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WAR AND THE ENVIRONMENT: TOWARD THE PREVENTION OF ENVIRONMENTAL WAR CRIMES

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Abstract

War is not only a humanitarian catastrophe but also a major driver of environmental destruction, biodiversity loss, and climate change. Drawing on historical and contemporary conflicts, including Vietnam, the Gulf War, Ukraine, and Gaza, this paper examines the far-reaching environmental consequences of warfare and its contribution to the global climate crisis. It argues for recognizing severe environmental destruction during armed conflict as an international crime and strengthening accountability through international law. It also highlights the need for transparency in military emissions and the role of renewable energy in reducing geopolitical tensions. Ultimately, lasting peace is essential to planetary environmental security.

Introduction: Why ‘war and the environment’ matters today

When people hear the word *war,* they tend to think of humanitarian tragedies such as military casualties, refugees, famine, and devastated cities. Contemporary warfare, however, cannot be understood solely through these human dimensions. War destroys the natural environment itself, accelerates climate change, erodes biodiversity, and threatens the sustainability of human civilization.

Inger Andersen, Executive Director of the United Nations Environment Programme (UNEP), has characterized the most pressing challenges facing humanity as the “Triple Planetary Crisis” of climate change, biodiversity loss, and pollution. Armed conflict exacerbates all three crises simultaneously (UNEP, 2021).

...environmental damage can persist far longer than the political consequences of war itself

Military conflicts continue to occur throughout the world, including Russia’s invasion of Ukraine, Israel’s military operations in Gaza, the armed confrontation involving Israel, the United States, and Iran, and ongoing civil wars across parts of Africa. These conflicts are not only humanitarian emergencies; they are also environmental and climate crises.

The Chinese poet Du Fu of the Tang Dynasty wrote, “The nation is shattered, yet mountains and rivers remain.” Modern warfare, however, presents a different reality. When nations are destroyed, mountains and rivers may also be destroyed. Indeed, environmental damage can persist far longer than the political consequences of war itself. We therefore live in an era in which war must be reconsidered not only as a political and military issue but also as an environmental one.

I. Why war constitutes the greatest form of environmental destruction

When people think of environmental problems, they often imagine pollution from factories and automobiles, deforestation, or plastic waste. Yet few human activities can rival war in terms of the scale, speed, and severity of environmental destruction it can inflict.

Modern warfare employs vast quantities of bombs, artillery shells, and missiles. These weapons often contain heavy metals such as lead, cadmium, and mercury, as well as other hazardous substances. When military installations, industrial facilities, oil depots, or chemical plants are attacked, toxic materials can be released into soils, rivers, and groundwater systems (UNEP, 2009).

When military activities ignite forest fires, ecosystems are devastated. Contamination of rivers and groundwater severely affects agricultural production. Oil spills in ports and coastal regions can cause long-term damage to marine ecosystems.

Furthermore, modern warfare increasingly targets civilian infrastructure, including power plants, water treatment facilities, sewage systems, and hospitals. During Russia's invasion of Ukraine, even nuclear power plants became objects of military threat and attack (IAEA, 2022–2026).

As a result, war undermines not only human societies but also the natural environment's capacity for recovery. It is often assumed that environmental restoration will proceed alongside postwar reconstruction once hostilities cease. In reality, however, environmental recovery is far more difficult. Soil and groundwater contamination may persist for decades. Polluted lands frequently become unsuitable for agricultural production, while the restoration of biological communities often requires even longer periods.

The environmental consequences of war therefore continue long after peace agreements are signed. They become a 'negative legacy of war', passed on to future generations.

II. Historical evidence of environmental damage caused by war

Environmental destruction caused by war is by no means a recent phenomenon. Even a brief review of major conflicts since the Second World War reveals numerous examples.

THE VIETNAM WAR AND AGENT ORANGE

One of the most symbolic cases is the Vietnam War. Between 1955 and 1975, the United States extensively sprayed herbicides containing highly toxic dioxins, resulting in widespread contamination of soils, rivers, and lakes (Stellman et al., 2003). Severe health impacts, including congenital abnormalities among newborns, continue to be reported today (Hatfield Consultants, 2007–2023).

The US military sprayed massive quantities of a herbicide known as Agent Orange to eliminate forest cover used by the National Liberation Front and North Vietnamese forces. Agent Orange contained dioxin, one of the most toxic chemical compounds known. The result was extensive destruction of tropical forests, severe soil and water contamination, loss of biodiversity, and widespread health impacts.

Reports indicate that congenital disabilities, developmental disorders, and other health problems continue to affect communities nearly half a century after the war ended. This case exemplifies how the environmental consequences of war can persist across generations.

THE GULF WAR AND OIL WELL FIRES

During the 1991 Gulf War, retreating Iraqi forces set fire to Kuwaiti oil fields and released large quantities of oil into the Persian Gulf, creating one of the largest oil pollution disasters in history. Approximately 700 oil wells burned, releasing enormous volumes of black smoke into the atmosphere for several months (UNEP, 1991) .

The resulting black carbon spread across a vast region, contributing to air pollution and influencing climatic conditions. Oil contamination also damaged desert ecosystems and marine environments. The incident demonstrated to the world that localized military actions can generate environmental impacts that transcend national borders.

THE IRAQ WAR AND DEPLETED URANIUM MUNITIONS

During both the 1991 Gulf War and the 2003 Iraq War, the United States and the United Kingdom are estimated to have used approximately one million depleted uranium rounds (UNEP, 2003). Although these weapons are highly effective against armoured targets, they leave behind fine radioactive particles that can persist in the environment after use.

Subsequent reports documented increases in leukaemia and various forms of cancer in affected areas, and epidemiological investigations continue today. This case demonstrates that while wars may end politically, their environmental consequences often endure for decades.

III. The Ukraine War and the ‘carbon footprint of war’

Ukraine has undertaken one of the world's most ambitious efforts to quantify the greenhouse gas emissions resulting from armed conflict. Following Russia’s invasion in February 2022, the Ukrainian government and a coalition of international researchers began measuring the climate impacts of the war. In March 2022, the Initiative on Greenhouse Gas Accounting of War (IGGAW) was established, bringing together experts on environmental issues from Ukraine and across Europe.

According to IGGAW, the cumulative greenhouse gas emissions attributable to the Russian invasion between 24 February 2022 and 23 February 2026 exceeded 1.1 billion tonnes of CO_2 equivalent (See Figure1, IGGAW, 2026). This amount is roughly comparable to the annual greenhouse gas emissions of France.

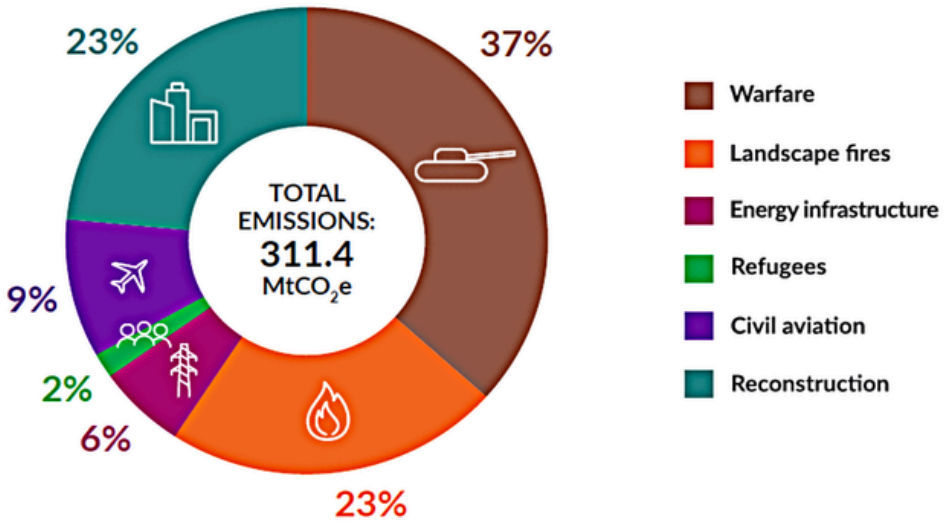


Figure 1: GHG emissions for each impact category
Source: IGGAW (2026)

The emissions originate from several major sources.

First, military operations themselves are significant emitters. Tanks, armoured vehicles, military trucks, aircraft, and naval vessels consume enormous quantities of fuel.

Second, bombardment and shelling have triggered widespread forest fires, generating substantial carbon emissions.

Third, attacks on power plants, oil facilities, and industrial infrastructure have caused fires, explosions, and leakages that release additional greenhouse gases.

Fourth, the war has altered international aviation routes. Flights between Europe and Asia have been forced to take longer detours, increasing fuel consumption and emissions.

Fifth, reconstruction itself generates emissions. Rebuilding destroyed buildings and infrastructure requires vast amounts of steel, cement, and construction materials, each associated with significant greenhouse gas production. Consequently, Ukraine has embraced the concept of 'green reconstruction', aiming to rebuild while minimizing emissions and incorporating sustainability principles.

Ultimately, Ukraine intends to seek 'climate damage compensation' from Russia for emissions resulting from the invasion. At the 30th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP30), held in Brazil in 2025, Ukraine announced plans to pursue accountability for these wartime emissions. Based on the 'environmental damage' category of the Registry of Damage for Ukraine, and using a social cost of carbon of USD 185 per tonne of CO_2 equivalent, total climate-related claims are estimated to exceed USD 57 billion (IGGAW, 2026; Government of Ukraine, 2025–2026).

IV. Ecocide in Gaza

One of the most severe ongoing cases of environmental destruction in the contemporary world is occurring in Gaza.

The Gaza Strip covers approximately 365 square kilometres, roughly sixty percent of the area of metropolitan Tokyo. Yet military operations in this relatively small territory are estimated to have generated approximately 1.9 million tonnes of CO_2-equivalent emissions directly through combat activities alone (Gilbert et al., 2024). When postwar reconstruction is included, emissions may exceed 32.2 million tonnes (Neimark et al., 2024).

Even more alarming than the emissions themselves is the systematic destruction of essential infrastructure. Power plants, water treatment facilities, sewage systems, hospitals, schools, and residential areas have experienced extensive damage.

Debris from destroyed buildings releases asbestos, lead, heavy metals, and fine particulate matter into the environment. Because water and sanitation systems no longer function adequately, residents are often forced to rely on contaminated water sources. Chronic electricity shortages have increased dependence on diesel generators, further contributing to pollution.

As a result, environmental degradation and public health crises are unfolding simultaneously.

The concept increasingly used to describe such large-scale environmental destruction is **ecocide** (Independent Expert Panel for the Legal Definition of Ecocide, 2021). Ecocide refers to extensive and long-term damage to ecosystems.

In recent years, growing numbers of legal scholars and policymakers have argued that ecocide should be recognized as a distinct international crime under the jurisdiction of the International Criminal Court (ICC). Humanity is beginning to acknowledge that large-scale destruction of ecosystems may constitute one of the gravest crimes against our collective future.

V. Environmental war crimes: a new challenge for international law

If environmental destruction during armed conflict is to be effectively deterred, a new legal framework recognizing **environmental war crimes** is required (Higgins, 2010).

There are at least three reasons for this.

First, under existing international law, holding perpetrators accountable for environmental destruction remains extremely difficult (Kelley et al., 2015). Deforestation, contamination of rivers, and ecosystem degradation are often treated merely as incidental damage accompanying military operations.

Second, environmental destruction affects not only the territory in which the conflict occurs but humanity as a whole. The atmosphere, oceans, and ecosystems are interconnected across national boundaries.
Third, explicitly defining severe environmental destruction as an international crime would strengthen deterrence against political leaders and military commanders.

The international community must move toward a shared understanding that environmental destruction is not merely a by-product of warfare but a punishable international offense.

VI. The vicious cycle between climate crisis and war

War and climate change reinforce one another in a dangerous feedback loop.

War increases greenhouse gas emissions, destroys forests and ecosystems, and accelerates environmental degradation. These impacts, in turn, intensify climate change.

At the same time, climate change contributes to water scarcity, food insecurity, declining agricultural productivity, displacement, and social instability. Numerous scholars have identified prolonged drought as one of the factors underlying the Syrian civil war (Kelley et al., 2015). Climate change alone does not cause armed conflict, but it can amplify existing political tensions and societal vulnerabilities.

A dual cycle thereby emerges:

Climate Crisis → Social Instability → Conflict and **Conflict → Environmental Destruction → Climate Crisis**

Contemporary society increasingly finds itself trapped within this mutually reinforcing cycle.

VII. The military sector as an ‘invisible source’ of emissions

Some estimates suggest that military activities account for approximately 5.5 percent of global greenhouse gas emissions (SGR & CEOBS, 2022). This is comparable to the combined emissions of the global aviation and shipping sectors.

Remarkably, however, these emissions remain inadequately measured and reported.

Under the framework of the Paris Agreement, there is no comprehensive requirement for reporting military emissions (Belcher et al., 2020). Governments frequently justify this exemption on national security grounds, arguing that disclosure of aircraft operations, fuel consumption, or naval deployments could compromise military secrecy.

Yet in an era defined by climate crisis, can such a major source of emissions remain statistically invisible?

If nations are serious about achieving emissions reduction targets, it will become increasingly difficult to justify exempting military activities from transparency requirements. The disclosure and monitoring of military emissions should therefore become an important objective of future international climate policy.

VIII. Renewable energy as a foundation for peace

One of the most effective ways to break the destructive cycle linking war and environmental degradation is the expansion of renewable energy.

The International Energy Agency (IEA) projects that by 2031 global renewable energy capacity will increase dramatically, accounting for approximately 45 percent of worldwide electricity generation (IEA, 2026).

Expanding renewable energy can simultaneously advance climate mitigation, energy security, economic stability, and conflict prevention

Renewable energy is not merely a decarbonization technology. Solar and wind power are domestically available resources that reduce dependence on geographically concentrated fossil fuel reserves such as oil and natural gas. Consequently, they have the potential to lessen geopolitical tensions and competition over energy resources.

Expanding renewable energy can simultaneously advance climate mitigation, energy security, economic stability, and conflict prevention.

Conclusion

A sustainable society is not simply one characterized by widespread renewable energy deployment or effective biodiversity conservation. It is a society in which human beings coexist harmoniously with nature and in which peace is maintained.

During the twentieth century, humanity came to recognize that war constitutes a crime against humanity. In the twenty-first century, we must take a further step and recognize that war may also constitute a crime against the Earth's environmental systems upon which human survival depends.

At a time when humanity faces the interconnected crises of climate change, biodiversity loss, and environmental pollution, security strategies based solely on military power are insufficient to safeguard our future. What is required is a new perspective of **planetary environmental security**, grounded in the principles of **human security** (UNDP, 1994).

Peacebuilding provides the foundation for a healthy global environment, while environmental protection represents one of the fundamental conditions for lasting peace. The transition to renewable energy serves as a crucial bridge between these two objectives.

In this sense, peace is not merely the absence of war. It is one of humanity's most fundamental global public goods, indispensable for protecting both human civilization and the Earth itself. A healthy planetary environment is impossible without it.

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