

War's silent victim: Ukraine's environment

Alexandre GERMOUTY



(Drawing by Alexandre GERMOUTY War's silent victim: Ukraine's environment)

At a time when the climate crisis demands the utmost international cooperation to devise scientific, political, social, and economic solutions to confront this border-transcending threat, we find ourselves mired in conflict instead of unity. Rather than uniting at the negotiation table to ensure a dignified life for all on our planet, climate concerns are once again being sidelined by other issues. Our world is currently in turmoil; armed conflicts rage in Ukraine and Gaza, peoples suffer, nations tear themselves apart, political factions trade accusations, and international unity fractures—while nature weeps. The war in Ukraine, ignited in 2014 and intensifying in 2022, brings profound and multifaceted environmental impacts. This conflict threatens not only human lives and geopolitical stability but also inflicts significant environmental degradation. It is a stark reminder that in the face of human folly, our environment remains the silent victim, bearing the scars of our discord.

War, by its very nature, brings about devastation, but beyond the immediate human and economic tolls, it also has far-reaching environmental consequences. The war in Ukraine is no exception. The conflict has wreaked havoc on our planet, manifesting in the contamination of soil and water, the destruction of biodiversity, and the escalation of greenhouse gas emissions. The environmental fallout of this war is as extensive as it is multifaceted.

Estimates from Ukraine's environmental inspections paint a grim picture: Russia's invasion has caused approximately €52.4 billion in environmental damage. This staggering amount includes €27 billion in air pollution, €23.6 billion from waste contamination, €1.5 billion in water damage, and €0.3 billion in soil degradation (European Parliament, 2024, [source](#)). These figures are not just numbers; they represent the degradation of our earth, the poisoning of our waters, and the loss of precious natural habitats.

The United Nations Environment Programme (UNEP) has sounded the alarm, describing the situation in Ukraine as a "compounded, multi-dimensional environmental crisis" that has

exacerbated existing issues and created new ones. UNEP highlights the multiple crises associated with chemicals, munitions, military equipment, and the destruction of critical infrastructure such as water, energy, and waste management systems (UNEP, 2022, [source](#)). This article delves into the myriad environmental impacts of the war in Ukraine, revealing the hidden, yet profound, cost of this ongoing conflict on our planet.

1. From battlefield to barren fields: soil degradation in Ukraine

One of the most significant environmental impacts of the war in Ukraine is soil contamination and land degradation. The relentless use of heavy artillery, tanks, and explosives has led to widespread soil disruption. Areas that have witnessed intense fighting are now poisoned with heavy metals, fuel residues, and unexploded ordnance. This contamination poses severe threats to agriculture, a cornerstone of Ukraine's economy.

1.1 The poison beneath: heavy metals and toxins in Ukraine's soil

Explosive remnants of war (ERWs), including unexploded ordnance and landmines, harbor a variety of toxic substances. When these deadly devices detonate, they unleash heavy metals such as lead, mercury, and cadmium into the soil. These contaminants can persist in the environment for decades, posing long-term risks to human health and ecosystems.

The scale of contamination is staggering. A report published in Occupational Medicine reveals that approximately 30% of Ukraine's territory has been contaminated with landmines and unexploded ordnance (B. Levy, et al., 2024, [source](#)). This contamination not only presents immediate dangers to civilians but also has long-term implications for agriculture and food security. Fields that should be fertile and productive are instead becoming barren and hazardous.

Satellite images, as reported by the BBC, have uncovered hundreds of craters and massive holes in fields surrounding villages like Dovhenke in eastern Ukraine, caused by artillery shells and bombs. The Ukrainian government has urgently requested assistance from the United Nations Environment Programme to assess the environmental damage. Preliminary monitoring suggests that the war could leave a "toxic legacy for generations to come" (BBC, 2023, [source](#)).



(Wars leave not only death and destruction in their wake — but also a lot of poisonous waste
Image: Ximena Borrazas/SOPA Images/ZUMA Press Wire/picture alliance/dpa)

1.2 War's toll on Ukraine farmlands

Ukraine, often referred to as the "breadbasket of Europe," stands as one of the world's largest producers of grain (OSW, 2021, [source](#)). The impact of war on agriculture is particularly alarming given Ukraine's crucial role as a global producer and exporter of cereals and oilseeds. The war has ravaged 22% of Ukraine's agricultural land, leading to a significant decrease in crop production (BBC, 2023, [source](#)). This catastrophe not only threatens food security within Ukraine but also disrupts global food supply chains (CSIS, 2023, [source](#)).

Three major types of damage—physical degradation, widespread chemical pollution from mines and affected industries, and the aftermath of exploded ammunition—have devastated millions of hectares of Ukrainian farmland. The International Committee of the Red Cross (ICRC) highlights that contamination caused by weapons poses a long-term problem that demands significant resources, extensive time, and involves considerable risk to address. Until such efforts can be mobilized, a significant portion of arable land will remain unusable for years (ICRC, 2023, [source](#)).



(Photo: MIGUEL MEDINA/AFP/Getty Images, [source](#))

2. The war's aquatic damage

The war in Ukraine has wreaked havoc on water quality, with bombings, shelling, and the destruction of infrastructure leading to the release of pollutants into rivers and groundwater. A study led by IGB researcher Oleandra Shumova revealed a range of damages, from dam breaches causing catastrophic flooding to pollution from various sources, resulting in a significant decline in water quality for both drinking and agricultural purposes (IGB, 2023, [source](#)).

2.1 Hazardous spills: industrial pollution amidst conflict

In heavily industrialized regions like Donbas, the destruction of chemical plants and factories has unleashed hazardous substances into water bodies. For instance, the shelling of a chemical plant in Donetsk led to the release of ammonia into the air and surrounding water systems. The monitoring group CEOBS has documented numerous instances of pollution in the Dnipro-Buh estuary near Mykolaiv, where Russian attacks targeted key industrial sites, including the Mykolaiv Alumina Plant, causing significant pollution of the estuary waters and the surrounding marine environment (Ukraïner, 2024, [source](#)).

Additionally, submerged military equipment, ships, and ammunition have released chemical compounds, rocket fuel residues, and heavy metals into the water. These incidents have led to severe water pollution, affecting both human health and aquatic ecosystems.



(The Komyshevakha River has been colored orange by highly mineralized mine water, and is no longer drinkable Image: Guillaume Ptak, [source](#))

2.2 Humanitarian emergency: Ukraine's drinking water crisis

The destruction of water infrastructure has precipitated a humanitarian crisis, leaving millions of people without access to clean drinking water. According to UNICEF, as of April 2022, 1.4 million people were without running water across war-affected eastern Ukraine. Additionally, damage to the water network and power cuts left an additional 4.6 million people across Ukraine without adequate access to safe water (UNICEF, 2022, [source](#)).

The war has inflicted an estimated \$7.5 billion in losses on the water supply and sewerage sector in just one year. Contaminated water supplies have led to outbreaks of waterborne diseases, exacerbating the humanitarian situation. The destruction of the Kakhovka Hydroelectric Power Plant on June 6, 2023, has further escalated the crisis, affecting an area of 600,000 hectares and causing an estimated \$4 billion in environmental damages (WAREG, 2023, [source](#)).

The water and sewerage sector now requires about \$700 million for recovery and reconstruction to meet the needs of flooded areas downstream and territories upstream that suffer from water scarcity. These challenges highlight the urgent need for international support to restore and protect Ukraine's water systems amidst this ongoing crisis.



Residents drawing water from a well in Mariupol, Ukraine, (ALEXANDER ERMOCHENKO/REUTERS)

3. The atmospheric impact of Ukraine's conflict

The environmental impacts of the war in Ukraine extend ominously into the atmosphere. The conflict has caused significant air pollution and contributed to greenhouse gas emissions, further exacerbating our global climate crisis. The relentless burning of fuel, the destruction of infrastructure, and the extensive use of explosives release vast quantities of pollutants into the air.

3.1 Particulate pollution: the war's air quality crisis

The World Health Organization (WHO) has reported elevated levels of particulate matter (PM) and other pollutants in the air within conflict zones. A study by the Initiative on GHG Accounting of War found that fires, which frequently rage along the front lines due to ongoing fighting, account for 15% of the war-related emissions (Japan Times, 2022, [source](#)). The burning of buildings, vehicles, and forests during military operations releases toxic substances, including dioxins and polycyclic aromatic hydrocarbons (PAHs). These pollutants pose serious health risks, particularly to vulnerable populations such as children and the elderly.



(Oil repository burning in Zhytomyr, Ukraine. Photo: UNIAN/Oleh Tereschenko, [source](#))

3.2 War-induced emissions and contribution to global climate change

The war in Ukraine has significantly contributed to global greenhouse gas emissions. According to Viktoria Kireyeva, Ukraine's deputy minister of environmental protection and natural resources, experts estimate that the total amount of emissions after 18 months of war is approximately 150 million tons of CO₂—more than the annual emissions of a highly developed country like Belgium. The Initiative on GHG Accounting of War's report reveals that warfare itself accounts for 25% of these emissions, primarily due to the fossil fuel consumption by the Russian and Ukrainian armies. The destruction of energy infrastructure, including coal mines and power plants, has further escalated emissions. Furthermore, the largest share of estimated emissions—54.7 million tons, or around a third of the total—is projected to come from the future reconstruction of towns and cities left in ruins by the war. This underscores the long-term environmental consequences of the conflict, as the construction sector is responsible for at least 37% of global carbon dioxide emissions (Japan Times, 2022, [source](#)).

4. Biodiversity loss in Ukraine

The war has taken a devastating toll on Ukraine's biodiversity. The country, known for its rich and diverse ecosystems, including forests, wetlands, and steppes, now faces unprecedented threats.

4.1 Razed ecosystems: habitat destruction

Military operations have led to the widespread destruction of natural habitats. The relentless shelling and bombing of forests and protected areas have resulted in significant habitat loss. According to the Ukrainian Nature Conservation Group, at least 44% of Ukraine's protected areas have suffered damage from military actions, with 8% experiencing severe impacts (IFAW, 2023, [source](#)). Key biodiversity hotspots, such as the Carpathian Mountains and the Black Sea coast, have been severely affected, tearing apart the delicate balance of these ecosystems. The Ministry of Environmental Protection and Natural Resources of Ukraine reports that as of November 2022, approximately 3 million hectares of forest have been impacted by the war, with nearly 450,000 hectares in the combat zone and about 200,000 hectares temporarily occupied (WWF, 2023, [source](#)).



(Goats eat grass next to unexploded shell of multiple rocket launch system, in the village of Teterivka, in Kyiv region, Ukraine, April 14, 2022. Vladyslav Musiienko/Reuters)

4.2 Wildlife in the crossfire

The war has wreaked havoc on Ukraine's wildlife. The noise and destruction caused by military activities have forced many species to flee their habitats. A study by the Initiative on GHG Accounting of War found that fires, particularly frequent along the front lines due to fighting, account for 15% of the war-related emissions, further devastating wildlife habitats (LeMonde, 2022, [source](#)). The Ukrainian Nature Conservation Group reports that the war has affected at least 20% of Ukraine's important bird areas and disrupted migration routes. For instance, the population of Dalmatian pelicans, a vulnerable species, has decreased by 30% since the start of the war (IFAW, 2023, [source](#)). The conflict has also had a devastating impact on marine life.

Since February 2022, thousands of dolphins have washed up on Black Sea beaches, likely due to disturbances from mines and low-frequency sonar (Ukraïner, 2024, [source](#)).



(A dead cow at the farm of 58-year-old Oleksandr Novikov, who says he lost 80 cows and 30 pigs during two months of Russian artillery shelling and occupation, in Vilkhivka, Ukraine, on May 14. Carol Guzy for NPR, [source](#))

5. The looming nuclear threat in Ukraine

One of the most alarming environmental risks of the war in Ukraine is the potential for radiological contamination. Ukraine is home to several nuclear power plants, including the infamous Chernobyl site. Military activities near these sites pose a significant risk of radiological accidents, raising new and urgent questions about radiological protection and the need to bolster operational and regulatory resilience during armed conflicts (NEA, 2023, [source](#)).

5.1 Threats to nuclear facilities

The International Atomic Energy Agency (IAEA) has expressed grave concern over the safety of Ukraine's nuclear facilities. The ongoing conflict drastically increases the risk of accidental damage to nuclear reactors or the deliberate targeting of nuclear sites. Such incidents could lead to the release of radioactive materials, with catastrophic consequences for human health and the environment. On March 4, 2022, the Zaporizhzhia plant became the first operating civil nuclear power plant to come under armed attack. Fighting resulted in a projectile hitting a training building within the site of the six-unit plant. Although the reactors were not affected

and no radioactive material was released, this incident underscored the severe risks posed by military activities near nuclear facilities (World Nuclear Association, 2024, [source](#)).

The NEA Committee on Radiological Protection and Public Health (CRPPH) has reviewed these complex issues since the start of the war in Ukraine. According to their findings, all types of nuclear facilities and related infrastructures have suffered various negative impacts, including occupations, bombings, theft of radioactive sources, and disruptive events affecting day-to-day operations, transport, and waste management (NEA, 2023, [source](#)).



(Russia has occupied the Zaporizhzhia nuclear plant since early 2022 (file photo from June 2023), Reuters, [Source](#))

5.2 Legacy of Chernobyl

The Chernobyl Exclusion Zone, still highly contaminated from the 1986 disaster, has seen renewed attention due to military activities. Reports from the IAEA indicate that military operations in the area could disturb radioactive dust, leading to further contamination. The area remains a sensitive and hazardous zone, and any disturbance could have long-lasting radiological impacts. On February 24, 2022, Ukraine informed the IAEA that Russian forces had taken control of all facilities of the Chernobyl nuclear power plant. Control of the site was returned to Ukrainian personnel on March 31, 2022. This occupation raised concerns about the potential disturbance of radioactive materials in the exclusion zone (World Nuclear Association, 2024, [source](#)).



File photo. A dosimetrist walks past the radiation sign at the Chernobyl zone, Ukraine, 22 April 2021. Ukraine marked the 35th anniversary of Chernobyl tragedy on 26 April 2021. [EPA-EFE/SERGEY DOLZHENKO]

6. Conflict's double edge: humanitarian and environmental crises

The environmental impacts of the war in Ukraine are deeply intertwined with humanitarian issues. Environmental degradation exacerbates human suffering and complicates recovery efforts, creating a vicious cycle of despair and destruction.

6.1 Health implications of environmental degradation

The contamination of soil, water, and air has dire health implications. Increased exposure to heavy metals and toxic substances can lead to a range of severe health problems, including respiratory illnesses, cancers, and neurological disorders. The World Health Organization (WHO) highlights that vulnerable populations, such as children, the elderly, and those with pre-existing health conditions, are particularly at risk. To address these escalating risks, WHO has been actively supporting Ukraine's health emergency preparedness. As of 2024, WHO has trained more than 2,000 emergency medical service first responders and clinicians on chemical and radiation emergency preparedness and response (WHO, 2024, [source](#)).

6.2 Displaced by degradation: refugees of the war

Environmental degradation also devastates livelihoods. Agriculture, fishing, and other natural resource-dependent activities are disrupted, leading to economic instability and food insecurity. The UN High Commissioner for Refugees (UNHCR) reports that millions of people have been displaced by the conflict, many of whom are now living in environmentally degraded areas with

limited access to resources. This war has sparked a refugee crisis affecting more than 6.4 million Ukrainians (European Parliament, 2024, [source](#)).



(Since Russia's invasion, more than 3 million Ukrainian refugees have entered Poland | Louisa Gouliamaki/AFP via Getty Images, [Source](#))

Conclusion: a call for global unity and responsibility

As we stand at the crossroads of a world fraught with conflict and environmental degradation, the situation in Ukraine serves as a stark reminder of our collective responsibility. The environmental impacts of the war in Ukraine are profound, ranging from soil contamination and water pollution to biodiversity loss and radiological risks. These issues not only threaten the immediate health and livelihoods of the Ukrainian people but also pose long-term challenges to global environmental sustainability.

Ukraine's determination to hold Russia accountable for the environmental damage caused by the conflict is a beacon of hope and justice (V. Zelensky, 2022, [source](#)). The path to ensuring that Russia pays reparations is fraught with challenges, yet it is essential for setting a precedent in international law and environmental accountability (C. Carpenter, 2023, [source](#)). The existing legal frameworks, such as the International Court of Justice and the International Criminal Court, provide avenues for pursuing justice, though they require significant evidence collection and international cooperation (UA Position, 2023, [source](#)).

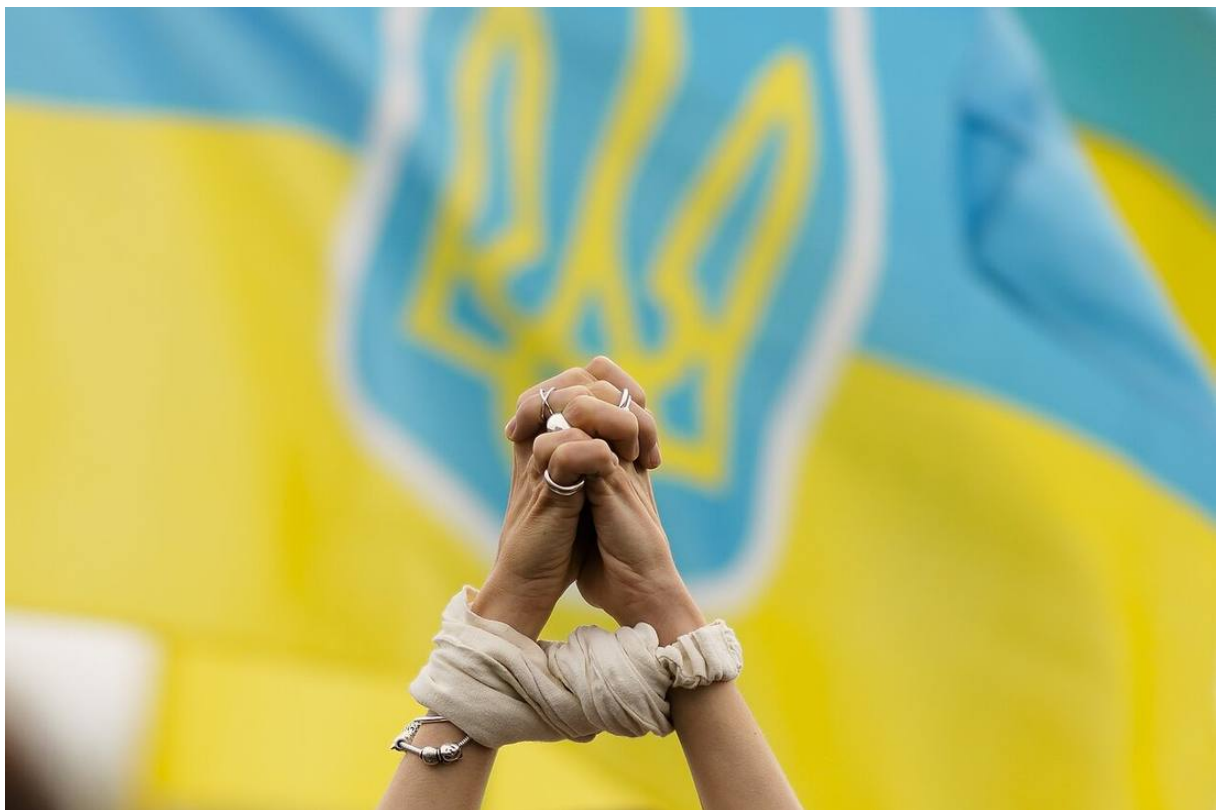
The destruction of the Kakhovka Dam and its catastrophic consequences highlight the urgent need for stringent international laws protecting the environment in times of war. The European Parliament's resolutions and the call for a tribunal on the crime of aggression against Ukraine underscore the recognition of the link between warfare and long-term environmental

damage ([Resolution 2023/C 214/10](#)). These steps are crucial in building a framework where ecocide is recognized and prosecuted as a grave international crime (ICRC, 2020, [source](#)).

However, holding perpetrators accountable is only part of the solution. The global community must come together to support Ukraine in its recovery efforts. This includes enhancing environmental monitoring systems, implementing remediation projects, and promoting sustainable agricultural practices. International cooperation is vital in providing the necessary resources and expertise to restore Ukraine's ecosystems and ensure a sustainable future.

This moment calls for a global awakening. We must recognize that environmental degradation anywhere affects us all, and it is our shared duty to act. The war in Ukraine is not just a geopolitical crisis; it is an environmental emergency that requires a unified, global response. As we move forward, the international community needs to embrace a spirit of fraternity and solidarity, standing collectively to protect our planet and support those who suffer the most.

The call to action is clear: we must rise to the occasion, not only to aid Ukraine but to fortify our collective resilience against future environmental crises. It is time for us to unite, to share our knowledge and resources, and to ensure that the scars of war do not permanently mar our world. Together, we must build a future where peace and environmental stewardship go hand in hand, creating a legacy of hope and sustainability for generations to come.



(Protests against Russia's war in Ukraine (associative image) / AP nuotr., [source](#))