environment of Peace: Security in a New Era of Risk*. Stockholm International Peace Research Institute, May 2022. Accessed January 11, 2025. <https://www.sipri.org/publications/2022/other-publications/environment-peace-security-new-era-risk>.
- Bohrer, Ziv. "Divisions over Distinctions in Wartime International Law." *Ziv Bohrer, Janina Dill & Helen Duffy, the Applicability of International Humanitarian Law—Part 2* (2019): 19–13. <https://ssrn.com/abstract=3397623> or <http://dx.doi.org/10.2139/ssrn.3397623>.
- Bustami, Ammar, and Marie-Christine Hecken. "Perspectives for a New International Crime against the Environment: International Criminal Responsibility for Environmental Degradation under the Rome Statute." *Goettingen J. Int'l L.* 11 (2021): 145. doi: 10.3249/1868-1581-bustami-hecken.
- Chalkidis, Ilias, and Dimitrios Kampas. "Deep Learning in Law: Early Adaptation and Legal Word Embeddings Trained on Large Corpora." *Artificial Intelligence and Law* 27, no. 2 (2019): 171–198. <https://doi.org/10.1007/s10506-018-9238-9>.
- Closmann, Charles. "Environmental Destruction During War." In *Routledge Handbook of Environmental Security*, 95–106. Routledge, 2021.
- Costi, Alberto. "Reverberating Effects in Armed Conflict: An Environmental Analysis." *Ariz. J. Int'l & Comp. L.* 39 (2022): 317. <https://repository.arizona.edu/handle/10150/667964>.
- Dardona, Zuhair, Mounia Amane, Ayman Dardona, and Samia Boussaa. "Health and Environmental Impacts of Gaza Conflict (2023-2024): A Review." *One Health Bulletin* (October 11, 2024). Accessed January 10, 2025. https://journals.lww.com/10.4103/ohbl.ohbl_42_24.
- Dienelt, Anne. "Complementing the Laws of Armed Conflict with Human Rights Law and International Environmental Law." In *Armed Conflicts and the Environment: Complementing the Laws of Armed Conflict with Human Rights Law and International Environmental Law*, 257–322. Springer, 2022. https://doi.org/10.1007/978-3-030-99339-9_5.

- Divetia, Manas, and Arjun Chaudhary. "Legal Pluralism: Re-Engaging the Narrative to Solve Global Problems." *Indian J. Integrated Rsch. L.* 3 (2023): 1. DOI: IJIRL/V3-I3/A106.
- Falk, Richard A. *Legal Order in a Violent World*. Princeton University Press, 2019.
- Fergusson, James. *In Search of the River Jordan: A Story of Palestine, Israel and the Struggle for Water*. Yale University Press, 2023.
- Gillett, Matthew. "Criminalizing Reprisals against the Natural Environment." *International Review of the Red Cross* 105, no. 924 (December 2023): 1463–1496. doi:10.1017/S1816383123000255.
- Hashimy, Sayed Qudrat. "The Agonising Narrative of Environmental Dilapidation in the Tussle of Armed Conflict; From the Lens of International Humanitarian Laws." *Journal of Global Ecology and Environment* (March 10, 2023): 45–59. DOI: 10.56557/jogee/2023/v17i28145.
- Hassoun, Abdo, Khawla Al-Muhannadi, Hussein F Hassan, Ahmed Hamad, Khaoula Khwaldia, Mohamed Buheji, and Ayoub Al Jawaldeh. "From Acute Food Insecurity to Famine: How the 2023/2024 War on Gaza Has Dramatically Set Back Sustainable Development Goal 2 to End Hunger." *Frontiers in Sustainable Food Systems* 8 (2024): 1402150. <https://doi.org/10.3389/fsufs.2024.1402150>.
- Haughton, Graham. "Environmental Justice and the Sustainable City." In *The Earthscan Reader in Sustainable Cities*, 62–79. Routledge, 2021.
- Hryhorczuk, Daniel, Barry S Levy, Mykola Prodanchuk, Oleksandr Kravchuk, Nataliia Bubalo, Alex Hryhorczuk, and Timothy B Erickson. "The Environmental Health Impacts of Russia's War on Ukraine." *Journal of occupational medicine and toxicology* 19, no. 1 (2024): 1. <https://doi.org/10.1186/s12995-023-00398-y>.
- Hulme, Karen. "Using International Environmental Law to Enhance Biodiversity and Nature Conservation During Armed Conflict." *Journal of International Criminal Justice* 20, no. 5 (February 16, 2023): 1155–1190. <https://doi.org/10.1093/jicj/mqac060>.
- Hulme, Karen, and Doug Weir. "Environmental Protection in Armed Conflict." In *Research Handbook on International Environmental Law*, 392–411. Edward Elgar Publishing, 2021.
- Human Rights Watch. "*Hopeless, Starving, and Besieged*": Israel's Forced Displacement of Palestinians in Gaza. United States of America: Human Rights Watch, 2024. Accessed January 8, 2025. <https://www.hrw.org/report/2024/11/14/hopeless-starving-and-besieged/israels-forced-displacement-palestinians-gaza>.
- Hussein, Safin, Sirwan Khalid Ahmed, Karzan Qurbani, Abdulmalik Fareeq, and Rawand Abdulrahman Essa. "Infectious Diseases Threat amidst the War in Gaza." *Journal of Medicine, Surgery, and Public Health* 2 (April 2024): 100067. <https://doi.org/10.1016/j.glmedi.2024.100067>.
- Ide, Tobias, McKenzie F. Johnson, Jon Barnett, Florian Krampe, Philippe Le Billon, Lucile Maertens, Nina Von Uexkull, and Irene Vélez-Torres. "The Future of Environmental Peace and Conflict Research." *Environmental Politics* 32, no. 6 (September 19, 2023): 1077–1103. DOI:10.1080/09644016.2022.2156174.
- Jarose, Joanna. "A Sleeping Giant? The ENMOD Convention as a Limit on Intentional Environmental Harm in Armed Conflict and Beyond." *American Journal of International Law* 118, no. 3 (2024): 468–511. doi:10.1017/ajil.2024.15.
- Kanazawa, Mark. *Research Methods for Environmental Studies: A Social Science Approach*. Routledge, 2023.
- Kearney, John E., Natalie Thiel, Arian El-Taher, Sabreen Akhter, David A. Townes, Indi Trehan, and Paul S. Pottinger. "Conflicts in Gaza and around the World Create a Perfect Storm for Infectious Disease Outbreaks." Edited by Julia Robinson and Madhukar Pai. *PLOS Global Public Health* 4, no. 2 (February 7, 2024): e0002927. <https://doi.org/10.1371/journal.pgph.0002927>.

- Keating, Michael, and Matt Waldman. *War and Peace in Somalia: National Grievances, Local Conflict and Al-Shabaab*. Oxford University Press, 2019.
- Kennedy, Duncan, and Karl E Klare. "A Bibliography of Critical Legal Studies." *Yale Law Journal* (1984): 461–490. <https://www.jstor.org/stable/796234>.
- Khan, Mahreen. *The Environmental Impacts of War and Conflict*. Institute of Development Studies, March 25, 2022. Accessed January 10, 2025. <https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/17466>.
- Khorram-Manesh, Amir, Krzysztof Goniewicz, and Frederick M Burkle Jr. "Social and Healthcare Impacts of the Russian-Led Hybrid War in Ukraine—a Conflict with Unique Global Consequences." *Disaster medicine and public health preparedness* 17 (2023): e432. doi:10.1017/dmp.2023.91.
- Krajnović, Zvonko, and Andrej Smolek. "Impact of Military Activities on the Environment." *Strategos*: 8, no. 2 (2024): 89–124. <https://hrcak.srce.hr/324164>.
- Kreike, Emmanuel. "Scorched Earth: Environmental Warfare as a Crime against Humanity and Nature" (2021).
- . *Scorched Earth: Environmental Warfare as a Crime against Humanity and Nature*. Princeton University Press, 2021. Accessed January 11, 2025. <http://www.jstor.org/stable/10.2307/j.ctv11hprdz>.
- Lehto, Marja. "Armed Conflicts and the Environment: The International Law Commission's New Draft Principles." *Review of European, Comparative & International Environmental Law* 29, no. 1 (April 2020): 67–75. <https://doi.org/10.1111/reel.12324>.
- Luiz, John M, Brian Ganson, and Achim Wennmann. "Business Environment Reforms in Fragile and Conflict-Affected States: From a Transactions towards a Systems Approach." *Journal of International Business Policy* 2 (2019): 217–236. <https://doi.org/10.1057/s42214-019-00030-z>.
- Malamud, Marina. "The Environment as a Factor in Small Wars." *Small Wars & Insurgencies* 29, no. 2 (2018): 245–268. <https://doi.org/10.1080/09592318.2018.1433505>.
- Martin, Adrian, M Teresa Armijos, Brendan Coolsaet, Neil Dawson, Gareth AS Edwards, Roger Few, Nicole Gross-Camp, et al. "Environmental Justice and Transformations to Sustainability." *Environment: Science and Policy for Sustainable Development* 62 no. 6 (2020): 19–30. <https://doi.org/10.1080/00139157.2020.1820294>.
- Maruf, Shah. "Environmental Damage in Ukraine as Environmental War Crime under the Rome Statute: The Kakhovka Dam Breach in Context." *Journal of International Criminal Justice* (2024): mqae004. <https://doi.org/10.1093/jicj/mqae004>.
- McFee, Erin, and Jonathan Röders. *Research Brief: Conflict, Climate Change and Environmental Degradation*. Trust After Betrayal, February 2023. Accessed January 10, 2025. <https://www.trustafterbetrayal.org/research-briefs/february-2023>.
- Menton, Mary, Carlos Larrea, Sara Latorre, Joan Martinez-Alier, Mika Peck, Leah Temper, and Mariana Walter. "Environmental Justice and the SDGs: From Synergies to Gaps and Contradictions." *Sustainability science* 15 (2020): 1621–1636. <https://doi.org/10.1007/s11625-020-00789-8>.
- Mohammed Alashqar, Muath, Asmar Abdul Rahim, and Ahmad Shamsul Abd Aziz. "War Crimes in Gaza Strip from Year 2008 2021: Individual Criminal Responsibility Under the Legal Framework of Rome Statute of the International Criminal Court." *Journal of International Studies (JIS)* 19, no. 1 (2023): 61–93. <https://doi.org/10.32890/jis2023.19.1.3>.

- Morganstein, Joshua C, and Robert J Ursano. "Ecological Disasters and Mental Health: Causes, Consequences, and Interventions." *Frontiers in psychiatry* 11 (2020): 1. <https://doi.org/10.3389/fpsyt.2020.00001>.
- Musisi, Seggane, and Eugene Kinyanda. "Long-Term Impact of War, Civil War, and Persecution in Civilian Populations—Conflict and Post-Traumatic Stress in African Communities." *Frontiers in psychiatry* 11 (2020): 20. <https://doi.org/10.3389/fpsyt.2020.00020>.
- Natow, Rebecca S. "The Use of Triangulation in Qualitative Studies Employing Elite Interviews." *Qualitative research* 20, no. 2 (2020): 160–173. <https://doi.org/10.1177/1468794119830077>.
- Nizkorodov, Evgenia, and Paroma Wagle. "Population Displacement and the Environment During War." In *Routledge Handbook of Environmental Security*, by Richard Matthew, Evgenia Nizkorodov, Crystal Murphy, Kristen A. Goodrich, Ashley Hooper, Bemmy Maharramli, Maureen J. Purcell, and Paroma Wagle, 129–145. 1st ed. London: Routledge, 2021. Accessed January 10, 2025. <https://www.taylorfrancis.com/books/9781315107592/chapters/10.4324/9781315107592-13>.
- Oktavianto, Pradhipta. "Kerusakan Lingkungan Akibat Perang Rusia-Ukraina." Last modified 2023. Accessed January 10, 2025. <https://www.forestdigest.com/detail/2163/perang-ukraina>.
- Olechowski, Adam Paweł. "Impact of Armed Conflicts on the State of Ecological Security." *Confrontation and Cooperation: 1000 Years of Polish-German-Russian Relations* 6. no. 1 (December 1, 2020): 32–39, DOI: 10.2478/conc-2020-0004.
- Otukoya, Titilayo Aishat. "The Scars beyond Bullets: Recognizing the Environmental Toll of War." *International Journal of Science and Research Archive* 11, no. 1 (February 28, 2024): 1721–1746. DOI:10.30574/ijrsra.2024.11.1.0224.
- Perrez, Franz Xaver. "The Role of the United Nations Environment Assembly in Emerging Issues of International Environmental Law." *Sustainability* 12, no. 14 (2020): 5680. <https://doi.org/10.3390/su12145680>.
- Rawtani, Deepak, Gunjan Gupta, Nitasha Khatri, Piyush K Rao, and Chaudhery Mustansar Hussain. "Environmental Damages Due to War in Ukraine: A Perspective." *Science of The Total Environment* 850 (2022): 157932. <https://doi.org/10.1016/j.scitotenv.2022.157932>.
- Rekrut, Iryna. "Environmental Damage Is a War Crime: Analyzing the Legal Implications of the Russian Armed Invasion's Environmental Impact on Ukraine." *J. Crim. L. & Crimin. Online* 114 (2023): 93. https://scholarlycommons.law.northwestern.edu/jclc_online/30.
- Roithmayr, Daria. "Introduction to Critical Race Theory in Educational Research and Praxis." In *Race Is... Race Isn't*, 1–6. Routledge, 2019.
- Salamanca, Omar Jabary. "Unplug and Play: Manufacturing Collapse in Gaza." *Human Geography* 4, no. 1 (2011): 22–37. <https://doi.org/10.1177/194277861100400103>.
- Sarosa, Samiaji. *Analisis Data Penelitian Kualitatif*. Pt Kanisius, 2021.
- Scheffran, Jürgen. "Limits to the Anthropocene: Geopolitical Conflict or Cooperative Governance?" *Frontiers in Political Science* 5 (2023): 1190610. <https://doi.org/10.3389/fpos.2023.1190610>.
- Schillinger, Juliane, Gül Özerol, and Michiel Heldeweg. "A Social-Ecological Systems Perspective on the Impacts of Armed Conflict on Water Resources Management: Case Studies from the Middle East." *Geoforum* 133 (2022): 101–116. <https://doi.org/10.1016/j.geoforum.2022.05.001>.
- Schneider, Nicolas, and Elizabeth Sprout. "Scorched Earth: Environmental Warfare as a Crime against Humanity and Nature: By Emmanuel Kreike, Princeton & Oxford, Princeton University Press, 2021, 521 Pp., \$39.95, £34.00 (Hc), ISBN 978-0-691-1374-21; eISBN 978-0-691-1890-17." *International Journal of Environmental Studies* 79, no. 3 (May 4, 2022): 573–574. 10.1080/00207233.2021.1911100.

- Shorrab, A, Mohamed Nassef, Ahmad Subhi, B Giwa, and Mohamed Buheji. "Health in the Crossfire- Analysing and Mitigating the Multifaceted Health Risks of the 2023 War on Gaza." *Public Health Research* 14, no. 1 (2024): 1–11. DOI: 10.5923/j.phr.20241401.01.
- Skiba, Richard. *Urban Warfare: Emergence, Evolution, Strategies and Mastery of the Modern Conflict Landscape*. After Midnight Publishing, 2024.
- Sowers, Jeannie, and Erika Weinthal. "Health and Environmental Tolls of Protracted Conflicts in the Middle East and North Africa." *Current History* 120, no. 830 (2021): 339–345. <https://doi.org/10.1525/curh.2021.120.830.339>.
- Statista. "Estimated Total War Damage Value in Ukraine from February 24, 2022 to December 31, 2023, by Sector." *Statista*. Last modified 2023. Accessed January 8, 2025. <https://www.statista.com/statistics/1303344/ukraine-infrastructure-war-damage/>.
- Stoett, Peter J. *Global Ecopolitics: Crisis, Governance, and Justice*. University of Toronto Press, 2019.
- Szpak, Agnieszka, Monika Bar, and Eric Kemp. "PROTECTION OF THE ENVIRONMENT – INTERNATIONAL HUMAN RIGHTS AND INTERNATIONAL HUMANITARIAN LAW PERSPECTIVES." *Torun International Studies* 1, no. 19 (September 30, 2024): 33–52. <https://doi.org/10.12775/TIS.2024.003>.
- Taekema, Sanne. "Methodologies of Rule of Law Research: Why Legal Philosophy Needs Empirical and Doctrinal Scholarship." *Law and philosophy* 40, no. 1 (2021): 33–66. <https://doi.org/10.1007/s10982-020-09388-1>.
- Tarkhani, Hogr. "Guns, Bombs, and Pollution: Unraveling the Nexus between Warfare, Terrorism, and Ecological Devastation in Iraq." *The Journal of Social Encounters* 8, no. 1 (March 3, 2024): 29–48. 10.69755/2995-2212.1240.
- UNEP, ed. *Environmental Impact of the Conflict in Gaza: Preliminary Assessment of Environmental Impacts*. Nairobi, Kenya: UN Environment Programme, 2024.
- Van Steenberghe, Raphael. "International Environmental Law as a Means for Enhancing the Protection of the Environment in Warfare: A Critical Assessment of Scholarly Theoretical Frameworks." *International Review of the Red Cross* 105, no. 924 (2023): 1568–1599. doi:10.1017/S1816383123000358.
- . "The Interplay between International Humanitarian Law and International Environmental Law: Towards a Comprehensive Framework for a Better Protection of the Environment in Armed Conflict." *Journal of International Criminal Justice* 20, no. 5 (2022): 1123–1154. <https://doi.org/10.1093/jicj/mqac062>.
- Vesco, Paola, Ghassan Baliki, Tilman Brück, S Döring, A Eriksson, H Fjelde, D Guha-Sapir, et al. "The Impacts of Armed Conflict on Human Development: A Review of the Literature" (2024). <https://doi.org/10.1016/j.worlddev.2024.106806>.
- Weinthal, Erika, and Jeannie Sowers. "Targeting Infrastructure and Livelihoods in the West Bank and Gaza." *International Affairs* 95, no. 2 (2019): 319–340. <https://doi.org/10.1093/ia/iiz015>.
- Welch, Catherine, Rebecca Piekkari, Emmanuella Plakoyiannaki, and Eriikka Paavilainen-Mäntymäki. "Theorising from Case Studies: Towards a Pluralist Future for International Business Research." *Research methods in international business* (2020): 171–220. <https://doi.org/10.1057/jibs.2010.55>.
- Wirthová, Lucia. "From Kuwait to Ukraine: Conflict's Implications on the Natural Environment and the Responses of International Humanitarian Law." *International and Comparative Law Review* 23, no. 1 (August 1, 2023): 117–138. <https://doi.org/10.2478/iclr-2023-0006>.

Yamashita, Nobuaki, and Trong-Anh Trinh. “Long-Term Effects of Vietnam War: Agent Orange and the Health of Vietnamese People After 30 Years.” *Asian Economic Journal* 36, no. 2 (June 2022): 180–202. <https://doi.org/10.1111/asej.12265>.