DOES THE NEXUS OF CONFLICT, ENVIRONMENT, AND SUSTAINABLE DEVELOPMENT DEMAND AN EVOLUTION IN INTERNATIONAL HUMANITARIAN LAW?

JE POTREBNÉ, ABY NASTALA EVOLÚCIA MEDZINÁRODNÉHO HUMANITÁRNEHO PRÁVA KVÔLI SÚVISLOSTI MEDZI KONFLIKTOM, ŽIVOTNÝM PROSTREDÍM A UDRŽATEĽNÝM ROZVOJOM?

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ABSTRACT

Global sustainability faces mounting threats from the intertwined crises of environmental degradation and armed conflict, where resource disputes drive over 40% of internal strife, amplifying ecological and social vulnerabilities. This study examines the legal gaps in international humanitarian law (IHL) concerning environmental destruction during armed conflict, using the 2023 Nova Kakhovka Dam collapse as a focal point. It proposes a multi-faceted reform agenda to align these laws with 21st-century ecological and humanitarian needs, integrating UN Sustainable Development Goals (SDGs). Through a concise analysis, it critiques the restrictive thresholds of Additional Protocol I and ENMOD, advocating amendments to enhance environmental safeguards. The methodology blends legal analysis with case studies, revealing IHL's inadequacies in addressing modern warfare's ecological toll. The findings highlight a pressing need to redefine legal standards, strengthen enforcement, and introduce an Environmental Protection Convention, fostering sustainability and peacebuilding.

ABSTRAKT

Globálna udržateľnosť čelí narastajúcim hrozbám spôsobeným prepojenými krízami environmentálnej degradácie a ozbrojených konfliktov, kde spory o zdroje poháňajú viac ako 40 % vnútorných nepokojov, čím zvyšujú ekologické a sociálne zraniteľnosti. Táto štúdia skúma právne medzery v medzinárodnom humanitárnom práve (IHL) týkajúce sa ničenia životného prostredia počas ozbrojených konfliktov, s osobitným zameraním na kolaps priehrady Nova Kachovka v roku 2023. Navrhuje viacstrannú reformnú agendu na zosúladenie tejto právnej úpravy s ekologickými a humanitárnymi potrebami 21. storočia, integrujúc ciele udržateľného rozvoja OSN (SDGs). Prostredníctvom stručnej analýzy kritizuje obmedzujúce prahy Dodatkového protokolu I a ENMOD a obhajuje zmeny na posilnenie environmentálnych záruk. Metodológia kombinuje právnu analýzu s prípadovými štúdiami, odhaľujúc nedostatky IHL pri riešení ekologických dopadov modernej vojny. Zistenia zdôrazňujú naliehavú potrebu predefinovať právne štandardy, posilniť vymáhanie

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práva a zaviesť Dohovor o ochrane životného prostredia, čím sa podporí udržateľnosť a budovanie mieru.

I. INTRODUCTION

Armed conflicts and environmental degradation present intertwined crises that profoundly threaten global sustainability, exacerbating ecological and societal vulnerabilities. Environmental decline, a pressing transnational issue, disproportionately affects war-torn regions, where ecological damage amplifies social and economic fragility. The escalation of armed conflicts, with approximately 110 active wars across 56 states and territories in 2022, compared to 69 conflicts in 30 regions in 2018, underscores the growing challenge to sustainable development. [2] This surge, fueled by increased involvement of armed factions and foreign actors, disrupts efforts to curb violence and advance ecological stability. The discourse on environmental protection during armed conflicts emerged around 1970, driven by the convergence of two political movements. [3] First, growing awareness of environmental issues, including concerns for future generations, highlighted the need for sustainable practices. Second, the imperative to advance the law of armed conflict addressed gaps in the 1949 Geneva Conventions, incorporating lessons from subsequent conflicts to strengthen legal protections.

Armed conflicts inflict severe environmental damage through both direct and indirect mechanisms, challenging the foundations of sustainability. Direct impacts stem from the deliberate or incidental targeting of environmentally sensitive infrastructure, such as refineries, nuclear power plants, and water systems, resulting in immediate ecological harm. [4] Historical cases, such as the Vietnam War's Agent Orange defoliation, which destroyed 2 million hectares of forest and farmland, and the 1991 Kuwait oil fires, which spilled 6–8 million barrels of oil, illustrate intentional environmental destruction with long-term ecological and public health consequences.[5] These actions contaminate water sources, pollute soils, and disrupt biodiversity, as evidenced by the loss of 30,000 seabirds in Kuwait. [6] Socioeconomic repercussions, including land scarcity, poverty, and displacement, further compound these effects, as seen in conflicts in Kosovo[7] and Lebanon[8]. More recently, Russian attacks on Ukrainian infrastructure, including the 2023 Nova Kakhovka Dam collapse and assaults on the Zaporizhzhia nuclear power plant, have caused widespread contamination, with elevated levels of copper, arsenic, and oil in surrounding water

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2 GENEVA ACADEMY, Today's Armed Conflicts (2024). available at https://geneva-academy.ch/galleries/today-s-armed-conflicts (accessed 10 May 2024.).

3 BOTHE, Michael. Protection of the Environment in Relation to Armed Conflict—50 Years of Effort, and No End in Sight. London, 2023. 1(1-2), 24-35. Sage Publications https://doi.org/10.1177/27538796231195601.

4 WEINTHAL, Erika, SOWERS, Jeannie. Targeting Infrastructure and Livelihoods in the West Bank and Gaza. Oxford: Oxford University Press, 2019. International Affairs, 95(2), pp.319–340.

5 CAHALAN, Robert F., The Kuwait Oil Fires as Seen by Landsat (1992). Journal of Geophysical Research, Vol. 97, No. 14565, 1992.

6 LINDÉN, Olof, JERNLÖV, Arne, EGERUP, Johan, The Environmental Impacts of the Gulf War 1991 Interim Report IR-04-019 (2004). Available at: https://pure.iiasa.ac.at/id/eprint/7427/1/IR-04-019.pdf (accessed 17 May 2025).

7 UNITED NATIONS ENVIRONMENT PROGRAMME (UNEP) and United Nations Centre for Human Settlements, The Kosovo Conflict: Consequences for the Environment and Human Settlements, 1999, available at: www.unep.org/resources/assessment/kosovo-conflict-consequences-environment-and-human-settlements.

8 ZEITOUN Mark, Karim Eid-Sabbagh and Jeremy Loveless, "The Analytical Framework of Water and Armed Conflict: A Focus on the 2006 Summer War between Israel and Lebanon", Disasters, Vol. 38, No. 1, 2014.

and soil. [9] Unexploded ordnance, such as World War II bombs discovered decades later, continues to disrupt urban areas, necessitating evacuations and hindering development. [10]

Indirect effects, though less visible, are equally significant, altering land use, resource exploitation, and governance structures. Conflicts shorten time horizons due to uncertainty, leading to unsustainable resource use on land and at sea. [11] In war-torn regions, weakened governance and territorial control impair the enforcement of environmental policies. [12] Remote sensing studies have documented substantial land-use changes in areas such as the Caucasus, Syria, and Iraq, driven by displacement and regulatory lapses. [13] Additionally, the carbon footprint of military operations, encompassing both active combat and routine activities, contributes an estimated 1% to 5% of global emissions, though data limitations hinder precise accountability. [14] These indirect impacts highlight the systemic environmental consequences of conflict, extending far beyond immediate combat zones and persisting across generations.

These examples illustrate how conflicts directly or indirectly target the environment as a weapon or cause collateral damage, with effects persisting across generations. It is noted that such conflicts "undercut or destroy" these critical resources, significantly impeding sustainable development efforts.[15] The detrimental effects of armed conflicts on sustainable development are indisputable, as they disrupt economic growth, health, education, and environmental stability. According to the International Committee of the Red Cross (ICRC), armed conflicts exert a profound and enduring negative impact across multiple dimensions of sustainable development. [16] Proactive measures are thus essential to mitigate war-related environmental risks, which, combined with the breakdown of governance and developmental structures, severely undermine sustainable development. [17]

This research examines the ecological consequences of armed conflicts to advocate for stronger environmental protections and advance sustainable development goals (SDGs). It analyzes key treaties safeguarding environmental protection, identifying gaps in accountability, particularly their high damage thresholds and anthropocentric focus. The study evaluates core principles of international humanitarian law (IHL), including limited warfare, military necessity, prohibition of

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[9] VYSHNEVSKYI, Viktor, SHEVCHUK, Serhii, KOMORIN, Viktor, OLEYNIK, Yuriy, GLEICK, Peter. The Destruction of the Kakhovka Dam and Its Consequences. Abingdon,Water International, 48(5),2023, pp. 631–647. https://doi.org/10.1080/02508060.

[10] PUNDIR, Pallavi. These Bombs Were Planted During World War II. They're Still Killing People. New York: Vice, 2021. https://www.vice.com/en/article/93y8bz/ww2-bombs-still-killing-people.

[11] UNRUH, Jon, WILLIAMS, Richard. Land and Post-Conflict Peacebuilding. Abingdon: Routledge, 2013. ISBN 9781849712316.

[12] JAMA, Osman M., LIU, Guijian, DIRIYE, Abdishakur W., YOUSAF, Balal, BASIRU, Ibrahim, ABDI, Abdulhakim M. Participation of Civil Society in Decisions to Mitigate Environmental Degradation in Post-Conflict Societies: Evidence From Somalia. Abingdon: Taylor & Francis, 2020. Journal of Environmental Planning and Management, 63(9), 1695–1715. https://doi.org/10.1080/09644016.2019.1688524.

[13] DINC, Pinar, EKLUND, Lisa. Syrian Farmers in the Midst of Drought and Conflict: The Causes, Patterns, and Aftermath of Land Abandonment and Migration. Abingdon: Taylor & Francis, 2024. https://doi.org/10.1080/17565529.2023.2183151; BEYGI HEIDARLOU, Hadi, BANJ SHAFIEI, Ahmad, ERFANIAN, Mahdi, TAYYEBI, Amin, ALIJANPOUR, Ahmad. Armed Conflict and Land-Use Changes: Insights From Iraq-Iran War in Zagros Forests. Amsterdam: Elsevier, 2020. https://doi.org/10.1016/j.forpol.2020.102246.

[14] RAJAEIFAR, Mohammad A., BELCHER, Oliver, PARKINSON, Stuart, NEIMARK, Benjamin, WEIR, Doug, ASHWORTH, Kirsti, LARBI, Reuben, HEIDRICH, Oliver. Decarbonize the Military-Mandate Emissions Reporting. London: Nature Publishing Group, 2022. pp.29-32,https://doi.org/10.1038/d41586-022-03444-7e .

[15] DAS, Onita. Environmental Protection, Security and Armed Conflict A Sustainable Development Perspective . Cheltenham, UK: Edward Elgar Publishing. 2013,https://doi.org/10.4337/9781781004685 .

[16] INTERNATIONAL COMMITTEE OF THE RED CROSS. International Humanitarian Law and Sustainable Development. (Johannesburg, South Africa 2002).

[17] UNEP, 'Protecting the Environment during Armed Conflict: An Inventory and Analysis of International Law' (UNEP, Switzerland 2009) pp.4.

unnecessary suffering, distinction, and proportionality, assessing their implications for environmental protection and their limitations in addressing ecological harm. Using the 2023 Nova Kakhovka Dam collapse as a case study, the research explores the feasibility of harmonizing IHL's military necessity doctrine with international environmental law's precautionary approach. It advocates for pre-conflict environmental assessments, lowered damage thresholds, and stronger enforcement mechanisms, including elevating environmental destruction to a grave breach under IHL. Adopting a qualitative methodology, the study integrates normative and scholarly contributions, historical case studies, and legal insights from the International Court of Justice and the International Criminal Tribunal for the former Yugoslavia to assess existing legal frameworks and propose reforms.

II. KEY TREATIES SAFEGUARDING THE ENVIRONMET DURING ARMED CONFLICTS

International humanitarian law (IHL), international environmental law (IEL), International human rights law (IHRL), and international criminal law (ICL) collectively establish a legal framework for environmental protection during armed conflicts, each offering distinct yet complementary provisions. Treaties further define environmental obligations, with varying scopes, bilateral, regional, or global[18], and differing applicability to wartime contexts: some explicitly include armed conflicts[19], others exclude them[20], and many remain ambiguous[21].[22] This variability undermines sustainable development, as conflicts disrupt its continuity, requiring mitigation of environmental harm to sustain progress. [23] Customary humanitarian law addresses gaps in treaty obligations, particularly when vague language or stringent applicability thresholds limit their efficacy. Despite increasing recognition of the need to integrate these legal regimes, enforcement and accountability face significant challenges, especially in internal conflicts.

This study analyzes treaty provisions governing environmental protection in armed conflicts, focusing on IHL's rules which prohibit warfare methods causing widespread, long-term, and severe environmental damage. The development of environmental protection within IHL has been shaped by jurisprudential, normative, and academic contributions. The International Court of Justice (ICJ), in its 1996 Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons, affirmed the environment's intrinsic value as foundational to human life, health, and intergenerational well-being. [24] The ICJ upheld the customary Trail Smelter principle, obligating states to prevent transboundary environmental harm, now a cornerstone of international law. [25] It stressed that

[18] VAN STEENBERGHE, Raphaël. 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, Volume 20, Issue 5, November 2022, pp. 1123–1154, https://doi.org/10.1093/jicj/mqac062.

[19] UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA. UN Doc. A/CONF.62/122; UNITED NATIONS ENVIRONMENT PROGRAMME. (1995). Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean. UN Doc. UNEP(OCA)/MED IG.6/7.

[20] CONVENTION ON CIVIL LIABILITY FOR DAMAGE RESULTING FROM ACTIVITIES DANGEROUS TO THE ENVIRONMENT. ETS No. 150.

[21] INTERNATIONAL ATOMIC ENERGY AGENCY. Vienna Convention on Civil Liability for Nuclear Damage.1963, UN Doc. INFCIRC/500.

[22] ARGREN, Ronnie. The Obligation to Prevent Environmental Harm in Relation to Armed Conflict. Cambridge: Cambridge University Press, 2023. https://doi.org/10.1017/S1816383123000231.

[23] DAS, Onita. The Impact of Armed Conflict on Sustainable Development: A Holistic Approach. The Hague: T.M.C. Asser Press, 2010. ISBN 9789067043113 pp. 117–136.

[24] INTERNATIONAL COURT OF JUSTICE. (1996). Legality of the Threat or Use of Nuclear Weapons (Advisory Opinion). ICJ Reports 1996, para 29.

[25] Ibid.

environmental considerations are integral to evaluating military actions' necessity and proportionality, aligning with IHL's principles. [26] The Court underscored Articles 35(3) and 55, which ban environmental reprisals[27] and excessive ecological harm, but noted that nuclear weapons' use would typically violate these protections, except in extreme self-defense cases, highlighting legal gaps. [28]

International organizations (and their bodies), including the United Nations Security Council[29], United Nations General Assembly[30], United Nations Environment Programme[31], International Law Commission[32], International Committee of the Red Cross[33], and International Law Association[34], alongside non-governmental entities[35], have advanced environmental protection by advocating ecocentric approaches and lower damage thresholds. Extensive academic literature further enriches this discourse, emphasizing the urgent need to mitigate ecological harm in conflicts and underscoring the importance of a unified legal framework to ensure robust environmental protection. [36]

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[26] Ibid, para 30.

[27] Ibid, para 31.

[28] Ibid, para 105.

[29] KAPOOR, Radhika, & LEWIS, Dustin A. "The Practice of the UN Security Council Pertaining to the Environment and Armed Conflict, 1945–2021." International Review of the Red Cross 105, no. 924 (2023): 1646–67. https://doi.org/10.1017/S1816383123000425.

[30] The UNGA has promoted environmental protection in conflicts through resolutions and initiatives. On November 5, 2001, it declared November 6 as the International Day for Preventing the Exploitation of the Environment in War and Armed Conflict (A/RES/56/4), raising awareness about environmental damage in conflicts. In 2016, the United Nations Environment Assembly (UNEA), under UNGA's framework, adopted Resolution UNEP/EA.2/Res.15, recognizing the role of healthy ecosystems in reducing conflict risks and reaffirming commitment to the SDGs.

[31] UNEP,2009, Ibid., highlighted how the exploitation of natural resources fuels conflicts and emphasized the need for stronger legal protections. UNEP collaborates with the UN Office for the Coordination of Humanitarian Affairs (OCHA) through the UNEP/OCHA Joint Environment Unit to coordinate emergency responses to environmental risks caused by conflicts.

[32] INTERNATIONAL LAW COMMISSION. Draft Code of Crimes Against the Peace and Security of Mankind (Part II): Including the Draft Statute for an International Criminal Court. New York: United Nations, 1996. https://legal.un.org/ilc/texts/instruments/english/draft_articles/7_4_1996.pdf.; The ILC adopted 27 Draft Principles on the Protection of the Environment in Relation to Armed Conflicts (PERAC) in 2022. These principles cover the entire conflict cycle (before, during, and after) and apply to both international and non-international armed conflicts. They draw from international humanitarian law (IHL), environmental law, and human rights law, addressing gaps in legal protections for the environment during conflicts. The principles were welcomed by the UN General Assembly in Resolution 77/104 on December 7, 2022.

[33] The ICRC has advanced environmental protections under IHL through its Guidelines on the Protection of the Natural Environment in Armed Conflict, first issued in 1994 and updated in 2020. The 2020 Guidelines include 32 rules and recommendations, with commentaries, to guide states and armed groups in limiting environmental damage during conflicts. These guidelines cover specific protections for the environment, general IHL rules, and rules on weapons use. The ICRC also engages with armed groups to promote environmental considerations in conflict zones.

[34] The ILA adopted the Berlin Rules on Water Resources in 2004. These rules revise and expand the ILA's earlier 1966 Helsinki Rules, which were a landmark in codifying principles for managing international watercourses. The Berlin Rules address the management of all waters (international and national) and include provisions relevant to environmental protection during armed conflicts. For more details see: SALMAN, Salman. M. A. The Helsinki Rules, the UN Watercourses Convention and the Berlin Rules: Perspectives on International Water Law. International Journal of Water Resources Development, 23(4),2007,pp. 625–640. https://doi.org/10.1080/07900620701488562.

[35] Some of the key contributors may include: Conflict and Environment Observatory, Zoï Environment Network, Environmental Law Institute, International Union for Conservation of Nature, and Greenpeace.

[36] SHUMILOVA, Oleksandra, TOCKNER, Klement, SUKHODOLOV, Alexander, KHILCHEVSKYI, Valentyn, DE MEESTER, Luc, STEPANENKO, Sergiy, TROKHYMENKO, Grygorii, HERNANDEZ-AGUERO, Jose A., GLEICK, Peter. Impact of the Russia–Ukraine Armed Conflict on Water Resources and Water Infrastructure. London: Nature Publishing Group, 2023. https://doi.org/10.1038/s41893-023-01098-0. pp.578–586; SOLOKHA, Maksym, PEREIRA, Paulo, SYMOCHKO, Lyudmyla, VYNOKUROVA, Nataliia, DEMYANYUK, Olena, SEMENTSOVA, Kateryna, INACIO, Miguel, BARCELO, Damia. Russian-Ukrainian War Impacts on the Environment: Evidence From the Field on Soil Properties and Remote Sensing. Amsterdam: Elsevier, 2023. https://doi.org/10.1016/j.scitotenv.2023.166122 ; HULME, Karen, War Torn Environment: Interpreting the Legal Threshold (2004). ISBN: 978-90-47-40534-4; WESTING, Arthur H. Herbicides in War: The Long-Term

2.1. The Hague Regulations of 1899 (Hague II) and 1907 (Hague IV)

The Hague Regulations are now integral components of customary international law, binding all states regardless of their formal ratification status.[37] This customary status was first recognized in the Nuremberg Trials (1946)[38] and reaffirmed in subsequent judicial decisions, including the ICJ Case (DRC V Uganda).[39]

Although the Hague Regulations do not explicitly address environmental protection in armed conflicts, specific provisions indirectly safeguard the environment by constraining the means and methods of warfare. [40]Article 23(g) of the 1907 Hague Convention IV prohibits the destruction or seizure of enemy property unless such actions are "imperatively demanded by the necessities of war." This limitation curtails property damage in conflict-affected areas, potentially mitigating environmental harm. For example, in the Hostages Case (1949), the Nuremberg Tribunal acquitted German General Rendulic for his scorched-earth tactics in Norway, deeming them justified by military necessity. [41] However, Article 23(g) generally proscribes unnecessary destruction, including environmental damage, as evidenced by Iraq's burning of Kuwaiti oil wells during the First Gulf War, which was widely condemned as lacking military purpose. [42] This principle underscores the Hague Regulations' role in restricting environmental harm by requiring belligerents to justify destructive actions.

Additionally, Article 55 of the Hague Convention IV imposes obligations on an occupying state, designating it as an "administrator and usufructuary" of public buildings, real estate, forests, and agricultural estates in occupied territories. As an administrator, the occupying state must manage these assets responsibly, while as a usufructuary, it may use and benefit from them but is prohibited from causing permanent alteration or destruction, consistent with the legal principles of usufruct. [43] This framework permits reasonable resource exploitation, such as harvesting timber or crops, but

Ecological and Human Consequences. London: Taylor & Francis, 1984. ISBN 9780850662658; HERNANDEZ, Claudia, PERALES, Hugo, JAFFEE, Daniel. "Without Food There Is No Resistance": The Impact of the Zapatista Conflict on Agrobiodiversity and Seed Sovereignty in Chiapas, Mexico. Amsterdam: Elsevier, 2022. https://doi.org/10.1016/j.geoforum.2021.12.010 pp.236–250.; MHANNA, Samir, HALLORAN, Liam J. S., ZWAHLEN, Fabienne, ASAAD, Abdel H., BRUNNER, Philip. Using Machine Learning and Remote Sensing to Track Land Use/Land Cover Changes Due to Armed Conflict. Amsterdam: Elsevier, 2023. https://doi.org/10.1016/j.scitotenv.2023.165600; HAMAD, Rawa, BALZTER, Heiko, KOLO, Kamal. Assessment of Heavy Metal Release Into the Soil After Mine Clearing in Halgurd-Sakran National Park, Kurdistan, Iraq. Berlin: Springer, 2019. https://doi.org/10.1007/s11356-018-3641-5; JENSEN, Eric T. The International Law of Environmental Warfare: Active and Passive Damage During Armed Conflict Armed Conflict, 38 Vanderbilt Law Review 145 (2021). Available at: https://scholarship.law.vanderbilt.edu/vjtl/vol38/iss1/4; OKOWA, Phoebe. "Environmental Justice in Situations of Armed Conflict." Chapter. In Environmental Law and Justice in Context, edited by Jonas Ebbesson and Phoebe Okowa, pp.231–252. Cambridge: Cambridge University Press, 2009. DOI: https://doi.org/10.1017/CBO9780511576027.013.

37 INTERNATIONAL COMMITTEE OF THE RED CROSS. (2005). Customary International Humanitarian Law: Volume I, Rules (J.-M. Henckaerts & L. Doswald-Beck, Eds.). Cambridge University Press; Hulme, Karen. "Natural Environment." Chapter. In Perspectives on the ICRC Study on Customary International Humanitarian Law, edited by Elizabeth Wilmshurst and Susan Breau, pp.204–237. Cambridge: Cambridge University Press, 2007. DOI: https://doi.org/10.1017/CBO9780511495182.009.

38 INTERNATIONAL MILITARY TRIBUNAL. Judgment of the International Military Tribunal at Nuremberg.1946. Available at: https://crimeofaggression.info/documents/6/1946_Nuremberg_Judgement.pdf (Accessed 05 July 2025).

39 INTERNATIONAL COURT OF JUSTICE. Case Concerning Armed Activities on the Territory of the Congo (Democratic Republic of the Congo v. Uganda). ICJ Reports 2005, Rep 1, at p. 70, para. 217.

40 Article 22.

41 UNITED STATES MILITARY TRIBUNAL, NUREMBERG. (1948). United States v. Wilhelm List et al. (Hostages Case). 11 Trials of War Criminals Before the Nuremberg Military Tribunals 1230.

42 HULME, Karen, War Torn Environment: Interpreting the Legal Threshold (2004). ISBN: 978-90-47-40534-4.

43 SCHMITT, Michael N. "War and the Environment: Fault Lines in the Prescriptive Landscape." Chapter. In The Environmental Consequences of War: Legal, Economic, and Scientific Perspectives, edited by Jay E. Austin and Carl E. Bruch, 87–136. Cambridge: Cambridge University Press, 2000. DOI: https://doi.org/10.1017/CBO9780511522321.007.

forbids reckless or malicious actions that deplete or irreparably harm these assets. Some scholars note that Article 55's protections are limited to the specified property categories, excluding other resources. [44] Nevertheless, by imposing these restrictions, Article 55 indirectly fosters sustainable resource management, mitigating environmental degradation and preserving assets critical to the socio-economic well-being of the occupied population, thereby supporting long-term stability and recovery.

The Hague Regulations also establish state responsibility for violations, providing a framework to address environmental harm indirectly. Article 3 of Hague Convention IV mandates that a belligerent party violating the Regulations is liable to pay compensation and is accountable for acts committed by its armed forces. This provision could encompass environmental damage arising from breaches of Articles 23(g) or 55. Furthermore, Article 53 requires an occupying state to restore or compensate for seized state-owned or personal property, potentially including environmental resources. However, the Regulations' enforcement mechanisms are limited. They lack provisions for individual criminal liability and specific procedures for imposing civil penalties, constraining the practical application of liability for environmental damage during armed conflicts.

2.2. The ENMOD Convention 1976

The ENMOD Convention represents an important instrument in international humanitarian law designed to safeguard the environment during armed conflict. [45] Catalyzed by global outrage over the environmental devastation from U.S. defoliation campaigns during the Vietnam War and concerns about emerging technologies capable of catastrophic environmental manipulation, the treaty prohibits the hostile use of environmental modification techniques as weapons of war. [46] Unlike broader frameworks addressing incidental environmental damage, the ENMOD Convention specifically targets deliberate manipulations of natural processes, establishing a narrowly defined scope focused on preventing their use in hostilities.

Article I of the Convention delineates its core obligation, requiring State Parties to abstain from military or hostile use of environmental modification techniques that cause widespread, long-lasting, or severe effects as a means of destruction, damage, or injury to another State Party. [47]This prohibition extends to assisting, encouraging, or inducing any State, group of States, or international organization to engage in such activities, thereby broadening the treaty's preventive ambit. [48] Article II defines environmental modification techniques as deliberate interventions in natural processes that alter the Earth's biota, lithosphere, hydrosphere, atmosphere, or outer space. [49] An associated Understanding illustrates potential consequences, including earthquakes, tsunamis, ecological imbalances, or disruptions to weather patterns, ocean currents, or the ozone layer.

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[44] SCHMITT, Michael N., Green War: An Assessment of the Environmental Law of International Armed Conflict. In: Essays on Law and War at the Fault Lines. T.M.C. Asser Press. (2011) https://doi.org/10.1007/978-90-6704-740-1_8; PEREZ, Antonio F. Legal Frameworks for Economic Transition in Iraq - Occupation under the Law of War vs. Global Governance under the Law of Peace, 18 Transnat'l Law. 53 (2004). Available at: https://scholarlycommons.pacific.edu/globe/vol18/iss1/8.

[45] UNITED NATIONS GENERAL ASSEMBLY. (1976). Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques. UN Doc. A/31/39.

[46] SCHWABACH, Aaron. International Environmental Disputes: A Reference Handbook. Santa Barbara: ABC-CLIO, 2006. ISBN 9781851097784.

[47] CONVENTION ON THE PROHIBITION OF MILITARY OR ANY OTHER HOSTILE USE OF ENVIRONMENTAL MODIFICATION TECHNIQUES, (ENMOD)(1976). 1108 UNTS 151, 1976, Article I(1) Available at: https://disarmament.unoda.org/enmod/.

[48] Ibid, Article I(2).

[49] Ibid, Article II.

The Convention's applicability rests on three critical criteria. First, the manipulation must be intentional, distinguishing it from incidental environmental harm. [50] Second, it must target natural processes, such as geological or climatic systems. [51] Third, the effects must meet a stringent threshold, widespread (spanning several hundred square kilometers), long-lasting (enduring for months, roughly a season), or severe (inflicting significant harm to human life, natural resources, or economic assets). [52] Satisfaction of any one criterion triggers the prohibition, with no exception for military necessity. However, the Convention permits peaceful applications, such as fog dispersal to facilitate aircraft operations, provided they cause no prohibited harm. [53]

The treaty unequivocally governs armed conflicts between State Parties, but its application to non-State Parties or actors is less clear. A restrictive interpretation posits that the Convention applies exclusively between State Parties, a stance rooted in the drafting history's rejection of proposals to establish *erga omnes* obligations applicable to all States. [54] This approach incentivizes ratification by ensuring non-parties cannot benefit without compliance. [55] Alternatively, some argue that non-State Parties may receive limited protection if a State Party violates Article I(2) by encouraging or assisting prohibited activities.[56] The Convention generally excludes areas beyond State jurisdiction, such as the high seas, unless a State Party's activities, like maritime operations, are affected. [57]

Despite its significance, the ENMOD Convention's focus on deliberate, high-threshold manipulation limits its scope, excluding incidental environmental damage during armed conflict. [58] Enforcement, outlined in Article V, emphasizes consultation and cooperation to resolve disputes rather than imposing direct liability. Suspected violations may be reported to the UN Security Council for investigation, with State Parties obligated to assist affected States and cooperate in mitigating harm. This cooperative framework underscores the Convention's precautionary approach to preventing environmental harm.

Finally, the ENMOD Convention constitutes a critical legal framework prohibiting the use of environmental modification techniques as weapons in armed conflict. Reinforced by customary international law, it reflects a global commitment to environmental protection. However, its narrow focus on intentional, severe manipulations and reliance on cooperative enforcement mechanisms constrain its applicability. While the Convention remains a cornerstone of environmental protection in warfare, addressing incidental damage and strengthening enforcement may necessitate further legal development.

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50 DINSTEIN, Yoram. The Conduct of Hostilities Under the Law of International Armed Conflict. Cambridge: Cambridge University Press, 2004. https://doi.org/10.1017/CBO9781316389591.

51 Ibid.

52 ENMOD Convention, Ibid, Article I.

53 COHAN, John A. Modes of Warfare and Evolving Standards of Environmental Protection Under the International Law of War. Florida Journal of International Law: Vol. 15: Iss. 4, 2003. Available at: https://scholarship.law.ufl.edu/cgi/viewcontent.cgi?article=1434&context=fjil pp.481–524.

54 PIMIENTO CHAMORRO, Sandra, HAMMOND, Edward. Addressing Environmental Modification in Post-Cold War Conflict. Edmonds, WA: The Sunshine Project, 2001. http://www.edmonds-institute.org/pimiento.html.

55 Dinstein, Ibid, pp.180.

56 Ibid.

57 Ibid, pp.181.

58 YUZON, Ensign Florencio J. "Deliberate Environmental Modification Through the Use of Chemical and Biological Weapons: "Greening" the International Laws of Armed Conflict to Establish an Environmentally Protective Regime." American University, International Law Review 11, no. 5 (1996): 793-846.Available at: https://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1413&context=auilr&httpsredir=1&referer=.

2.3. The 1977 Additional Protocol I

The 1977 Additional Protocol I to the 1949 Geneva Conventions establishes a legal framework for protecting the natural environment during international armed conflicts, motivated by the environmental devastation observed during the Vietnam War. [59] This protocol introduces targeted provisions to mitigate environmental harm, reflecting an increasing acknowledgment of the environment's intrinsic value and its critical role in human survival and intergenerational equity. Articles 35(3) and 55 form the core of this framework. Article 35(3) prohibits methods or means of warfare intended or expected to cause widespread, long-term, and severe damage to the natural environment, emphasizing the environment's protection irrespective of direct human or biodiversity impacts. Article 55(1) complements this by requiring care in warfare to prevent such damage, particularly when it prejudices civilian health or survival, while Article 55(2) bans environmental attacks as reprisals, reinforcing the protective regime. These provisions incorporate the precautionary principle, restricting warfare methods with uncertain risks of serious or irreversible environmental harm, and balance anthropocentric concerns with the environment's inherent value. [60]

The obligations under Articles 35(3) and 55 bind States Parties to Protocol I, but their status as customary international law is debated, affecting their universal applicability. Support for their customary status includes their adoption in military manuals of States such as Argentina, Australia, Canada, Germany, Kenya, New Zealand, Russia, Togo, the United Kingdom, and the United States, and their codification as offenses in domestic laws of countries like Australia, Azerbaijan, Belarus, Canada, Congo, Croatia, Germany, the Netherlands, New Zealand, and the United Kingdom. [61] The ICJ's advisory opinion on the *Legality of the Threat or Use of Nuclear Weapons* noted arguments from several States that these provisions reflect customary law, suggesting a general duty to avoid catastrophic environmental harm. [62] The Rome Statute of the International Criminal Court further aligns with this view by incorporating widespread, long-term, and severe environmental damage into its war crimes framework. [63] However, opposition, particularly regarding nuclear weapons, persists. France, the United Kingdom, and the United States have consistently argued, through military manuals and reservations to Protocol I, that these articles apply only to conventional weapons. [64] In the *Nuclear Weapons Case*, the ICJ suggested these provisions do not constitute customary law for nuclear weapons, a position echoed cautiously in the 2000 NATO Bombing Campaign Review, which noted Article 55's potential customary status without firm endorsement. [65] The ICRC's Study on Customary International Humanitarian Law concludes that these provisions are customary for conventional weapons but not for nuclear weapons due to persistent State objections. [66]

The practical application of Articles 35(3) and 55 is constrained by their stringent cumulative threshold of widespread, long-term, and severe damage. The ICRC commentary interprets the

[59] Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (1977). 1125 UNTS 3, 1977.

[60] SANDOZ, Yves, SWINARSKI, Christophe, ZIMMERMANN, Bruno. Commentary on the Additional Protocols of 8 June 1977 to the Geneva Conventions of 12 August 1949. Geneva: Martinus Nijhoff Publishers, 1987. ISBN 9789024734603.

[61] Henckaerts & Doswald-Beck, Ibid., pp. 152.

[62] Ibid.

[63] UNITED NATIONS DIPLOMATIC CONFERENCE OF PLENIPOTENTIARIES ON THE ESTABLISHMENT OF AN INTERNATIONAL CRIMINAL COURT. (1998). Rome Statute of the International Criminal Court. UN Doc. A/CONF.183/9.

[64] Henckaerts & Doswald-Beck, Ibid, pp.153–154.

[65] Ibid.

[66] Ibid.

"natural environment" broadly, encompassing flora, fauna, and climatic elements, but undefined terms like "widespread" and "severe," and "long-term" interpreted as spanning decades, limit enforcement.[67] Legal scholars note that this high threshold excludes incidental battlefield damage or short-term environmental harm from conventional warfare, restricting the provisions' scope.[68] To ensure compliance, Protocol I establishes accountability mechanisms. Article 86 imposes criminal liability on military superiors who fail to prevent or address breaches within their authority, while Article 87 requires commanders to prevent, suppress, and report violations, initiating disciplinary measures. Article 91 holds States Parties liable for violations by their forces, including compensation obligations. These mechanisms incentivize precautionary measures to minimize environmental harm.

Protocol I's environmental protections differ markedly from those of the ENMOD Convention, reflecting distinct drafting intentions. Protocol I's Articles 35(3) and 55 require cumulative widespread, long-term, and severe damage, with "long-term" understood during the CDDH debates as spanning decades, excluding typical battlefield damage.[69] In contrast, ENMOD's prohibition is disjunctive, triggered by widespread, long-lasting, or severe effects, with "long-lasting" defined as months or a season.[7071] This makes Protocol I's scope narrower, potentially covering chemical or biological warfare but excluding nuclear conflict, as argued by NATO States.[72] Both instruments face limitations: Protocol I imposes minimal constraints on conventional warfare, while ENMOD's focus on intentional environmental modification limits its relevance to broader ecological harm. Enforcement remains weak, exacerbated by disputes over customary status, notably from the United States and United Kingdom.[73] Environmental advocates, frustrated by these gaps, intensified reform calls after the Gulf Wars' oil spills (1980–1988, 1990–1991), proposing a "Fifth Geneva Convention."[74] However, resistance from military powers resulted in the 1994 ICRC Guidelines for Military Manuals, which offered no substantive progress and received tepid UN General Assembly support.[75] Thus, while Protocol I laid a critical foundation for environmental protection in international humanitarian law, its legacy is constrained by practical and political challenges.

III. KEY PRINCIPLES OF ARMED CONFLICT: IMPLICATIONS FOR ENVIRONMENTAL PROTECTION

IHL is grounded in fundamental principles that regulate the conduct of warfare, balancing military objectives with humanitarian and environmental considerations. These principles, such as limited warfare, military necessity, prohibition of unnecessary suffering, distinction, and proportionality, provide a framework for ethical and legal constraints on military operations,

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67 See The protection of the natural environment in armed conflict | How does law protect in war? - Online casebook.

68 SANDOZ, et.al.,Ibid, pp. 417.

69 PROTOCOL I, supra note 21, Arts. 35(3), 55.

70 UNITED NATIONS COMMITTEE OF THE CONFERENCE ON DISARMAMENT, Report to the General Assembly (1976). UN Doc. A/31/27, Annex, Understanding to ENMOD, 1976.

71 SOLF, Waldemar A. Article 55: Protection of the Natural Environment. The Hague: Martinus Nijhoff Publishers, 1982. ISBN 9789024726356SOLF, New Rules for Victims of Armed Conflicts: Commentary on the Two 1977 Protocols Additional to the Geneva Conventions of 1949, 1982, pp.347.

72 Ibid., pp. 348.

73 HENCKAERTS, Jean-Marie, DOSWALD-BECK, Louise,Ibid., pp.143.

74 UNITED NATIONS ENVIRONMENT PROGRAMME, Protecting the Environment During Armed Conflict: An Inventory and Analysis,2009, pp. 12.

75 INTERNATIONAL COMMITTEE OF THE RED CROSS, Guidelines for Military Manuals and Instructions on the Protection of the Environment in Times of Armed Conflict (1994). UNGA Res. 49/50, 1994.

including targeting and weapons use. They not only protect human life but also extend, directly and indirectly, to environmental preservation during armed conflicts. This part critically examines these principles, their legal underpinnings, and their implications for environmental protection, highlighting tensions and ambiguities in their application.

3.1. The principle of limited warfare

The principle of limited warfare establishes that the means and methods of warfare are not unrestricted, requiring a balance between military necessity and humanitarian considerations, including environmental protection. Codified as early as the 1874 Brussels Declaration[76] and reinforced in Article 22 of the 1907 Hague Convention IV[77] and Article 35(1) of the 1977 Protocol I to the Geneva Conventions, this principle reflects a core tenet of IHL: warfare must balance military needs with humanitarian limits. The 1874 Brussels Declaration (Article 13) first articulated that the means of injuring the enemy are not unlimited, laying the groundwork for subsequent codifications. The 1907 Hague Convention IV (Article 22) reinforced this by stating that belligerents' rights to choose means of warfare are restricted, emphasizing proportionality and necessity. The 1977 Additional Protocol I (Article 35(1)) explicitly affirms that the methods and means of warfare are not unlimited, extending this principle to environmental considerations through Articles 35(3) and 55(1), which prohibit means or methods causing "widespread, long-term, and severe damage to the natural environment." These provisions aim to prevent ecological harm that jeopardizes human survival or health, particularly in international armed conflicts. Hence, the environmental implications are significant, as it restricts actions causing unjustified ecological damage, such as deforestation or pollution, during armed conflicts. It recognizes that armed conflict is a temporary state, and its conduct must not inflict harm beyond what is necessary to achieve legitimate military objectives. For instance, while engaging enemy combatants is permissible, targeting those who are injured or no longer pose a threat violates this principle.[78] This limitation extends to weapons, requiring states to ensure new armaments comply with IHL obligations before deployment.[79] However, the principle's broad formulation raises questions about its enforcement, as states may interpret "necessary" military actions subjectively, potentially undermining its restrictive intent.

3.2. The Principle of Military Necessity

Closely related is the principle of military necessity, which permits measures essential to achieving legitimate military objectives while prohibiting actions that exceed this scope. Closely intertwined with the prohibition of unnecessary suffering, which bans weapons causing superfluous injury beyond what is required to disable combatants, this principle indirectly supports environmental protection during armed conflicts by restricting ecologically harmful armaments. The central legal issue is how the principle of military necessity, alongside the prohibition of unnecessary suffering, restricts the means and methods of warfare to protect the environment during armed conflicts. Sub-issues include determining the extent to which military necessity

[76] INTERNATIONAL CONFERENCE OF BRUSSELS, Project of an International Declaration Concerning the Laws and Customs of War (1874).Available at: https://ihl-databases.icrc.org/en/ihl-treaties/brussels-decl-1874 (Accessed 04.07.2025).

[77] CONVENTION (IV) RESPECTING THE LAWS AND CUSTOMS OF WAR ON LAND and Its Annex: Regulations Concerning the Laws and Customs of War on Land (1907). Available at: https://ihl-databases.icrc.org/en/ihl-treaties/hague-conv-iv-1907 (Accessed 04.07.2025).

[78] Common Article 3, INTERNATIONAL CONFERENCE OF GENEVA, Geneva Conventions for the Protection of War Victims (1949).

[79] Protocol I, 1977: Article 36.

justifies environmental harm, the principle's indirect environmental benefits, its limitations in prioritizing ecological protection, and the enforceability of these restrictions in conflict settings. The 1863 Lieber Code, Article 14, defines it as actions indispensable for securing the ends of war, excluding wanton destruction or cruelty.[80] The 1907 Hague Convention IV, Article 23(g), prohibits unnecessary property destruction, while Article 35(1) of the 1977 Additional Protocol I limits the means and methods of warfare, tying necessity to proportionality and distinction. Customary IHL, as articulated in ICRC Rule 70, further restricts actions to those proportionate to military objectives, protecting civilians and the environment from excessive harm.[81]

3.3. The Prohibition of Unnecessary Suffering

The prohibition of unnecessary suffering complements military necessity by banning weapons that cause superfluous injury or excessive harm. The 1868 St Petersburg Declaration established this principle by prohibiting explosive projectiles under 400 grams, emphasizing that harm must be limited to disabling combatants.[82] The 1907 Hague Convention IV, Article 23(e), explicitly bans weapons calculated to cause unnecessary suffering, while Article 23(a) prohibits poisonous weapons, such as chemical gases, due to their cruel and indiscriminate effects. The 1925 Geneva Protocol reinforces this by banning asphyxiating and poisonous gases, reducing risks of environmental contamination.[83] Customary IHL extends these protections to weapons with severe ecological impacts, indirectly safeguarding the environment. By restricting such armaments, IHL mitigates environmental degradation. Yet, the principle's focus on human suffering may limit its environmental application, as ecological harm is not explicitly prioritized, revealing a gap in direct environmental protections. Complementary frameworks bolster these protections. The 1976 ENMOD Convention prohibits environmental modification techniques with widespread, long-lasting, or severe effects, aligning with necessity by restricting hostile environmental manipulation. The International Law Commission's 2022 Draft Principles on Protection of the Environment in Relation to Armed Conflicts (PERAC), as mentioned earlier, urge states to limit environmental harm to what is strictly necessary, though their non-binding nature limits their impact.

3.4. The Principle of Distinction

The principle of distinction, a cornerstone of international humanitarian law (IHL), obligates parties to an armed conflict to differentiate between military and civilian targets, prohibiting direct attacks on civilians or civilian objects.[84] This principle, vital for protecting civilian life and infrastructure, has adapted to modern warfare, particularly in urban contexts, and extends to safeguarding the natural environment. By the late 1990s, legal scholars recognized the natural environment as a presumptive civilian object under IHL treaties and customary law, entitled to

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[80] SCHINDLER, Dietrich, and TOMAN, Jiří,, eds. Laws of Armed Conflicts. Martinus Nijhoff Publishers Leiden/Boston, 2004. ISBN 90-04-13818-8.

[81] INTERNATIONAL COMMITTEE OF THE RED CROSS. Rule 70: Weapons of a Nature to Cause Superfluous Injury or Unnecessary Suffering. Available at: https://ihl-databases.icrc.org/en/customary-ihl/v1/rule70 (Accessed 03.07.2025); INTERNATIONAL COMMITTEE OF THE RED CROSS. (2005). Customary International Humanitarian Law: Volume I, Rules (J.-M. Henckaerts & L. Doswald-Beck, Eds., pp. 237–244). Cambridge University Press.

[82] INTERNATIONAL MILITARY CONFERENCE OF SAINT PETERSBURG, Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight. Saint Petersburg: ICRC, 1868. Available at: https://ihl-databases.icrc.org/en/ihl-treaties/st-petersburg-decl-1868 (Accessed 04 July 2025).

[83] INTERNATIONAL CONFERENCE OF GENEVA, Protocol for the Prohibition of the Use of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare (1925).Available at: https://ihl-databases.icrc.org/en/ihl-treaties/geneva-gas-prot-1925 (Accessed 03.07.2025).

[84] Protocol I, 1977: Article 48.

protection unless it qualifies as a military objective. [85] However, this protection is not absolute, as environmental components, such as a forest concealing enemy forces, may become legitimate targets if they meet the criteria outlined in Article 52(2) of Additional Protocol I (AP I), a provision reflecting customary IHL.

Article 52(2) defines military objectives as objects that, by their nature, location, purpose, or use, make an effective contribution to military action and whose total or partial destruction, capture, or neutralization offers a definite military advantage in the circumstances at the time. The term "military action" refers specifically to the enemy's war-fighting capabilities, requiring a direct nexus between the target and combat operations. For example, a hill may qualify as a military objective due to its strategic location, or a forest may be targeted if enemy forces use it for cover. Conversely, environmental elements like air, soil, or underground water resources rarely contribute directly to military action, retaining their civilian status and protection from attack. The transformation of a civilian object, including the environment, into a military objective is neither automatic nor frequent, as Article 52(2) establishes a high threshold, demanding a concrete and perceptible military advantage, not merely hypothetical or political benefits. For instance, exploiting natural resources for war-sustaining purposes or undermining enemy morale does not suffice as a direct contribution to military action. [86]

Even when an environmental component qualifies as a military objective, IHL imposes additional constraints. The principle of proportionality prohibits attacks that would cause excessive incidental harm to civilians or civilian objects, including the environment, relative to the anticipated military advantage. Furthermore, Article 35(3) of AP I explicitly bans attacks intended or expected to cause widespread, long-term, and severe environmental damage, regardless of the target's military status. This provision establishes an absolute prohibition on disproportionate ecological harm, though its application hinges on subjective interpretations of "widespread," "long-term," and "severe." Additionally, the principle of distinction restricts the use of indiscriminate weapons, such as chemical agents, which cannot be confined to military targets, offering further environmental safeguards.

Despite these protections, the principle of distinction reveals limitations in addressing environmental harm in modern conflicts. While the environment's civilian object status provides a baseline of protection, the flexibility in defining military objectives risks undermining this safeguard, particularly when military and civilian objects are intermingled. The principle's focus on intentional targeting inadequately addresses collateral ecological damage, especially when military objectives are broadly interpreted. The subjective nature of terms like "definite military advantage" and the challenges of assessing environmental harm in real-time combat situations further complicate enforcement. To enhance environmental protection, IHL would benefit from clearer criteria for designating military objectives and stricter obligations to mitigate unintended ecological consequences, ensuring the principle of distinction evolves to meet the complexities of contemporary warfare.

3.5. The Principle of Proportionality

The principle of proportionality seeks to limit incidental harm to civilians, civilian objects, and the natural environment during armed conflicts. Codified in Article 51(5)(b) of Additional Protocol

[85] BOTHE, Michael. The Protection of the Environment in Times of Armed Conflict. German Yearbook of International Law, 34, 1991.pp. 54–62.

[86] UNITED NATIONS ENVIRONMENT PROGRAMME. Supra note 74.

I (AP I) (Protocol I, 1977), it prohibits attacks where the expected incidental damage to civilians or civilian objects, including the environment, is excessive relative to the anticipated concrete and direct military advantage. As a customary norm applicable to both international and non-international armed conflicts[87], proportionality requires commanders to incorporate ecological harm into their assessments. [88] However, its application faces significant challenges, particularly in balancing immediate military objectives against often diffuse, long-term environmental consequences. The absence of clear metrics for comparing tangible military gains with ecological harm, which may manifest indirectly or over extended periods, complicates implementation. For instance, destroying a military target like an electricity network may disrupt sewage systems, causing water and soil contamination with far-reaching effects, such as deforestation or resource depletion from refugee movements. [89] The San Remo Manual reinforces the need to consider such indirect environmental impacts in proportionality assessments[90], yet the principle's flexibility permits significant ecological destruction if justified by substantial military advantage, often prioritizing operational goals over environmental preservation.[91]

Historical cases, such as the 2006 Lebanon conflict, where the bombing of the *El Jyieh* power plant spilled 12,000 -15,000 tons of fuel into the Mediterranean Sea[92], illustrate the subjective and context-dependent nature of proportionality assessments. [93] The lack of an upper limit on permissible collateral damage, provided the military advantage is deemed proportionate, raises concerns about the foreseeability of secondary and tertiary environmental effects, such as species extinction or ecosystem disruption. [94] NATO advocates pre-attack environmental assessments to mitigate these risks[95], but differing priorities among belligerents and varying levels of ecological awareness complicate consistent application. [96] The ICTY's review of NATO's 1999 campaign further highlighted the commanders' limited knowledge of a target's environmental implications, underscoring the principle's reliance on foreseeability as a practical challenge. [97]

Complementing proportionality, Articles 35(3) and 55 of AP I impose an absolute prohibition on methods or means of warfare expected to cause widespread, long-term, and severe environmental damage, a customary rule setting an exceptionally high threshold. Interpreted as damage spanning decades, covering hundreds of square kilometers, and causing serious ecosystem

87 Henckaerts and Doswald-Beck, Ibid, pp. 14.

88 Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons, 1996: para. 30, Available at: https://digitallibrary.un.org/record/230996?v=pdf (Accessed 04.07.2025).

89 UNEP, 2009, Ibid. pp. 13.

90 SAN REMO MANUAL ON INTERNATIONAL LAW APPLICABLE TO ARMED CONFLICTS AT SEA(1994).Available at: https://ihl-databases.icrc.org/en/ihl-treaties/san-remo-manual-1994 (Accessed 12 May 2025).

91 KALSHOVEN, Frits, ZEGVELD, Liesbeth. Constraints on the Waging of War: An Introduction to International Humanitarian Law. 4th ed. Cambridge: Cambridge University Press, 2011. ISBN 9781107011663.

92 HULME, Karen, War Torn Environment: Interpreting the Legal Threshold (2004). ISBN: 978-90-47-40534-4.

93 UNITED NATIONS ENVIRONMENT PROGRAMME. (2007). Lebanon Post-Conflict Environmental Assessment. UNEP. https://postconflict.unep.ch/publications/UNEP_Lebanon.pdf.

94 BOTHE, Michael, BRUCH, Carl, DIAMOND, Jordan, JENSEN, David, International Law Protecting the Environment During Armed Conflict: Gaps and Opportunities (2010). International Review of the Red Cross, Vol. 92, No. 879, 2010, 578. Doi: 10.1017/S1816383110000597.

95 Joint Doctrine for Environmental Protection (STANAG-7141, 2008).

96 BOTHE, 1991: 54–62.

97 INTERNATIONAL CRIMINAL TRIBUNAL FOR THE FORMER YUGOSLAVIA. Final Report to the Prosecutor by the Committee Established to Review the NATO Bombing Campaign Against the Federal Republic of Yugoslavia. The Hague: ICTY, 2000. https://www.icty.org/x/file/About/OTP/otp_report_nato_bombing_en.pdf.

disruption[98], this standard is rarely met, even in cases like the 1991 Gulf War oil well fires. [99] The cumulative criteria, widespread, long-term, and severe, limit the rule's utility, prompting calls for a lower threshold to address ecologically significant but less catastrophic harm[100], such as the extinction of a single species. [101] In non-international armed conflicts, where environmental damage is often localized, the threshold's applicability is particularly questionable. The tension between proportionality's flexible assessments, which may tolerate significant ecological harm, and the absolute prohibition's stringent criteria reveals a gap in IHL's environmental protections, especially as scientific understanding of ecosystem interdependence grows. [102]

The principle of proportionality complements the principle of distinction by limiting collateral damage when attacking military targets. However, IHL's environmental protections remain incidental, derived from rules primarily designed to safeguard human life. The recognition of the environment as a civilian object marks progress, but its conditional status and the subjective nature of proportionality assessments weaken practical impact. The anthropocentric focus of IHL, particularly in AP I's environmental provisions, prioritizes human health and survival, relegating ecological harm to a secondary concern unless it directly affects populations. This framework misaligns with international environmental commitments, such as the 1992 Rio Declaration and SDGs 14 and 15, which affirm ecosystems' intrinsic value. Historical and ongoing conflicts, from the 1991 Gulf War to the Ukraine conflict, demonstrate how IHL's human-centered approach limits accountability for biodiversity loss and long-term environmental degradation, compromising livelihoods and human rights beyond conflict zones. [103]

Finally, where specific wartime regulations on environmental issues are lacking, core customary principles bridge these gaps, prohibiting actions in armed conflicts that cause significant environmental harm, especially when they lack a clear or critical military purpose. Additionally, the broader rules and principles of IHL provide a degree of environmental protection during armed conflicts. From a sustainable development viewpoint, these laws emphasize the importance of balancing the short-term and long-term consequences of warfare tactics and methods. If adhered to, such protections could mitigate impacts on vulnerable civilian populations and conflict-affected states, not only environmentally but also socioeconomically, reducing the burden of post-conflict reconstruction.

IV. LEGAL REFORMS FOR ENVIRONMENTAL PROTECTION IN WARTIME

This section begins with the Nova Kakhovka dam as a case study, then explores four proposed legal reforms through a qualitative approach, evaluating their theoretical merits, practical hurdles, and capacity to bolster environmental protection in wartime. A two-pronged approach stands out: tweaking current frameworks for quick wins while designing a bold, long-term overhaul. Drawing on recent scholarship and judicial decisions, these reforms offer promising routes forward, though their fate hinges on overcoming political pushback and enforcement gaps.

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98 DINSTEIN, Yoram. The Conduct of Hostilities Under the Law of International Armed Conflict. Cambridge: Cambridge University Press, 2004. https://doi.org/10.1017/CBO9781316389591.

99 HULME, Ibid.

100 ICRC, 2005: Rule 45.

101 BOTHE, Michael, BRUCH, Carl, DIAMOND, Jordan, JENSEN, David, International Law Protecting the Environment During Armed Conflict: Gaps and Opportunities (2010). International Review of the Red Cross, Vol. 92, No. 879, 2010, Doi: 10.1017/S1816383110000597.

102 DINSTEIN, 2004, Ibid.

103 BOTHE, et.al.2010, Ibid.

4.1. Nova Kakhovka: A Case Study

On June 6, 2023, the Kakhovka Dam suffered a massive breach, draining its reservoir and destroying the Kakhovka Hydroelectric Power Plant. The resulting flood displaced tens of thousands, inundating villages and vast agricultural lands, while depriving hundreds of thousands of drinking water and crippling irrigation systems, 94% in Kherson, 74% in Zaporizhzhia, and 30% in Dnipropetrovsk.[104] Environmental harm compounded the crisis: 150 tons of industrial lubricant contaminated the Dnipro River, with twice that amount at risk, alongside pollutants from sewage, gas stations, and pesticides, and dislodged landmines. The reservoir's critical role in providing cooling water for the Zaporizhzhia nuclear plant raised safety concerns, though mitigated by alternative sources. Wildlife and flora across the affected region were entirely decimated, and large volumes of potentially heavy metal-laden silt further polluted already compromised areas.[105] These impacts underscore the disaster's profound ecological and societal consequences, posing challenges for recovery and accountability.

This section examines the international legal framework governing the destruction of the *Nova Kakhovka* dam amid the armed conflict between Ukraine and the Russian Federation. It primarily addresses International Humanitarian Law and International Environmental Law, while incorporating relevant aspects of International Criminal Law. This analysis is not exhaustive but focuses on pathways to accountability for the environmental consequences of the incident.

The conflict qualifies as an international armed conflict under IHL, as defined by Common Article 2(1) of the 1949 Geneva Conventions, which applies to any armed conflict arising between states, regardless of formal recognition of war. This determination rests on objective criteria, specifically the resort to armed force between states, which is evident here. Consequently, all four 1949 Geneva Conventions (GCs) and the 1977 Additional Protocol I (AP I) bind both Ukraine and Russia as contracting parties.

In addition to treaty law, customary IHL applies, including rules restated in the 2020 International Committee of the Red Cross Guidelines on the Protection of the Natural Environment in Armed Conflict (2020 ICRC Guidelines)[106], which synthesize customary norms in this domain. The analysis also draws on the 2022 UN International Law Commission Principles on the Protection of the Environment in Relation to Armed Conflicts (PERAC principles), to the extent they reflect established international law. Under IHL, Article 56(1) of AP I prohibits attacks on dams, if such attacks may release dangerous forces and cause severe civilian losses.[107] Article 56(2) specifies limited exceptions. This provision establishes that the special protection granted to dams, dykes, and nuclear power stations under Article 56(1) can be lifted under narrowly defined circumstances. For dams like Nova Kakhovka, the protection ceases only if three cumulative conditions are met: (1) the dam is used for purposes beyond its normal function (e.g., water storage or power generation), such as a military purpose; (2) it provides regular, significant, and direct support to military operations (e.g., powering military facilities or enabling strategic operations);

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[104] MALYSHEVA, Natalia, HUROVA, Anna, Environmental Consequences of the Kakhovka H.P.P. Destruction in Ukraine: Challenge and Opportunity for International Justice (2024). Journal of Environmental Law & Policy, Vol. 4, No. 4, 2024, available at https://doi.org/10.33002/jelp040104 (Accessed 4 March 2025).

[105] Dr. Efthymis Lekkas in News24/7, 'Ukraine: Chersona "sank" after the dam blew up - Shocking frames of the water disaster' (7 June 2023) <https://www.news247.gr/kosmos/oykrania-i-chersona-vythistike-meta-tin-anatinaxi-toy-fragmatos-sygklonistika-kare-apo-tin-ydatinikatastrofi.10070631.htm (Accessed 6 August 2025).

[106] ICRC, 'Guidelines on the Protection of the Natural Environment in Armed Conflict: Rules and Recommendations Relating to the Protection of the Natural Environment Under International Humanitarian Law, with Commentary.

[107] INTERNATIONAL COMMITTEE OF THE RED CROSS, Commentary on the Additional Protocols of 8 June 1977 to the Geneva Conventions of 12 August 1949 (1987), 1450, 2145; See also Rule 11, 2020 ICRC Guidelines.

and (3) an attack on the dam is the only feasible means to stop this military support. These conditions are stringent to ensure that such installations, which pose catastrophic risks if damaged, remain protected unless their military use is clear and unavoidable.

An attack on a dam, such as the Nova Kakhovka Dam, raises significant concerns under IHL, particularly regarding the principles of distinction, proportionality, precautions, and specialized protections for installations containing dangerous forces, civilian survival objects, and the environment. This analysis evaluates the legality of such an act, considering its potential classification as a war crime and the obligations of an occupying power. Under the principle of distinction, as outlined in Article 48 of API, only military objectives may be targeted. Article 52(2) API defines a military objective as an object that, by its nature, location, purpose, or use, effectively contributes to military action and whose destruction, capture, or neutralization offers a definite military advantage. For a dam to lose its civilian object status, both criteria must be met. While its destruction could theoretically impede enemy movements, if it does not effectively contribute to military action, it remains a civilian object. If Ukraine destroyed its own dam to hinder enemy advances, this might not violate distinction, as IHL does not prohibit a state from targeting its own civilian objects. However, if deemed an attack, it could constitute a grave breach under Article 85(3)(c) API if conducted willfully with knowledge of excessive civilian harm, potentially amounting to a war crime.

Proportionality, per Article 51(5)(b) API, prohibits attacks where expected incidental civilian harm or damage to civilian objects is excessive compared to the anticipated concrete and direct military advantage. The extensive downstream devastation to civilians and infrastructure caused by the dam's destruction likely renders such an attack disproportionate, even if a military advantage, such as disrupting an offensive, was anticipated. The scale of harm, affecting thousands in unevacuated areas, suggests a violation under generous assumptions.

The principle of precautions, articulated in Article 57(1) API, requires constant care to spare civilians and civilian objects during military operations, a broader obligation than attacks alone. Article 58(c) API further mandates feasible precautions to protect civilian objects under a party's control from attack effects. If Ukraine attacked a dam qualifying as a military objective, failure to take such precautions could breach this obligation. Regardless of attribution, the broad scope of precautions likely renders the act unlawful.

Article 56 API provides specialized protection for installations containing dangerous forces, such as dams, prohibiting attacks that may release these forces and cause severe civilian losses, even if the target is a military objective and the attack proportionate under general rules. The "may cause" standard imposes a lower risk threshold than proportionality, and the severity of potential civilian losses, exemplified by flooding risks to thousands, likely meets this threshold. If the dam was attacked, it almost certainly violated Article 56, potentially constituting a grave breach under Article 85(3)(c) API, with *mens rea* requirements aligning closely with disproportionate attacks.[108]

As an occupying power, Russia's obligations under Article 53 of Geneva Convention IV prohibit property destruction unless absolutely necessary for military operations. Even if flooding provided a military advantage, the high threshold of necessity, incorporating environmental impacts, likely renders the act unlawful. Article 54 API protects objects indispensable to civilian

[108] MILANOVIC, Marko, The Destruction of the Nova Kakhovka Dam and International Humanitarian Law: Some Preliminary Thoughts (2023). EJIL: Talk!, 2023, available at https://www.ejiltalk.org/the-destruction-of-the-nova-kakhovka-dam-and-international-humanitarian-law-some-preliminary-thoughts/ (Accessed 31 March 2025).

survival, such as the reservoir's water supply. Its drainage, imperiling food and water security, breaches this absolute prohibition, with no exceptions applicable under occupation.

Environmental protections under IHL further complicate the analysis. Articles 35(3) and 55 API prohibit methods of warfare causing widespread, long-term, and severe environmental damage. Article 55(1) adds that such damage must prejudice population health or survival, while Article 35(3) imposes no such requirement. The cumulative threshold, widespread, long-term, and severe, is demanding, with "long-term" interpreted as spanning decades. Reports of severe ecological harm, including flooding of forests, projected desertification, toxin releases, animal losses, and threats to protected areas like the Black Sea Biosphere Reserve, suggest this threshold may be met, though the "long-term" element requires further evaluation. The *ex ante* assessment, based on expected effects, indicates a likely violation. Additionally, Rule 1 of the 2020 ICRC Guidelines requires due regard for environmental protection, though its customary status and applicability warrant scrutiny. Customary IHL, per PERAC Principle 13(2a), prohibits using environmental destruction as a weapon, and PERAC Principle 21 imposes obligations on occupying powers to prevent significant environmental harm.

Russia's failure to maintain the dam under occupation violates Geneva Convention IV's obligations to ensure public health and essential services.[109] Extraterritorial human rights obligations, including the rights to life, private and family life (International Covenant on Civil and Political Rights), and adequate living standards and health (International Covenant on Economic, Social and Cultural Rights), further bind Russia to prevent such harm.

The Nova Kakhovka dam disaster not only exacerbates environmental degradation but also undermines sustainable development efforts.[110] This breach is compounded by the International Law Commission's Draft Principles on the Protection of the Environment in Relation to Armed Conflicts, which mandate post-conflict environmental assessment and restoration[111], reinforced by the ICJ's *Gabčíkovo-Nagymaros* Project judgment. [112] In that ruling, the ICJ affirmed states' duties to mitigate transboundary environmental harm[113], a principle potentially violated in the *Nova Kakhovka* incident. This duty, commonly known as the "no-harm rule" or principle of prevention, constitutes a norm of customary international law. Its content is derived from a diverse array of sources, including judgments of international courts and tribunals[114], state pleadings[115], diplomatic correspondence, and decisions of international bodies such as the UN General Assembly.[116] The rule's substance, rooted in the obligation to prevent significant transboundary harm, is not static

[109] Articles 55–56.

[110] UNITED NATIONS WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT, Our Common Future (1987); UNITED NATIONS GENERAL ASSEMBLY, Resolution 70/1 (2015). UN Doc. A/RES/70/1, 2015.

[111] INTERNATIONAL LAW COMMISSION, Draft Principles on Protection of the Environment in Relation to Armed Conflicts (2022). UN Doc. A/77/10, 2022.

[112] INTERNATIONAL COURT OF JUSTICE, Gabčíkovo-Nagymaros Project (Hungary v. Slovakia), Judgment, 25 September 1997 (1997). ICJ Reports 7, 1997.

[113] NAKAMACHI, Mari. "THE INTERNATIONAL COURT OF JUSTICE DECISION REGARDING THE GABCÍKOVO-NAGYMAROS PROJECT." Fordham Environmental Law Journal, vol. 9, no. 2, 1998, pp. 337–372. JSTOR, http://www.jstor.org/stable/44174323.

[114] See Trail Smelter (United States v Canada) (Awards) (1938 and 1941) 3 RIAA 1905 ('Trail Smelter (Awards)'); Legality of the Threat or Use of Nuclear Weapons (Advisory Opinion) [1996] ICJ Rep 226, [29] ('Nuclear Weapons Advisory Opinion');Also more details are available in BIRNIE, Patricia , BOYLE, Alan and REDGWELL Catherine, International Law and the Environment (4th edn, OUP, Oxford 2021) 140. https://doi.org/10.1093/he/9780199594016.001.0001.

[115] BROWNLIE, Ian. "5. State Responsibility and International Pollution: A Practical Perspective". International Law and Pollution, edited by Daniel Barstow Magraw, Philadelphia: University of Pennsylvania Press, 1991, pp. 120-126. https://doi.org/10.9783/9781512804003-007.

[116] Ibid, pp. 121.

but evolves dynamically, with scholars identifying three developmental phases in its progression.[117] This evolving nature underscores its adaptability to emerging environmental challenges, as evidenced by its application in state practice and international legal discourse.

In the context of the Nova Kakhovka dam, the rule applies to the severe downstream flooding, pollution, and ecological devastation in Ukraine, which undermine Sustainable Development Goals (SDGs) 6 (clean water), 2 (zero hunger), and 15 (life on land). The disaster's transboundary impacts, such as contaminated water supplies, disrupted agriculture, and damaged ecosystems, fall within the rule's scope, which defines "significant" harm as serious, measurable, and often irreversible effects.

However, applying the no-harm rule to the Nova Kakhovka case is complicated by the wartime context. While primarily a peacetime norm, it can extend to conflicts if the harm is attributable to a state, potentially intersecting with IHL, such as Article 55 of AP I. Determining state responsibility requires fact-finding to establish control over the dam and intent or negligence, a process likely necessitating ICJ or UN intervention. If a breach is proven, remedies include cessation, reparation (e.g., compensation or restoration), and negotiations, as seen in *Gabčíkovo-Nagymaros*. Thus, the no-harm rule provides a legal framework to hold the responsible party accountable for the transboundary environmental and humanitarian impacts of the Nova Kakhovka disaster, despite evidentiary challenges in a conflict zone.

The destruction of the Nova Kakhovka Dam may constitute a war crime or crime against humanity, contingent on the underlying conduct and perpetrators' *mens rea*, which remain uncertain. It could qualify as a disproportionate attack irrespective of special protections under IHL, and Ukraine has already initiated a domestic ecocide investigation under Article 441 of its Criminal Code. Focusing on war crimes derived from Articles 54-56 of AP I, these prohibitions, unlike the underlying IHL rules that apply regardless of military advantage, require proportionality assessments: under Article 85(3)(c) of AP I, attacking works containing dangerous forces becomes a grave breach if willfully launched knowing it will cause excessive civilian loss, injury, or damage relative to anticipated concrete and direct military advantage, and resulting in death or serious injury, conditions met here given observed impacts. Similarly, Article 8(2)(b)(iv) of the ICC Statute criminalizes attacks causing widespread, long-term, and severe environmental damage only if clearly excessive compared to overall military advantage, elevating the threshold beyond AP I. The value of these specialized crimes lies primarily in their expressive specificity for international accountability, potentially bolstering calls for recognizing ecocide internationally, rather than relying on general disproportionate attack provisions. Given the dam's destruction's severe civilian and environmental harms, the anticipated military advantage would need to be extraordinary to justify proportionality, rendering a deliberate attack highly likely to qualify as excessive based on limited case law precedents. In contrast, the starvation war crime under Article 8(2)(b)(xxv) of the ICC Statute operates independently of proportionality, requiring that perpetrators deprive civilians of objects indispensable to survival, such as the reservoir's water supply, with intent to starve civilians as a method of warfare; no actual harm from deprivation need be proven. The *mens rea* element is contested: a restrictive view demands specific purpose to weaponize civilian suffering via denial of sustenance, whereas a broader interpretation, supported by scholarly analysis, treats "starvation" as the act of deprivation itself, necessitating only purposive denial in a belligerent context, even if aimed at combatants amid civilians or indiscriminately. Alternatively, if starvation

[117] BRENT, Kerryn Anne. "The Certain Activities case: what implications for the no-harm rule?." Asia Pacific Journal of Environmental Law 20, no. 1, 2017, pp. 28-56.

implies an outcome, intent under Article 30(2)(b) of the ICC Statute encompasses oblique forms, where perpetrators act with virtual certainty of resulting deprivation, aligning with ICC jurisprudence unless overridden by crime-specific language; in this case, establishing such intent, whether purposive or oblique, would hinge on evidence that the destruction targeted the water source knowing civilian dependency would lead to starvation in the ordinary course.

The destruction of the Nova Kakhovka dam represents a profound violation of international law, with severe humanitarian and ecological consequences. The incident likely breaches key IHL provisions, including protections for dams under Article 56 of Additional Protocol I, prohibitions on destroying objects indispensable to civilian survival, and safeguards against widespread, long-term, and severe environmental damage. These violations, compounded by Russia's obligations as an occupying power and the customary no-harm rule, underscore the disaster's illegality and its impact on SDGs. The potential classification of the act as a war crime, particularly under the ICC Statute, hinges on establishing intent and proportionality, though evidentiary challenges in a conflict zone complicate attribution. Accountability requires robust fact-finding, potentially through international mechanisms like the ICJ or ICC, alongside remedies such as cessation, reparation, and environmental restoration. The Nova Kakhovka case highlights the urgent need for stronger international norms to address environmental devastation in armed conflicts.

4.2. Reform agenda

The primary reform focuses on strengthening AP I and the ENMOD Convention. AP I's Articles 35(3) and 55 prohibit methods or means of warfare intended or expected to cause widespread, long-term, and severe environmental damage prejudicial to human health or survival, while banning reprisals against the environment. This anthropocentric approach, linking ecological harm to human welfare, permits interpretations that broadly prohibit environmental damage. The ENMOD prohibits environmental modification techniques with widespread, long-lasting, or severe effects as weapons, employing a disjunctive threshold less stringent than AP I's cumulative standard, but it is confined to intentional acts like inducing natural disasters, excluding incidental harm such as industrial pollution. The Kakhovka Dam breach, potentially violating AP I, exposes these treaties' shortcomings: AP I's stringent threshold often demands decades-long damage, as noted in the ICRC's 2005 Customary International Humanitarian Law Study, while ENMOD's narrow focus on deliberate modification misses subtler practices and lacks applicability to non-state actors, domestic damage, or international waters. [118] Weak enforcement mechanisms further limit both treaties' effectiveness.

The scholarship suggests targeted reforms.[119] Some authors propose integrating Islamic legal perspectives with IHL to strengthen environmental protection in Muslim-majority states.[120] Others highlight that current IHL provisions are vague and have stringent applicability thresholds, reducing their efficacy.[121] They advocate for the adoption of the ICRC's 2020 Updated Guidelines. Some authors critique AP I's threshold as overly restrictive, advocating a redefinition of "long-

[118] HENCKAERTS, Jean-Marie, DOSWALD-BECK, Louise, Ibid.

[119] VERWEY, Wil. D. Protection of the environment in times of armed conflict: In search of a new legal perspective. Leiden Journal of International Law, 8(1), 1995. pp.7–40. https://doi.org/10.1017/S0922156500003083.

[120] AL-DAWOODY, Ahmed, & THYNNE, Kelisiana. "Of Date Palms and Dialogue: Enhancing the Protection of the Natural Environment under International Humanitarian Law and Islamic Law." International Review of the Red Cross 106, no. 925 (2024): 350–65. https://doi.org/10.1017/S1816383124000146.

[121] AKPOGHOME, Theresa U., WORLUH-OKOLIE, Nkechinyere HUOMACHI, Protection of the Environment under International Humanitarian Law Regime: Challenges and Way Forward (2024). Journal of Environmental Law & Policy, 2024. https://doi.org/10.33002/jelp040202.

term" from decades to years to reflect modern ecological science, where localized damage can cascade across ecosystems.[122] Others suggest integrating the precautionary principle, articulated in the ICJ's 1996 Nuclear Weapons advisory opinion, to lower AP I's bar, prioritizing proactive protection amid uncertainty.[123] For ENMOD, some authors recommend expanding its ambit to incidental harm[124], such as Ukraine's industrial pollution, while others call for its extension to non-international armed conflicts (NIACs) and non-state actors, given their growing role.[125] Nevertheless, integrating IEL principles, such as the duty to prevent transboundary harm, could enhance both treaties' accountability mechanisms and reduce evidentiary burdens. [126]

The International Law Commission's 2022 Draft Principles on Protection of the Environment in Relation to Armed Conflicts (PERAC), adopted by UNGA Resolution A/RES/77/104, provides a flexible framework without necessitating treaty amendments. Its 27 principles, including Principle 13(2) reaffirming AP I's prohibition and Principle 17 referencing ENMOD, offer interpretive guidance to ease thresholds via the "subject to applicable international law" clause. [127] Proposals like the 2021 Stop Ecocide Foundation's ecocide definition suggest amending the Rome Statute to criminalize environmental harm, reinforcing treaty reforms with individual accountability. [128]

Implementing these reforms faces significant obstacles, as major powers, including the United States and Russia, oppose stricter regulations, citing operational constraints, as seen in their AP I reservations. Treaty amendments require broad consensus, often stalled by conflicting interests, particularly in ongoing conflicts like Ukraine. [129] Interpretive frameworks like PERAC provide a practical alternative, achieving similar goals without formal amendments. [130] These reforms support SDG 13 (climate action) by deterring destruction of carbon sinks and mitigating climate impacts from industrial attacks, enhancing global resilience. [131] While formal amendments may face resistance, customary and soft law developments, bolstered by PERAC and IEL integration, offer feasible pathways to strengthen environmental protections in armed conflicts, aligning IHL and ICL with 21st-century sustainability imperatives.

Second, this study advocates elevating environmental destruction to a "grave breach" under Article 85 of Additional Protocol I (AP I) to the Geneva Conventions and revising Article 8(2)(b)(iv) of the Rome Statute to bolster the International Criminal Court's (ICC) prosecutorial capabilities, drawing inspiration from deterrence precedents like the Lubanga case.[132] Currently, AP I addresses environmental harm under Articles 35(3) and 55 but does not explicitly classify it

[122] HULME, Karen, Using International Environmental Law to Enhance Biodiversity and Nature Conservation During Armed Conflict (2022). Journal of International Criminal Justice, Vol. 20, No. 1155, 2022.
[123] VAN STEENBERGHE, Ibid.
[124] BOTHE, et.al. 2010, 575.
[125] VÖNEKY, Silja, The ENMOD Convention,Research Handbook on International Arms Control Law, 2022.
[126] DIENELT, Anne, The Environment and the Laws of Armed Conflict. In: Armed Conflicts and the Environment. Springer, Cham. 2022. pp.89. https://doi.org/10.1007/978-3-030-99339-9_2).
[127] INTERNATIONAL LAW COMMISSION, Draft Principles on Protection of the Environment in Relation to Armed Conflicts (2022). UN Doc. A/77/10, 2022, Principles 13(2), pp.17.
[128] STOP ECOCIDE FOUNDATION, Independent Expert Panel for the Legal Definition of Ecocide, 2021, available at https://tinyurl.com/3x39nc3h (accessed 31 March 2025).
[129] UNITED STATES AND UNITED KINGDOM, Declarations on Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (1977). 1125 UNTS 3, 1977; HENCKAERTS, Jean-Marie, DOSWALD-BECK, Louise,Ibid.,153.
[130] ARGREN, Ronnie, Ibid. pp.5.
[131] UNITED NATIONS GENERAL ASSEMBLY, Resolution 70/1 (2015). UN Doc. A/RES/70/1, 2015, 15.
[132] INTERNATIONAL CRIMINAL COURT, Prosecutor v. Thomas Lubanga Dyilo, Judgment, ICC-01/04-01/06, 14 March 2012 (2012). 2012, para. 558.

as a grave breach under Article 85, though it might fall under Geneva Convention IV's Article 147 if deemed "extensive destruction… carried out unlawfully and wantonly."[133]Designating it a grave breach would affirm environmental damage as a serious IHL violation, enhancing accountability. Similarly, Article 8(2)(b)(iv) of the Rome Statute defines environmental damage as a war crime when it is "widespread, long-term and severe" and "clearly excessive" relative to military advantage, but its high threshold and proportionality test limit prosecutions.[134]Revising this provision to ease these standards, potentially aligning it with AP I or incorporating the 2021 ecocide proposal by the Independent Expert Panel, would strengthen ICC enforcement.[135] Some scholars suggest removing "overall" and "clearly" from the military advantage clause[136], while others call for broader IHL protections, reflecting a consensus on the need for reform despite no formal amendment proposals.[137] Practical challenges persist: amending AP I demands state consensus, historically resisted by powers like the United States, and altering the Rome Statute requires a two-thirds majority in the Assembly of States Parties, complicated by enforcement issues against non-signatories, as seen in the Al Bashir case.[138] Nevertheless, these reforms would advance SDG 16 by embedding environmental accountability in international law, reinforcing global justice mechanisms, with the growing push for ecocide offering a complementary avenue to address these gaps.[139]

Third, the study proposes reinterpreting the *Martens Clause*,[140] a foundational principle in IHL articulated in the 1899 Hague Convention and reaffirmed in subsequent treaties like the 1949 Geneva Conventions and their 1977 Additional Protocols, to incorporate the precautionary principle, thereby enhancing environmental protections during armed conflict.[141] This Clause ensures that in the absence of specific treaty provisions, populations and belligerents remain protected by principles derived from established custom, the laws of humanity, and the dictates of public conscience, a status widely recognized as customary.[142] The precautionary principle, prominent in IEL and enshrined in Principle 15 of the 1992 Rio Declaration on Environment and Development, mandates preventive action in the face of potential serious or irreversible harm despite scientific uncertainty.[143] Drawing on the ICJs reasoning in *Pulp Mills*, where the Court emphasized environmental impact assessments and precautionary measures to prevent transboundary harm amid uncertainty, the study suggests that belligerents should take affirmative steps to avoid or mitigate ecological damage in armed conflict, even when scientific evidence is

[133] PROTOCOL ADDITIONAL TO THE GENEVA CONVENTIONS, Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (1977). 1125 UNTS 3, 1977, Art. 85; GENEVA CONVENTION RELATIVE TO THE PROTECTION OF CIVILIAN PERSONS IN TIME OF WAR, 75 UNTS 287, 1949, Art. 147.

[134] ROME STATUTE OF THE INTERNATIONAL CRIMINAL COURT, 1998. 2187 UNTS 90, 1998, Art. 8(2)(b)(iv).

[135] STOP ECOCIDE FOUNDATION, Ibid.

[136] HELLER, Kevin J., LAWRENCE, Jessica C., The Limits of Article 8(2)(b)(iv) of the Rome Statute, the First Ecocentric Environmental War Crime. available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=979460 (accessed 1 March 2025).

[137] ARGREN, Ronnie, Ibid.

[138] INTERNATIONAL CRIMINAL COURT, Prosecutor v. Omar Hassan Ahmad Al Bashir, Warrant of Arrest, ICC-02/05-01/09, 4 March 2009 (2009). 2009; 1. SCHABAS, William, The ICC and Non-Party States: Windsor Y.B. Access Just. Vol. 28 No. 1 (2),2010. DOI: https://doi.org/10.22329/wyaj.v28i1.4488.

[139] UNGA Res. 70/1 (21 October 2015) UN Doc. A/RES/70/1, at 15 (SDG 16).

[140] The groundwork for this topic is established in FLECK, Dieter. "The Martens Clause and Environmental Protection in Relation to Armed Conflicts." Goettingen Journal of International Law 10, no. 1 .2020. Consequently, our study does not address it in detail.

[141] CONVENTION (II) WITH RESPECT TO THE LAWS AND CUSTOMS OF WAR ON LAND, 32 Stat. 1803, 1899, preamble.

[142] HENCKAERTS, Jean-Marie, DOSWALD-BECK, Louise, Ibid, pp. 4.

[143] UNITED NATIONS GENERAL ASSEMBLY, Rio Declaration on Environment and Development (1992). UN Doc. A/CONF.151/26 (Vol. I), 1992, Principle 15.

inconclusive.[144]This reinterpretation would bolster the applicability of Article 8(2)(b)(xxv) of the Rome Statute," including water infrastructure, a tactic increasingly evident in conflicts like Syria and Yemen, where such destruction exacerbates civilian hardship.[145] By integrating precaution, this shift would lower the threshold for proving intent or foreseeability under Article 8(2)(b)(xxv), compelling belligerents to anticipate and prevent harm to water systems, thus aligning with SDG 6 on clean water and sanitation by safeguarding critical civilian infrastructure essential for public health and post-conflict recovery.[146] Further support emerges from the ICJ's Certain Activities Carried Out by *Nicaragua in the Border Area* , which reinforced the duty to prevent transboundary harm, providing a legal basis for applying precaution in conflict settings.[147] However, the ICJ's caution in *North Sea Continental Shelf* highlights a key challenge: customary law requires consistent state practice and *opinio juris*, and fragmented state practice could undermine this reinterpretation's legal weight, especially given diverse military approaches to environmental considerations.[148] Some scholars advocate integrating IEL principles into IHL via the *Martens Clause* to address environmental uncertainty[149], while others see it enhancing accountability for ecological harm, aligning with SDG 16 (peace, justice, and strong institutions) by strengthening legal mechanisms.[150] Fleck warns, however, that without uniform state practice, such an interpretation risks lacking customary status, echoing *North Sea Continental Shelf's* emphasis on consistency.[151] The ICRC's 2020 Guidelines on the Protection of the Natural Environment in Armed Conflict reinforce this normative shift by urging precautionary measures, offering practical guidance for states.[152] An unexpected dimension is the growing advocacy for ecocide as a standalone crime under the Rome Statute, proposed by the Independent Expert Panel in 2021, which could complement this reinterpretation by providing a broader framework for prosecuting environmental harm, further supporting SDG 16.[153] This proposal bridges IHL and IEL, ensuring belligerents protect vital ecological systems like water infrastructure, aligns with SDGs 6 and 16 by promoting water access and justice, but its success hinges on overcoming the risk of fragmented state practice to establish a robust customary norm.

The fourth and most ambitious element of the proposed reform agenda envisions the establishment of an Environmental Protection Convention (EPC), drawing on the proven frameworks of the Ottawa Convention and the UN Compensation Commission's post-Gulf War reparations system established in 1991 by UN Security Council Resolution 687.[154] This new treaty

144 INTERNATIONAL COURT OF JUSTICE, Pulp Mills on the River Uruguay (Argentina v. Uruguay), Judgment, 20 April 2010 (2010). ICJ Reports 14, 2010, para. 101.

145 ROME STATUTE OF THE INTERNATIONAL CRIMINAL COURT, Ibid, Art. 8(2)(b)(xxv); UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, Syria: Attacks on Water Infrastructure, 2020, available at https://reliefweb.int/report/syrian-arab-republic/syria-attacks-water-infrastructure (Accessed 11 March 2025).

146 UNGA Res. 70/1 (21 October 2015) UN Doc. A/RES/70/1, at 14 (SDG 6).

147 INTERNATIONAL COURT OF JUSTICE, Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua), Judgment, 2 February 2018 (2018). ICJ Reports 15, 2018, para. 104.

148 INTERNATIONAL COURT OF JUSTICE, North Sea Continental Shelf (Germany v. Denmark; Germany v. Netherlands), Judgment, 20 February 1969 (1969). ICJ Reports 3, 1969, para. 74.

149 HULME,2022, Ibid.

150 VAN STEENBERGHE, Ibid.

151 FLECK, Ibid. pp.32.

152 INTERNATIONAL COMMITTEE OF THE RED CROSS, Guidelines on the Protection of the Natural Environment in Armed Conflict (2020). pp.13.

153 STOP ECOCIDE FOUNDATION, Ibid.

154 CONVENTION ON THE PROHIBITION OF THE USE, STOCKPILING, PRODUCTION AND TRANSFER OF ANTI-PERSONNEL MINES AND ON THEIR DESTRUCTION. 2056 UNTS 211, 1997; UNITED NATIONS SECURITY COUNCIL, Resolution 687 (1991). UN Doc. S/RES/687, 1991.

would explicitly prohibit military attacks on ecologically critical zones, such as dams, water systems, and nature reserves, and impose binding obligations for post-conflict environmental restoration, aiming to address the profound ecological devastation caused by modern warfare. The destruction of the Nova Kakhovka Dam serves as a compelling case for this initiative.[155] This incident, which disrupted irrigation for half a million acres, endangered the Zaporizhzhia nuclear plant's cooling system, and left a legacy of chemical and bacterial pollution described as a "toxic timebomb" could galvanize a UN General Assembly resolution to launch treaty negotiations, much as public outrage has driven past environmental law reforms.[156] Existing IHL offers limited protection: AP I under Articles 35(3) and 55 sets a high threshold for enforcement (all three elements must be met simultaneously) making it extremely difficult to enforce in practice, often requiring proof of foreseeability and extreme scale that rarely aligns with real-world incidents.The ENMOD Convention is limited to prohibiting the deliberate use of environmental modification techniques as a weapon, such as weather manipulation for hostile purposes, but it does not cover collateral or incidental environmental damage, like the ecosystem fallout from events such as the Nova Kakhovka dam destruction.[157] The Rome Statute under Article 8(2)(b)(iv) criminalizes intentional attacks causing excessive incidental environmental damage relative to military advantage, but its high evidentiary standards, proportionality test, and focus on war crimes within the ICC jurisdiction result in rare prosecutions, leaving most environmental harms unaddressed Non-binding instruments, such as the PERAC and the ICRC 2020 Guidelines, offer progressive recommendations, like designating protected environmental zones and addressing remnants of war, but lack legal enforceability, creating persistent gaps in accountability, prevention, and remediation.[158] Unlike the high cumulative barriers in AP I and the Rome Statute, the EPC could introduce a more accessible standard for "particularly serious offences," defined as intentional, unlawful acts causing destruction; irreversible, widespread, and substantial damage; or long-lasting, widespread, and substantial damage to ecosystems, habitats, or environmental quality. This disjunctive approach potentially reduces the evidentiary burden, enabling prosecution of incidental harms that fall short of AP I's "severe" criterion but still devastate biodiversity, such as pollution from military operations or habitat destruction in conflict zones.[159] By explicitly applying in "times of peace and in situations of armed conflict, wartime, or occupation," it extends criminal liability to wartime environmental damage, filling ENMOD's gap on non-intentional modifications and providing a complementary layer to IHL that emphasizes criminal sanctions over mere prohibitions. This aligns with non-binding efforts like the ILC's PERAC by making principles enforceable, such as requiring states to prevent and remediate harm, while tying environmental recovery to post-conflict peacebuilding, e.g., through restoration orders and corporate accountability for conflict-related industries. The Ottawa Convention's success in banning

[155] SHUMILOVA, Oleksandra V., Environmental Effects of the Kakhovka Dam Destruction by Warfare in Ukraine. Science, 2025, available at https://www.science.org/doi/10.1126/science.adk1855 (Accessed 21 March 2025).

[156] FARRER, Martin, Destruction of Ukraine Dam Caused "Toxic Timebomb" of Heavy Metals, Study Finds (2025). The Guardian, 2025, available at https://www.theguardian.com/world/2025/mar/13/destruction-of-ukraine-kakhovka-dam-caused-toxic-timebomb-in-rivers-study-finds (accessed 21 March 2025); NESLEN, Arthur, Ukrainian Scientists Tally the Grave Environmental Consequences of the Kakhovka Dam Disaster. Science, 2023, available at https://www.science.org/content/article/ukrainian-scientists-tally-grave-environmental-consequences-kakhovka-dam-disaster (accessed 10 March 2025).

[157] ENMOD CONVENTION, Ibid.

[158] ROME STATUTE OF THE INTERNATIONAL CRIMINAL COURT, Rome Statute of the International Criminal Court (1998). 2187 UNTS 90, 1998, Art. 8(2)(b)(iv).; INTERNATIONAL LAW COMMISSION, Draft Principles on Protection of the Environment in Relation to Armed Conflicts (2022). UN Doc. A/77/10, 2022.

[159] UNITED NATIONS GENERAL ASSEMBLY, Resolution 70/1 (2015). UN Doc. A/RES/70/1, 2015, 24.

landmines through stigmatization and compliance mechanisms, and the UN Compensation Commission's precedent in securing reparations for Gulf War environmental damage, provide models for an EPC's structure, potentially incorporating the precautionary principle from the *ICJ's Pulp Mills* to mandate preventive action amid uncertainty.[160] However, securing broad support poses a significant challenge, as evidenced by the Paris Agreement (2015), which, despite over 190 parties, faces implementation struggles due to divergent state commitments.[161] Defining "ecologically critical zones" could spark contention, whether to include cultural sites or limit to natural ecosystems, as noted in ILC discussions, and enforcement against non-state actors or non-signatories, like Russia in Ukraine, mirrors difficulties seen in the Al Bashir case.[162] Despite these obstacles, the Nova Kakhovka disaster's scale, termed an "environmental bomb" by Ukrainian leadership, offers a potent catalyst for action, potentially driving a UN-led treaty process to advance global sustainability and peace by protecting critical ecosystems and ensuring their restoration, reinforcing the nexus between environmental health and lasting stability.[163]

Finally, this study highlights the urgent need to reframe environmental protection not as a peripheral concern of IHL, but as a core obligation tied to the survival of communities and ecosystems alike. By embedding legal safeguards for ecosystems, lowering outdated thresholds for harm, and advancing mechanisms for enforcement and restoration, this agenda seeks to realign the international legal order with the interconnected aims of peace, justice, and sustainable development. The law must evolve, not only to prosecute those who weaponize nature, but to preserve the ecological foundations upon which peace and human security ultimately depend.

V. CONCLUSION

Armed conflicts and environmental degradation form a vicious cycle that undermines global sustainability by exacerbating ecological and societal vulnerabilities. The escalation of conflicts, from 69 in 2018 to 110 in 2022, amplifies direct environmental damage, through deliberate or incidental destruction of critical infrastructure like dams, refineries, and ecosystems, and indirect impacts, such as altered land use, weakened governance, and military carbon emissions.

The destruction of the Nova Kakhovka Dam reveals critical deficiencies in the international legal framework governing environmental protection in armed conflicts. The incident likely violates key provisions of IHL, which protects dams from attacks that may release dangerous forces, and those which safeguards objects indispensable to civilian survival. It also breaches the customary no-harm rule, undermining Sustainable Development Goals (SDGs) 6, 2, and 15. The disaster's potential classification as a war crime under the Rome Statute, particularly for disproportionate attacks or starvation tactics, highlights the need for stronger accountability mechanisms, though evidentiary challenges in conflict zones complicate attribution.

The proposed reform agenda addresses these gaps through four key measures: strengthening Additional Protocol I and the ENMOD Convention by lowering evidentiary thresholds and expanding their scope to incidental harms; elevating environmental destruction to a grave breach under IHL and revising the Rome Statute to enhance ICC prosecutions; reinterpreting the Martens

[160] INTERNATIONAL COURT OF JUSTICE, Pulp Mills on the River Uruguay (Argentina v. Uruguay), Judgment, 20 April 2010 (2010). ICJ Reports 14, 2010, para. 101.

[161] PARIS AGREEMENT, Paris Agreement (2015). [2016] OJ L 282/4, 2015.

[162] INTERNATIONAL LAW COMMISSION, Protection of the Environment in Relation to Armed Conflicts: Analytical Guide. available at https://legal.un.org/ilc/guide/8_7.shtml accessed 31 March 2025.

[163] BBC NEWS, What the Destruction of Kakhovka Dam Means for the Environment (2023). 2023, available at https://www.bbc.com/news/science-environment-65849745 accessed 3o March 2025.

Clause to incorporate the precautionary principle, ensuring proactive environmental protection; and establishing an Environmental Protection Convention (EPC) to prohibit attacks on ecologically critical zones and mandate post-conflict restoration. Drawing on precedents like the Ottawa Convention and the UN Compensation Commission, the EPC would introduce enforceable standards for environmental harm, addressing limitations in existing IHL and International Environmental Law.

Despite challenges, including state resistance and enforcement against non-signatories, the Nova Kakhovka disaster underscores the urgent need to reframe environmental protection as a core obligation of IHL, integral to human security and global stability. By embedding robust legal safeguards, easing outdated thresholds, and promoting restoration, these reforms align IHL and International Criminal Law with 21st-century sustainability imperatives, ensuring accountability for ecological devastation and preserving the foundations of peace and development.

KEY WORDS
Armed Conflict, Environmental Degradation, Global Sustainability, International Humanitarian Law.

KĽÚČOVÉ SLOVÁ
Ozbrojený konflikt, environmentálna degradácia, globálna udržateľnosť, medzinárodné humanitárne právo.

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