

Ecocide in Ukraine: Environmental Fallout of the Russia-Ukrainian War

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Abstract:

The ongoing Russo-Ukrainian War has presented one of the most severe environmental crises of modern conflict, revealing how war inflicts damage not only on human life and infrastructure but also on ecosystems. This paper explores the concept of ecocide the mass destruction of the natural environment as it relates to the environmental devastation observed in Ukraine since 2022. The deliberate targeting of industrial plants, chemical storage sites, and energy infrastructure has released hazardous substances into soil, rivers, and air, while forest fires and the destruction of protected areas have caused irreversible biodiversity loss.

This study examines whether these acts may be classified as ecocide within the ambit of international legal frameworks, drawing upon evolving jurisprudence and the proposed recognition of ecocide as the fifth core international crime under the Rome Statute of the International Criminal Court (ICC). It further assesses Ukraine's legal and diplomatic efforts to record ecological damage and pursue international accountability, including its collaboration with the United Nations Environment Programme (UNEP), the European Union, and various international non-governmental organisations.

Through an analysis of environmental data, satellite imagery, and field reports, this paper demonstrates that the environmental degradation witnessed in Ukraine is not merely incidental, but in certain instances appears to be deliberate or carried out with reckless disregard. Furthermore, it critically examines the inadequacies of existing International Humanitarian Law (IHL) in addressing environmental harm during armed conflict. The paper advocates for comprehensive legal reform to bridge the existing lacunae concerning environmental protection in times of war.

KEY WORDS: *Environment, Russia-ukrainian War, ICC, UNEP, IHL.*

Introduction

This article discusses the concept of “ecocide” and the environmental issues during the Russia Ukraine war. Ecocide literally means “*killing the environment*”.¹ It refers to mass damage and destruction of ecosystems to the point where people, animals and nature can no longer thrive safely.²

The Russia Ukraine war has emerged not only as a humanitarian tragedy but also as an unprecedented environmental disaster in modern Europe.³ The ongoing conflict has caused severe ecological destruction polluting rivers and soils, damaging forests, destroying agricultural land, and threatening biodiversity on a massive scale⁴. Unlike traditional warfare, the current conflict has targeted critical infrastructure such as oil depots, chemical plants, dams, and even nuclear facilities,⁵ thereby transforming the natural environment itself into a casualty of war. This large-scale, deliberate, and long-lasting damage has led to renewed global discussions on ecocide,⁶ a term used to describe the extensive destruction of ecosystems that endangers human survival and ecological balance.⁷

The environmental fallout of the conflict is alarming and multi-dimensional. The breach of the Kakhovka Dam in June 2023 released vast quantities of water, resulting in catastrophic flooding, soil erosion, habitat destruction, and long-term loss of freshwater resources. Attacks on industrial complexes and fuel storage sites have caused widespread air and water pollution, releasing toxic substances that contaminate ecosystems for decades. Agricultural fields, once central to Ukraine’s role as a global food supplier, have been rendered unusable by bombings,

¹Higgins, P., Short, D., & South, N., “Protecting the Planet: A Proposal for a Law of Ecocide,” *Crime, Law and Social Change*, Vol. 59, No. 3, 2013.

²Stop Ecocide International, Definition of Ecocide, Legal Proposal Submitted to the International Criminal Court, 2021.

³United Nations Environment Programme (UNEP), Environmental Consequences of the War in Ukraine (Report, 2023)

⁴Organisation for Security and Co-operation in Europe (OSCE), Environmental Impacts of the Armed Conflict in Ukraine (Briefing Note, 2023).

⁵BBC News, “Ukraine War: Attacks on Infrastructure Raise Fears of Environmental Crisis,” March 2023.

⁶Stop Ecocide International, Definition of Ecocide (Legal Proposal, 2021).

⁷The Guardian, “Calls Grow to Recognise ‘Ecocide’ as International Crime amid Ukraine War,” June 2022.

fires, and unexploded ordnance⁸, creating not only a food security crisis but also long-lasting soil degradation.

Forests and natural reserves in conflict zones have suffered repeated fires and deforestation, leading to the loss of biodiversity and disruption of fragile ecosystems. Meanwhile, the repeated shelling near the Zaporizhzhia Nuclear Power Plant, the largest in Europe, has raised fears of a potential nuclear accident that could contaminate vast areas with radioactive fallout, impacting not only Ukraine but also neighbouring countries. These environmental consequences demonstrate that the war has effects far beyond immediate battlefields, threatening the long-term ecological sustainability of an entire region.

International legal frameworks, such as the Geneva Conventions (1977 Additional Protocol I) and the Environmental Modification Convention (ENMOD, 1976), acknowledge the need to protect the environment during armed conflict⁹. However, the scale of destruction in Ukraine reveals significant gaps in their effectiveness. The absence of a binding legal category for ecocide under the Rome Statute of the International Criminal Court means that such acts of environmental devastation often go unpunished.¹⁰ The Ukraine war thus provides a critical case study for examining how modern warfare contributes to ecological collapse and why international law must evolve to recognize and address ecocide as a crime.

Ecocide and International Law

In this para, the concept of “ecocide” has its roots in the latter half of the twentieth century, emerging in response to the large-scale environmental destruction caused by human activity, particularly during armed conflicts.¹¹ The term is widely credited to Arthur Galston, a biologist and professor at Yale University, who became deeply disturbed by the U.S. military’s use of

⁸Food and Agriculture Organization of the United Nations (FAO), Ukraine: Impact of the War on Agricultural Production and Food Security, 2023

⁹International Committee of the Red Cross (ICRC), Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 1977, Articles 35(3) and 55.

¹⁰Rome Statute of the International Criminal Court, 1998, Articles 5–8; see also Stop Ecocide International, Proposal for the Inclusion of Ecocide as an International Crime, 2021.

¹¹Higgins, P., Short, D., & South, N., “Protecting the Planet: A Proposal for a Law of Ecocide,” *Crime, Law and Social Change*, Vol. 59, No. 3, 2013.

defoliants such as Agent Orange, Agent White, and Agent Blue during the Vietnam War.¹² These chemical substances, deployed as weapons of war, were intended to destroy vegetation and deny cover to enemy forces. However, their impact was far more devastating, extending beyond military objectives to catastrophic environmental and humanitarian consequences.

The use of these defoliants resulted in the destruction of approximately 20,000 km² of forests and cultivable land and 500,000 hectares of mangrove ecosystems representing nearly 20% of South Vietnam's territory.¹³ Among these, Agent Orange was particularly infamous, as it contained dioxin, one of the most toxic chemical substances known¹⁴. Dioxin's effects were not limited to the immediate devastation of flora and fauna. It also produced long-lasting consequences, persisting for decades within soil and water systems and bioaccumulating within the food chain. Even thirty years after its initial release, traces of dioxin continued to affect human health, biodiversity, and ecological integrity.¹⁵

Beyond chemical defoliants, the U.S. military relied on additional tactics such as bulldozers and napalm-induced forest fires, effectively flattening jungles and annihilating entire ecosystems. This unprecedented scale of destruction not wiped-out forests but also led to the collapse of wildlife populations and ecological habitats, compounding the human suffering caused by war.

Outraged by these acts, Galston sought to bring international attention to what he saw as the deliberate destruction of the environment acts, he believed should be recognized as crimes against peace. In February 1970, he attended the Conference on War and National Responsibility in Washington, D.C., where he urged the international community to adopt legal measures to ban what he termed ecocide. He described it simply as the "wilful destruction of

¹²Zierler, D., *The Invention of Ecocide: Agent Orange, Vietnam, and the Scientists Who Changed the Way We Think About the Environment*, University of Georgia Press, 2011.

¹³Stellman, J. M. et al., "The Extent and Patterns of Usage of Agent Orange and Other Herbicides in Vietnam," *Nature*, Vol. 422, 2003, pp. 681–687

¹⁴Institute of Medicine (U.S.), *Veterans and Agent Orange: Health Effects of Herbicides Used in Vietnam*, National Academies Press, 1994

¹⁵United Nations Environment Programme (UNEP), *Persistent Organic Pollutants and Their Environmental Impact: Dioxins and Furans in Vietnam*, 2007.

the environment”, framing it as a moral and legal wrong that transcended national borders and demanded collective responsibility.

Since then, the Vietnam War has become one of the most frequently cited historical examples of ecocide. Many international legal scholars and environmental advocates regard the U.S. military’s use of chemical agents as a clear manifestation of ecocidal conduct. Nevertheless, despite widespread acknowledgment of the destructive consequences, neither the U.S. military nor any individual soldiers or commanders have ever been charged or prosecuted for these actions before the International Criminal Court (ICC) or any other international tribunal. This legal gap highlights the ongoing challenges in defining ecocide under international criminal law and incorporating it formally within the jurisdiction of global legal institutions.

Thus, the Vietnam experience marked both the birth of the term “ecocide” and the beginning of a broader international dialogue about the need for legal frameworks to address grave environmental crimes, particularly in the context of armed conflict. The debate continues today, as scholars, activists, and policymakers strive to articulate ecocide as a distinct international crime alongside genocide, crimes against humanity, war crimes, and the crime of aggression.

There is no single agreed upon definition of ecocide in academic scholarship or international law. In broad terms, “ecocide refers to the destruction of ecosystems and the species they support on a massive scale. The definitions of the term vary, but in all cases, they concern the widespread killing or degradation of nature.”¹⁶

Literature Review

1.The Concept of Ecocide

The term ecocide first articulated in the 1970s has regained attention in recent years as scholars and advocacy groups campaign to codify it as a fifth international crime under the Rome Statute of the International Criminal Court. A model definition prepared by the Independent Expert Panel describes ecocide as “unlawful or wanton acts committed with knowledge that there is a

¹⁶Bedirhan Erdem and Ugur Orhan, “Ecocide,” in *Earth Law: Emerging Eco centric Law. A Guide for Practitioners*, edited by Anthony R. Zelle, Grant Wilson, Rachelle Adam, and Herman F. Greene (New York: Wolters Kluwer, 2021),333.

substantial likelihood of severe and either widespread or long-term damage to the environment.”¹⁷

2.Environmental Impacts in Ukraine

International agencies have recorded unprecedented environmental destruction since the onset of the war. A UNEP rapid environmental assessment after the Kakhovka Dam breach in June 2023 found irreversible ecological harm, with flooding causing habitat loss, destruction of farmland, and long-term threats to freshwater supplies.¹⁸ A UNECE-led Inter-Agency Coordination Group (IACG) similarly highlighted air, water and soil contamination across industrial and urban areas, calling the environmental damage “systemic and severe.”¹⁹

3.Nuclear Risk

The ongoing military operations near the Zaporizhzhia Nuclear Power Plant, Europe’s largest, have drawn global alarm. Analysts stress that combat in and around nuclear sites poses risk son large-scale radiological release, with transboundary implications that international nuclear law and humanitarian law are ill-equipped to fully prevent.²⁰

4.Industrial and Agricultural Pollution

Strikes on oil depots, fertilizer factories, and chemical plants have released toxic pollutants into the air and water.²¹ Agricultural lands central to Ukraine’s role as a food exporter have been destroyed by flooding, unexploded ordnance, and fires, with serious implications for food security and soil fertility.²²

¹⁷ Stop Ecocide Foundation, Independent Expert Panel: Definition of Ecocide (2021)

¹⁸ United Nations Environment Programme (UNEP), Rapid Environmental Assessment of the Kakhovka Dam Breach, Ukraine (25 October 2023).

¹⁹UNECE, Report of the Inter-Agency Coordination Group on Environmental Damage in Ukraine (December 2023).

²⁰ Anthony Burke et al., “Playing with Fire at the Zaporizhzhia Nuclear Power Plant: Challenges for International Nuclear Law” (2022); see also International Atomic Energy Agency (IAEA), Safety and Security of Ukraine’s Nuclear Facilities (IAEA Updates, 2022–2023).

²¹ European Parliamentary Research Service, Russia’s War on Ukraine: The High Environmental Toll (July 2023).

²²Ibid., p.125.

5.Comparative Precedents

Previous conflicts offer relevant lessons. The deliberate burning of Kuwaiti oil wells during the 1991 Gulf War produced massive air and soil pollution, later assessed by UNEP as one of the most severe wartime environmental disasters.²³ Such precedents underline the persistence and cost of war-related ecological damage, offering a comparative lens for evaluating the Ukraine conflict.

6.Gaps in Existing Law

While the 1977 Additional Protocol to the Geneva Conventions prohibits methods of warfare that cause “widespread, long-term and severe damage to the natural environment,” the high threshold of proof and lack of enforcement mechanisms limit its practical utility. The ENMOD Convention (1976) (Convention on the prohibition of military or any other hostile use of Environmental Modification Techniques) likewise restricts only environmental modification techniques, leaving industrial strikes and dam destruction largely outside its scope.²⁴ This gap strengthens calls to recognize ecocide as a discrete international crime.²⁵

Legal Frame Work

International Humanitarian Law (IHL) and Environmental Protection The primary body of law regulating conduct during armed conflict is International Humanitarian Law, codified in the Geneva Conventions (1949) and their Additional Protocols (1977). Article 35(3) and Article 55 of Additional Protocol I explicitly prohibit methods of warfare “intended or expected to cause widespread, long-term and severe damage to the natural environment.”²⁶ Article 55(1) is formulated in an anthropocentric way, making harm to the natural environment problematic only in so far as it negatively impacts the health, well-being, or survival of human being. Article 55(1) and article 8(2)(b)(iv) also repeat the language of Article 1(1) of ENMOD namely,

²³UNEP, Environmental Consequences of the Gulf War: Desk Study on the Environment in Iraq and Kuwait (1991).

²⁴ Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD), adopted 10 December 1976, entered into force 5 October 1978

²⁵ David Grzybowski, “Ecocide as an International Crime: The Case of Ukraine” (2023) Journal of International Criminal Justice.

²⁶ Protocol Additional to the Geneva Conventions of 12 August 1949 (Protocol I), adopted 8 June 1977, Arts 35(3) and 55.

“widespread,” “long-term,” and “severe”; however, unlike Article 1(1) of ENMOD, which uses the disjunctive “or,” they employ a conjunctive “and,” which means that all three must be met in order to constitute a violation of the Protocol.

Moreover many scholars criticized the ambiguity presents in the Articles that creates the warfare’s to justify the environmental destruction in the warfare. However, these provisions suffer from ambiguity and high thresholds: all three conditions widespread, long-term, and severe must be proven cumulatively, making enforcement difficult.

Furthermore, the Geneva framework lacks direct accountability mechanisms for environmental crimes. While states may be held responsible for violations, individuals cannot be prosecuted solely for environmental destruction unless it overlaps with recognized war crimes (e.g., targeting civilian infrastructure).²⁷

Environmental Modification Convention (ENMOD, 1976) The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD) prohibits manipulation of the environment as a weapon of war for example, causing earthquakes, tsunamis, or deliberate weather modification.²⁸ While innovative for its time, ENMOD’s scope is narrow, addressing only deliberate environmental modification techniques rather than conventional warfare that indirectly destroys ecosystems, such as dam bombings or industrial explosions. Thus, ENMOD has little applicability to the Ukraine conflict.

Customary International Environmental Law Customary principles such as the “no harm rule” (states must prevent transboundary environmental damage) are relevant in wartime as well as peacetime.²⁹ Attacks that release hazardous pollution into air, rivers, and soils such as in Ukraine could be argued to breach this customary obligation, particularly when damage crosses into neighbouring states like Poland, Moldova, or Romania. However, in practice, wartime enforcement of such norms remains politically and legally weak.

International Criminal Law and the Rome Statute the Rome Statute of the International Criminal Court (ICC) allows prosecution of war crimes that cause environmental damage, but

²⁷Karen Hulme, *War Torn Environment: Interpreting the Legal Threshold* (Brill, 2004).

²⁸Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD), adopted 10 December 1976, entered into force 5 October 1978

²⁹Trail Smelter Arbitration (United States v. Canada), 3 R.I.A.A. 1905 (1941).

only under very limited conditions. Article 8(2)(b)(iv) criminalizes intentional attacks “knowing that they will cause widespread, long-term and severe damage to the natural environment,” provided that such damage is “clearly excessive” relative to anticipated military advantage.³⁰ Again, the cumulative threshold is so restrictive that no case has ever been successfully prosecuted under this provision.

Importantly, the Rome Statute does not yet recognize ecocide as a distinct international crime, though campaigns to amend the Statute have gained momentum following the Ukraine war.³¹

Regional and Domestic Legal Instruments Ukraine has also invoked regional instruments, such as the Aarhus Convention (1998), which emphasizes access to information, public participation, and justice in environmental matters.³² Domestically, Ukraine’s environmental laws prohibit pollution, deforestation, and damage to natural reserves, but wartime realities have made enforcement nearly impossible. Ukrainian officials have nonetheless begun documenting environmental damage with the aim of seeking reparations under international law.

Gaps and the Case for Ecocide The current legal framework reveals systemic gaps:

High thresholds in IHL and ICC statutes make prosecutions rare. ENMOD is outdated and inapplicable to modern industrial warfare. Customary law obligations lack enforceability in war contexts.

As a result, the Russia–Ukraine war has amplified global calls to codify ecocide as the “fifth international crime” alongside genocide, crimes against humanity, war crimes, and aggression. Recognizing ecocide would lower thresholds, provide clearer accountability, and emphasize the protection of the environment as a legal subject in its own right.³³

³⁰Rome Statute of the International Criminal Court (1998), Art. 8(2)(b)(iv).

³¹Stop Ecocide Foundation, Independent Expert Panel: Definition of Ecocide (2021).

³²Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention), adopted 25 June 1998

³³David Grzybowski, “Ecocide as an International Crime: The Case of Ukraine” (2023) *Journal of International Criminal Justice*.

Case Studies: Ecocide and Environmental Law in Conflict

1.Kakhovka Dam Breach, Ukraine (June 2023) ³⁴

The Kakhovka Dam, built on the Dnipro River in southern Ukraine, was a major hydro-technical structure. It regulated water supply for drinking, agriculture, industry, and the Zaporizhzhia Nuclear Power Plant (cooling). On 6 June 2023, the dam was destroyed during the Russia–Ukraine war, unleashing catastrophic flooding and ecological devastation. The incident has been widely described as one of the largest industrial-environmental disasters in Europe in decades. I indicate how Russia’s destruction of the Kakhovka Dam constitutes an act of ecocide. Deliberate destruction of the dam caused massive flooding across southern Ukraine. Loss of freshwater supply for millions of people. Submergence and erosion of agricultural lands. Destruction of wetlands and aquatic ecosystem

International Humanitarian Law (IHL): Article 56 of Additional Protocol I prohibits attacks on dams if destruction may release dangerous forces causing severe civilian losses.

ENMOD Convention (1976): Limited relevance, since the breach was not an environmental modification technique but direct destruction. Neither IHL nor ENMOD adequately criminalizes deliberate ecocide.

Call for Ecocide Law: The dam breach exemplifies the type of widespread, long-term, and severe environmental harm that advocates argue should be prosecutable as ecocide before the ICC.

Legal Issues:

Violation of IHL provisions protecting natural resources. Article 56, Additional Protocol I (1977): prohibits attacks on dams if their destruction may cause severe civilian losses due to “dangerous forces. targeting civilian infrastructure with disproportionate impact on civilians violates IHL. Environmental harm and civilian losses must not outweigh military advantage.

³⁴United Nations Environment Programme (UNEP), Rapid Environmental Assessment of Kakhovka Dam Breach, Ukraine (25 October 2023).

Potential Classification as a War Crime. Under the Rome Statute of the ICC, Article 8(2)(b)(iv): it is a war crime to intentionally launch attacks causing “widespread, long-term, and severe damage” to the environment, if clearly excessive to anticipated military advantage.

Absence of Ecocide as an International Crime. Current frameworks criminalize harm indirectly (via war crimes or crimes against humanity), but ecocide per se is not recognized.

The dam breach illustrates the need for a new international crime of ecocide to cover deliberate, reckless, or negligent destruction of ecosystems.

2.Zaporizhzhia Nuclear Power Plant, Ukraine (2022–2023) ³⁵

Military operations near Europe’s largest nuclear plant, including shelling and occupation.

Shelling of plant site: Explosions near storage facilities, cooling systems, and reactors.Disruption of power supply: The plant has repeatedly lost external power, forcing reliance on fragile backup diesel generators. Ukrainian staff worked under duress, raising concerns about safety culture and operational errors. ZNPP effectively became a shield and bargaining chip in the conflict.High risk of radioactive contamination.Potential long-term cross-border effects on air, water, and soil. Nuclear accident scenario: Damage to reactors or spent fuel pools could release massive amounts of radioactive material. Radiation could spread across Ukraine, Russia, Belarus, Eastern Europe, and even globally (via air and rivers). The cooling system relied heavily on the Kakhovka Reservoir—drained after the June 2023 dam destructionincreasing meltdown risks. Soil, water, and food chains could be poisoned for decades, with intergenerational health consequences.

International Humanitarian Law (IHL). Article 56, Additional Protocol I (1977): prohibits attacks on nuclear power plants if their destruction may release dangerous forces affecting civilians.Using ZNPP as a military shield breaches IHL by endangering civilians and critical civilian infrastructure. International Atomic Energy Agency (IAEA). Mandate is technical, not judicial; despite monitoring and inspections, it cannot enforce compliance. The IAEA’s repeated calls for a “nuclear safety and security protection zone” around ZNPP were

³⁵International Atomic Energy Agency (IAEA), Safety and Security Updates on Zaporizhzhia Nuclear Power Plant, Ukraine (2022–2023).

ignored. Rome Statute (ICC). Article 8(2)(b)(iv): prohibits war tactics causing widespread, long-term, severe environmental damage. Intentional attacks or reckless endangerment of a nuclear facility could qualify as war crimes, though proving intent remains difficult. No specific mechanism to hold individuals accountable for “nuclear blackmail.” Ecocide is absent as a distinct crime, despite the catastrophic environmental risks.

3. Industrial and Chemical Site Attacks

Bombing of chemical plants, fertilizer depots, and oil refineries in multiple regions. Since the start of the Russia-Ukraine war, industrial facilities such as chemical plants, fertilizer depots, fuel storage sites, and oil refineries have been frequently targeted or damaged. Ukraine’s heavy industrial base located in regions like Donetsk, Luhansk, Dnipro, and Kharkiv make such sites particularly vulnerable. These attacks have triggered large-scale releases of toxic pollutants, creating “invisible battlefields” of air, soil, and water contamination.

Release of hazardous chemicals into air, soil, and water. the air pollutants like release of ammonia, chlorine, sulphur dioxide, and particulate matter, leading to respiratory hazards. From fires and explosions massive smoke clouds containing dioxins, heavy metals, and carcinogens. There is long term contamination of ecosystems and human health risks

Article 55, Additional Protocol I: Requires protection of the environment against “extensive, long-term and severe damage. The principle of distinction: Industrial sites serving primarily civilian purposes (fertilizer, chemicals for agriculture) are protected civilian objects. Stockholm (1972) & Rio (1992) Declarations: States must ensure activities within their control do not cause damage to the environment of other states.

The targeting of industrial and chemical sites in Ukraine has generated catastrophic environmental, health, and socio-economic consequences. These incidents reveal the inadequacy of current legal frameworks to prevent or punish the weaponization of toxic infrastructure. A new paradigm of accountability through ecocide law is needed to close these gaps, ensure justice for victims, and deter the deliberate use of environmental destruction as a tool of war.

4. Historical Precedent: Gulf War Oil Fires (1991)³⁶

Iraqi forces deliberately set fire to Kuwaiti oil wells during the Gulf War. During the retreat from Kuwait in February 1991, Iraqi forces deliberately set fire to over 600 Kuwaiti oil wells and released millions of barrels of crude oil into the Persian Gulf. Oil well fires burned from February to November 1991 (8+ months). At peak, fires consumed 6 million barrels of oil per day. Approximately 8–11 million barrels of oil discharged into the Persian Gulf, creating one of the largest marine oil spills in history. Considered one of the worst man-made environmental disasters of the 20th century.

Dense black smoke fumes (reaching 3 km high) spread across the Middle East, South Asia, and even parts of the Mediterranean. Air contained Sulphur dioxide, nitrogen oxides, carbon monoxide, and carcinogens. Severe acid rain recorded in Iran, Pakistan, and India. Massive air pollution, soil contamination, and ecosystem destruction. Estimated 1–2 billion barrels of oil burned, creating “oil lakes” and long-term contamination. This leads to severe soil and land contamination. damaged marine ecosystem. this leads to health impact on humans especially long-term health issues like respiratory illnesses. Cancers, immune system damage and birth defects.

UNEP post-conflict reports highlighted the difficulty of holding perpetrators accountable. Shows the precedent for considering large-scale environmental destruction as part of war crimes or ecocide discussions.

The Gulf War oil fires highlight how deliberate environmental destruction can create consequences as devastating as traditional warfare. They exposed weaknesses in international law: while Iraq was held financially responsible, the absence of personal accountability mechanisms left justice incomplete. This case underscores the necessity of codifying ecocide as a distinct international crime, ensuring that leaders who weaponize the environment face prosecution, and that the environment itself is recognized as a victim of war.

5. Vietnam War: Agent Orange (1960s–1970s)

A herbicide and defoliant chemical containing dioxin (TCDD), one of the most toxic substances known. US military sprayed ~ 80 million litres of herbicides (of which Agent Orange was the

³⁶UNEP, Environmental Consequences of the Gulf War: Desk Study on the Environment in Iraq and Kuwait (1991).

most used) over ~20% of South Vietnam. Defoliate forests used as cover by the Viet Cong and destroy crops used to feed enemy forces. Nicknamed “ecocide” by scientists and activists due to its unprecedented scale and deliberate destruction of the environment.

Destroyed ~ 3 million hectares of forest and mangroves. Caused long-term soil degradation; many areas unable to regenerate naturally even decades later. Loss of wildlife habitats led to sharp declines in bird, mammal, and fish populations. Mangrove destruction increased coastal erosion and reduced marine productivity. Dioxin residues persisted in soil and sediments for decades. Contaminated water bodies poisoned fish and other aquatic life, entering the food chain.

International Humanitarian Law (IHL). Agent Orange blurred civilian–combatant lines by destroying crops vital for civilians. The long-term and widespread environmental and human damage far outweighed any temporary military advantage. Additional Protocol I (1977) later prohibited such methods, but during the war, the legal framework was underdeveloped.

The use of Agent Orange in Vietnam represents one of the clearest historical examples of ecocide—a deliberate act of environmental destruction with severe and long-lasting consequences for both ecosystems and human populations. It revealed profound gaps in international law, as no framework then existed to criminalize such actions or provide adequate remedies for victims. This case continues to fuel the global movement to recognize ecocide as an international crime, ensuring accountability for environmental warfare and justice for affected communities.

6.Iraq/Kuwait Environmental Damage (1990–1991) ³⁷

Intentional destruction of oil infrastructure and environmental sabotage during Gulf War. Iraq under Saddam Hussein invaded and occupied Kuwait. Retreat (Feb 1991): As coalition forces advanced, Iraqi forces carried out a “scorched earth” policy. Over 600 Kuwaiti oil wells set ablaze, burning for ~8 months. Deliberate release of ~8–11 million barrels of crude oil into the Persian Gulf, creating the largest oil spill in history. Damage to refineries, pipelines, desalination plants, and coastal ecosystems.

³⁷UNEP, Post-Conflict Environmental Assessment of Iraq and Kuwait (1991).

Fires released toxic plumes of Sulphur dioxide, carbon monoxide, nitrogen oxides, and particulate matter. Regional air quality collapse, respiratory illnesses, and acid rain recorded as far away as India. Temporary local climate cooling (“black rain” and reduced sunlight).

Additional Protocol I (1977, Articles 35 & 55): Prohibits methods of warfare causing “widespread, long-term and severe” environmental damage. Iraq’s deliberate actions (oil fires, spills) clearly violated this principle. UN Security Council Resolution 687 (1991): Declared Iraq liable for environmental and economic damage. UN Compensation Commission (UNCC): Awarded ~\$52 billion in reparations, including ~\$5.2 billion specifically for environmental claims (to Kuwait, Saudi Arabia, Iran). UN Security Council Resolution 687 (1991): Declared Iraq liable for environmental and economic damage. UN Compensation Commission (UNCC): Awarded ~\$52 billion in reparations, including ~\$5.2 billion specifically for environmental claims (to Kuwait, Saudi Arabia, Iran).

The Iraq/Kuwait environmental damage during the Gulf War represents one of the most severe cases of deliberate ecological destruction in modern history. While reparations provided some recognition of harm, the absence of individual criminal liability exposed a profound gap in international law. This case underscores the urgent necessity of strengthening legal frameworks especially through recognition of ecocide to deter environmental warfare and ensure accountability for large-scale ecological crimes.

Conclusion

The Russia Ukraine war has demonstrated with striking clarity that environmental devastation is not merely a collateral consequence of armed conflict but a deliberate and large-scale outcome with long-term consequences for ecosystems, human health, and global climate stability. The destruction of the Kakhovka Dam, extensive forest fires, toxic contamination of soil and waterways, and massive greenhouse gas emissions illustrate how warfare in Ukraine has created transboundary environmental crises that will persist for generations.

Existing international legal instruments the 1977 Additional Protocol I to the Geneva Conventions and the 1976 ENMOD Convention have proven inadequate in addressing such destruction due to their narrow scope, high evidentiary thresholds, and weak enforcement. They

fail to capture the full scale of environmental harm in contemporary warfare and provide little accountability for perpetrators.

This legal vacuum underscores the urgent need to recognize ecocide as a discrete international crime within the jurisdiction of the International Criminal Court. By codifying ecocide, the international community would establish individual criminal liability for severe environmental destruction, strengthen deterrence, and affirm the intrinsic value of the environment as a global common requiring protection.

In the Ukrainian context, recognizing ecocide would not only contribute to justice and accountability for environmental destruction but also set a precedent for post-war reconstruction, ensuring ecological restoration and sustainability are central to peacebuilding. Ultimately, bridging the gaps in international law by criminalizing ecocide is vital to protect both people and the planet from the environmental fallout of modern warfare.

Suggestions

The war has produced simultaneous water, soil, air and biodiversity impacts: industrial-site strikes, contamination from munitions, widespread wildfires, and the Kakhovka dam breach an event with partly irreversible ecosystem change and heavy metal mobilization downstream to the Black Sea. this leads to major ecosystem damage.

Ukraine criminalizes ecocide (Criminal Code art. 441), but international law lacks a universally binding “ecocide” offense; practitioners must repurpose IHL and ICC war crimes provisions.

A model definition exists (Stop Ecocide panel, 2021), and ICC level recognition is advancing politically (e.g., Pacific states’ ICC push), but it’s not yet law.

IHL standards (“widespread, long-term and severe”) and causation across moving front lines create high proof burdens especially for diffuse pollution (sediments, airborne toxins). The Kakhovka breach underscores the difficulty of attributing specific ecological endpoints to a wartime act amid confounders. Protect people and ecosystem. And regional public health safeguards. Close Legal gaps and sharpen deterrence.