https://doi.org/10.15407/fd2025.03.093
UDC 111.32+165.24

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RUSSO-UKRAINIAN WAR: ENVIRONMENTAL THREATS AND NUCLEAR FEARS

The article is analyzing the environmental impacts of full-scale Russian aggression in Ukraine within the framework of modern approaches to assessing the war-environment interaction. This includes the concept of ecocide as the widespread, long-term, and severe damage to the natural environment.

The particularities of the current Russo-Ukrainian war are its hybrid character and scale, vast targeting of industrial and agricultural infrastructure, as well as weaponization of different kinds of resources and civilian nuclear facilities. Special attention is paid to the analysis of new threats of nuclear disaster resulting from the Russian occupation of the Zaporizhzhia Nuclear Power Plant (ZNPP) and attacks on other civilian objects, which match nuclear terrorism and violate the principle of nuclear taboo (Nina Tannenwald), inducing nuclear fear. Such a fear is considered an expression of solidarity with all life forms threatened by nuclear disasters (Ulrich Beck). Russian nuclear terrorism is a speculation on nuclear fears and an exploitation of this feeling. Hans Jonas' heuristics of fear could be a clue to transform the fear into effective actions to stop Russian aggression, nuclear blackmail, and terrorism.

Keywords: *Russo-Ukrainian war, environmental impacts of war, ecocide, nuclear fear, nuclear terrorism, heuristics of fear.*

Цитування: Gardashuk, T. (2025). Russo-Ukrainian war: environmental threats and nuclear fears. *Філософська думка*, 3, 93—104. https://doi.org/10.15407/fd2025.03.093

Introduction

War is a factor of large-scale, complex, and long-lasting threats, risks, and harm that result in the degradation of both the natural and human environment. Hostilities destroy landscapes, ecosystems, habitats, and species populations and violate the integrity of the Biosphere and functioning of the natural life support systems and natural services (like climate support systems, soil fertility, purification of water and air, pollination, etc.). War is, by its very essence, deadly, violent, and destructive. (Warfare, 1980; Westing 1974). It is difficult to estimate war harms precisely due to the complexity of natural ecosystems, direct and secondary pollution, bio-accumulation, and the entangled causal relationships between different parts of ecosystems. Nuclear threats and risks associated with possible damage to civilian nuclear facilities and the potential use of nuclear weapons are also on this list of warfare challenges.

Unprovoked full-scale Russian aggression in Ukraine raises a broad range of problems concerning the direct and indirect effects of warfare and destruction of the environment and their impacts on the quality of human life, not only in Ukraine but also in Europe and globally. These call for an in-depth analysis of the environmental challenges of the Russian aggression in Ukraine as a basis for diminishing and preventing the negative impacts of warfare.

The interconnection between war and the environment

The natural environment has always suffered from both accidental and deliberate actions during wars and other conflicts. However, environmental issues were long overlooked in investigations into military conflicts and their consequences, as most war crimes and crimes against humanity were perceived against humans. The whole category of arms controls aimed at humanizing warfare, known as The Hague and Geneva Conventions, Nuremberg Principles, U.N. General Assembly resolutions, etc., did not provide a direct approach to controlling the environmental impacts of war. At the same time, A. Westing emphasizes that keeping the focus on man may help to gain the acceptance of some "ecologically advantageous proposals". He refers to the prehistory of attempts to limit weapons and warfare concerning both humans and the environment (Westing, 1974: p. 26).

The attitude towards the war-environment interaction significantly changed during the Vietnam War (1961 — 1971) when the USA used not only conventional weapons but also toxic defoliant (Agent *Orange*), which caused serious health problems for Vietnamese people and US soldiers and their offspring.

To prevent or diminish the negative impacts of war, the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques was adopted in 1976 (open for signing on 18 May 1977). The

Convention prohibits the application of the methods of modification of the environment as a tool of warfare.

Protocol (I) to the Geneva Conventions was adopted in 1977 to prevent the long-term consequences of hostilities. This document states the prohibition "to employ methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment" (Art. 35) and "to protect the natural environment against widespread, long-term and severe damage. This protection includes a prohibition of the use of methods or means of warfare which are intended or may be expected to cause such damage to the natural environment and thereby to prejudice the health or survival of the population" (Art. 55) (Protocol, 1977). In the year 2001, the General Assembly of the United Nations proclaimed 6 November as the International Day for Preventing the Exploitation of the Environment in War and Armed Conflict, since the environmental harms of war result in a long-term degradation of ecosystems and natural resources and go far beyond hostilities.

Another outcome of the attempts to assess the Vietnam War scientifically, legally, and ethically was the coinage of the "ecocide" term. It was suggested by the American biologist and bioethicist Arthur W. Galston (1920—2008) at the Conference on War and National Responsibility in Washington (1970) (Ecocide Law, s.a.). He proposed to use this term to describe the catastrophic consequences of the application of the herbicide Agent *Orange* during the war in Vietnam. Arthur W. Galston argued that the wide-scale application of this defoliant destroyed the important ecological niches of the region. Thus, the war in Vietnam became the starting point for the sharp and extensive discussions at the international level about the environmental consequences of military actions and hostilities, as well as the ethical assessment of the environmental impacts of war.

American lawyer Richard Falk was one of the first to formally outline a definition of "ecocide" and propose the adoption of the International Convention on the Crime of Ecocide. Later, in 1978, the UN Sub-Commission on Prevention of Discrimination and Protection of Minorities proposed to add the crime of ecocide to the Genocide Convention (Convention on the Prevention and Punishment of the Crime of Genocide) and The Amendment in which "the widespread, long-term and severe damage to the natural environment" was mentioned in the list of war crimes (Article 8 (b, IV) in the Rome Statute, 1998) (Rome Statute, s.a.).

In June 2021, the group of independent experts, in collaboration with the "Stop Ecocide Foundation", drafted the amendment to the Rome Statute for the Legal Definition of Ecocide. It proposes considering ecocide and genocide as important articles of the Genocide Convention, as any massive interference into the environment compromises the grounds of the existence of a certain nation, ethnic group, or community, its traditional lifestyle, and safety (Independent Expert, 2021). Many studies are dedicated to the assessment and re-

thinking of negative, destructive environmental impacts of war, ecocidal and ecologically generated genocidal consequences of war from scientific, philosophical, juridical, and ethical positions (Ibid.; Lindgren, 2018; Westing, 1974).

Specific features of the current Russo-Ukrainian war

After World War II, the most impactful military conflicts in Europe resulted from geopolitical changes of the late 1980s—2000s. These conflicts took place the former Yugoslavia, known as the Balkan Wars, triggered by the interethnic confrontations in Yugoslavia (Key Points, 2016) that affected the territory of the whole of Yugoslavia and neighboring countries (Albania, Bulgaria, Romania). The greatest damage caused by the destruction of industrial infrastructure resulted in severe pollution in the vicinity of targeted industrial complexes (Pančevo, Prahovo, and Novi Sad), resulting in the disruption of various ecosystems. Transboundary pollution and refugee camps operations negatively impacted the environment in the neighboring countries (Assessment, 1999; Environmental Impact, 2001).

Another group of conflicts is associated with the collapse of the USSR (Nagorno-Karabakh, Chechnya, Moldova, and Georgia). In 2014, the Crimean Peninsula and parts of the Donetsk and Luhansk regions (oblasts) of Ukraine were added to the list of frozen conflicts backed by Russia. However, the Russian Federation did not limit its expansion to this, as the key to Russia's geopolitical culture is the legacy of the empire and the desire for its renewal (Toal, 2022). This became obvious on 24 February 2022 when Russia launched a full-scale unprovoked aggression against Ukraine.

The current Russo-Ukrainian war remains one of the most significant conflicts in Europe since World War II. It is characterized by "high-intensity warfare, including heavy artillery bombardments, aerial assaults, and ground offensives that have resulted in a devastating loss of life, widespread displacement, and significant geopolitical realignments" (The Copenhagen, 2025: p. 14). This war also demonstrates its hybrid nature when "military action tends to be an element of more diverse political, social, and economic battlegrounds" (Major Military Operations, 2023). The intensive military actions in the territory of Ukraine have broad and multiple transboundary impacts. Ukraine is a country with a relatively dense population, urban agglomerations, and extensive industrial infrastructure that includes mining, industrial, and civic nuclear facilities. Military destruction or damage to industrial objects and civilian infrastructure results in various risks to the population and the environment. This has long-term and uncertain consequences for Ukraine as well as for the European and global ecosystems, water and air quality, climate, etc.

A large territory of farmlands, mostly concentrated in the East and South of Ukraine, is used for the production of many commodities, not only for inter-

nal consumption but also for export. Agriculture plays a significant role in the economic welfare and food safety of the country, GDP share (about 11%), employment, self-employment, and livelihood of many people, as well as for food sustainability and safety in Europe and the whole world. However, as a result of Russian aggression, many farmlands have become the targets of collateral or purposeful destruction due to mine laying and intense shelling.

Analyzing the consequences of the war in Vietnam, Arthur H. Westing argued that the consequences of purposeful modification of ecosystems and other military activities are most noticeable in regions where a significant population is involved in and dependent on agriculture (Westing, 1974). In this instance, the current Russian aggression in Ukraine can be compared to the Vietnam War in terms of its effects on agroecosystems. Moreover, these actions correspond to the criteria of ecocide, as the very environment becomes the target for destruction.

The recent act of ecocide, as purposeful widespread and long-term damage to the environment, committed by the Russians, was undermining the Kakhovka hydroelectric power plant (Kakhovka HPP) dam (6 June 2023), which was occupied by Russians since the first days of the large-scale invasion.

Since it is not possible within the article to analyze in detail all aspects of the war-environment interaction and its environmental and socio-economic costs, I will focus my reflection on one of them. Namely, the risks of the nuclear disaster and its possible consequences for Europe and the world will be considered in the next section.

The Russian aggression in Ukraine and the new threats of nuclear disaster.

The risk of damage to nuclear facilities is one of the biggest threats that arises from the ongoing war in Ukraine. This issue deserves special attention from environmental, security, political, ethical, moral, psychological, and existential positions. Foremost, it is worth remembering that Ukrainians are a nation that suffered the catastrophe of the Chornobyl nuclear plant in 1986 as the worst nuclear accident. Many people in Ukraine are still bearing this trauma and are especially sensitive to the danger of nuclear disaster, which has a "shock value" for Ukrainians. The Chornobyl accident contributed, on the one hand, to the antinuclear sentiment and, on the other hand, to the formation of the concept of "safety culture", which defines "the safety of a facility is the top priority for all operators" (Guarnieri, 2017: p. 2).

Since 24 February 2022, the Kharkiv Institute of Physics and Technology, Chornobyl Nuclear Power Plant (NPP) and the exclusion zone, South Ukraine NPP, and Khmelnytskyi NPP were attacked by Russians. The largest in Europe, Zaporizhzhia Nuclear Power Plant (ZNPP), was captured by the Russian troops after numerous direct attacks in March 2022. This seriously threatens the safety and security of the operation of the ZNPP (Hibbs, 2023). Moreover, the situation at the ZNPP is constantly changing for the worse despite operating all

reactors in a cold shutdown state, especially after the undermining of the dam at the Kakhovka Hydropower Plant (KHPP) (6 June 2023), and taking into account the information about the mining of reactors and cooling ponds. In addition, the civilian nuclear objects in Ukraine remain under constant threat from Russia's attacks, as happened on the night of 13—14 February 2025. The Russian drone hit the roof of the new containment structure that protects the destroyed Unit 4 at the Chornobyl NPP.

The case of the ZNPP and attacks on other civic nuclear objects demonstrate the violence in the basic principles of international humanitarian law relating to the legal use of force in armed conflict (military necessity, distinction, proportionality). International law prohibits actions that may result in widespread, long-term and severe damage to the natural environment and cause transboundary damage to neutral states (Carlson, 2022). These actions at the civilian nuclear facilities can be qualified as terrorism, which is a special type of war carried out for psychological pressure, blackmail, and instilling fear and chaos.

Nuclear terrorism is unequivocally condemned from existential, humanitarian, environmental, moral, and legal positions due to its unpredictable, large-scale, destructive consequences for the environment and many people. The International Convention on the Suppression of Acts of Nuclear Terrorism was adopted and came into force in 2007. Both Ukraine and the Russian Federation are part of it. Moreover, ironically, the draft convention was proposed by the Russian Federation and then considered by the Legal Committee of the UN General Assembly (UNGA) in December 1996. The Convention criminalizes "planning, threatening, or carrying out acts of nuclear terrorism; it also requires States to criminalize these offenses via national legislation and to establish penalties in line with the gravity of such crimes" (International Convention, s.a.). The Convention also defines the obligation of countries and national governments to take measures that would prevent the ingress of radioactive substances and technologies to third parties, that is, non-state actors or terrorist groups (Ibid.). Instead, Russian's behavior in Ukraine concerning civic nuclear facilities demonstrates that the very state ignores and violates its obligations and acts like a third party.

It seems that Russia's actions concerning civilian nuclear facilities in Ukraine continue its general neglect of the nuclear threat and disregard for security and non-assimilation of the post-Chornobyl "safety culture". For instance, Maerli et al. mentioned in their overview of the characteristics of nuclear terrorist weapons that at many Russian nuclear facilities, physical protection and nuclear material accountancy fall below defined Western standards. Maerli et al. also emphasized the need for more intensive international cooperation to improve the security of nuclear material in Russia (Maerli et al., 2003: p. 739).

Theoretically, it is rather difficult to predict or build a precise model of the risks and consequences of third-party interference in the operation of nuclear

facilities. This is why such risks are sometimes defined as virtual ones (Downes, Hobbs, 2017). Another side of the virtual risk is the potentially low probability of nuclear terrorism due to difficulties in accessing relevant nuclear materials and technologies as well as operating with such technologies without special knowledge, skills, and experience. Some scholars and security experts criticized excessive concern about nuclear terrorism as "an overrated nightmare". However, despite the low probability of nuclear terrorism, the possible (or virtual) "level of physical destruction, fatalities, and injuries is so great in and of itself" that the potential for terrorist use of nuclear devices or unauthorized interference in the operation of nuclear facilities is worth serious consideration: "This is why ignoring the possibility of nuclear terrorism seems to be not only simplified but also a dangerous approach" (Maerli et al., 2003: p. 728).

Applying general approaches to defining nuclear safety and the threat of nuclear terrorism to current Ukrainian realities reveals the shortsightedness of oversimplifying or underestimating security vulnerabilities and nuclear risks.

The current situation at the ZNPP, occupation of the Chornobyl NPP and exclusion zone in Spring 2022, and other attacks on civilian nuclear facilities give reason to assume that Russia's actions fall under the definition of nuclear terrorism. The Russian Federation, according to its international obligation, should prevent nuclear terrorism, but in Ukraine, it acts as a state terrorist. The events of the current Russo-Ukrainian War proved the reality of nuclear terrorism: "The lesson from Zaporizhzhia is that the unthinkable — an attack on an operating nuclear power plant — can happen" (Carlson, 2022).

Despite different prognoses about scenarios of possible disaster and their consequences, the core concern is that the purposeful act of nuclear terrorism or accidental breakdown due to external intervention in the operation of the facility cannot be excluded. According to Nick Ashdown, after "having destroyed entire large cities in Ukraine and elsewhere — Grozny, Aleppo, Mariupol — and having rewarded the unit reportedly responsible for the mass atrocities committed in Bucha, it seems dubious that Putin would have any moral qualms with using nuclear weapons if he felt an urgent need" (Ashdown, 2022). This conclusion is all the truer for the weaponization of civilian nuclear facilities.

Thus, the Russian Federation's actions regarding nuclear infrastructure, especially the occupation of and behavior at the ZNPP, can be defined as double nuclear terrorism. In other words, the nuclear state (that is, the state with nuclear weapons) attacks on and interferes with the operation of the civilian nuclear facilities. These actions are a weaponization of the civilian nuclear infrastructure with the purpose of blackmail and pressure not only on Ukraine but also on the international community. Russian nuclear status combined with rhetoric of blackmail deterrence is decisive for the West's response, as it was during the Gulf War and the Yugoslav (Balkans) Wars when the West intervened in conflicts without the risk of nuclear escalation (Inheriting, 2023).

The invasion of a nuclear-weapon state in Ukraine detrimentally impacts the non-proliferation regime. It violates the nuclear taboo as "an international norm on non-use, particularly no-first-use, of nuclear weapons and discussed its origins in the anti-nuclear movement, driven by the revulsion at the indiscriminate effects of nuclear weapons use" (International Norms, 2023). According to Nina Tannenwald, a taboo is a specific type of norm that is a particularly forceful kind of normative prohibition that deals with "the sociology of danger". It is aimed at protecting individuals and society from behavior that is supposed to be dangerous (Tannenwald, 2009: p. 10).

The nuclear taboo principle corresponds to Hans Jonas' principle of heuristics of fear, which reshapes the ethics of responsibility in the age of technology and outlines the boundaries for unlimited technological optimism. Technological expansion, including nuclear weapons as a derivative of modern technologies, makes the world fragile and vulnerable. This is why Jonas claims to give the prevalence of the Bad over the Good Prognosis and states that "moral philosophy must consult our fears prior to our wishes to learn what we really cherish" (Jonas, 1984: p. 27). For Jonas, the fear of the possibility of technological destruction of life on Earth becomes a means of realizing the excessive precariousness and risks of the present era. At the same time, for Jonas fear highlights the potential links between irresponsibility and human technical design and demonstrates human solidarity with the broader phenomenon of life (Tibaldeo, 2015: p. 230).

A taboo can therefore be defined as a norm that uses fear as a tool to prevent potential harms, threats, and risks. Employing the nuclear taboo or "no-use-first" principle, humankind realizes its fear of self-destruction and demolition of life on Earth. In contrast, nuclear terrorism is speculation on and exploitation of human fears, and the Russian Federation abuses these fears. Such horror and blackmail, according to the opinion of the MEP for the Greens and Vice-Chair of the Delegation to the EU-Ukraine Parliamentary Association Committee, Viola von Cramon is very dangerous and opens a "Pandora's box where any nuclear state can extort any concession from the international community with impunity" (Ashdown, 2022).

As it became evident after the accidents at the Chornobyl and Fukushima nuclear plants, the civic nuclear facilities are the objects of increased danger and risk, which cannot be reduced to zero. No one can feel wholly secure. The risk that arises from the civic nuclear facility weaponization is not "an eschatological ecofatalism" (Beck, 1992: p. 37). It is real. In other words, civic nuclear facilities are components of the risk society as it was defined by Ulrich Beck in the book "Risk Society: Towards a New Modernity" (Ibid.). The weaponization of civilian nuclear facilities and their use for blackmail lowers the security threshold and critically changes the "social and political dynamics of the risk society" which is characterized by "the threatening and destruction

of the natural foundations of life" (Ibid., p. 51) and warms up the anxieties of a "nuclear holocaust" (Ibid., p. 72). Like Hans Jonas, Beck also appeals to the feeling of fear as an expression of solidarity with all forms of life threatened by the nuclear disaster. The appeal to fear is also an essential feature of modern risk society, which asks about the ways of coping with it.

In the current Russo-Ukrainian war, risks of new nuclear disasters arise from the weaponization of civilian nuclear infrastructure or the probability of the use of nuclear weapons. A question of how to transform the fear of nuclear disaster into effective actions to stop Russian nuclear blackmailing and terrorism, or how to effectively apply the heuristics of fear, follows from this. This question remains open.

Conclusion

The natural and human environments are victims of unintentional and intentional actions during wars and other conflicts. The current Russian aggression in Ukraine results in large-scale, cumulative, and long-term environmental consequences caused by military actions and collateral effects, as well as intentional targeting of industrial and other civilian facilities and farmlands.

Despite similarities in the environmental impacts of many wars, the current Russo-Ukrainian War has its particular characteristics. They are defined by the scale of the conflict and its geographical placement in the center of Europe. It takes place in a country with a relatively high density of population, urban agglomerations, extended farmlands, and extensive industrial infrastructure, which also includes civilian nuclear facilities. The intensive military actions in the territory of Ukraine thus have broad and multiple internal and transboundary impacts.

The risk of unintended or purposeful damage to civilian nuclear facilities is one of the biggest threats that arise from the current war, with its catastrophic and unpredictable environmental and human consequences for the national, European, and global levels.

According to the internationally accepted principles of nuclear security and post-Chornobyl safety culture, Russia's actions concerning civilian nuclear facilities in Ukraine fall under the definition of nuclear terrorism. It is a part of the hybrid war not only against Ukraine but also against Europe and the rest of the world.

The tactic of nuclear blackmail is rooted in the general low-security culture of the Russian Federation and the failure to learn the lessons of Chornobyl and other nuclear disasters. Such actions can be assessed as a violation of the nuclear taboo principle, threatening the non-proliferation regime, and speculation on and exploitation of human fears about nuclear contamination.

European and global communities, in close cooperation with the Ukrainian authority, scientists, and civic society, urgently need to work out efficient

instruments to convert nuclear fear and concern into efficient actions. This is necessary for the enforcement of international legislation in the sphere of nuclear safety and terrorism prevention, and empowering international institutions and organizations.

In combination with other forms of assistance to Ukraine in its just fight for state sovereignty and national independence, these steps should result in an end to military action and the transfer of occupied civilian nuclear facilities to Ukrainian control.

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Отримано 21.04.2025
Прийнято до друку після рецензування 28.05.2025
Підписано до друку 18.08.2025

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РОСІЙСЬКО-УКРАЇНСЬКА ВІЙНА:
ЕКОЛОГІЧНІ ЗАГРОЗИ ТА ЯДЕРНІ СТРАХИ

Стаття присвячена аналізу екологічних впливів повномасштабної російської агресії в Україні в рамках сучасних підходів до оцінки впливу військових дій на довкілля, включно з концепцією екоциду як широкомасштабної, довгострокової та серйозної шкоди довкіллю.

Визначено особливості російсько-української війни, які полягають в її гібридності, масштабі, обсягах ураження індустріальної та сільськогосподарської інфраструктури, вепонізації різноманітних ресурсів та цивільних ядерних об'єктів. Спеціальну увагу приділено новим екологічним загрозам, пов'язаним з окупацією Запорізької ЧАЕС та атаками на інші цивільні об'єкти, що підпадає під визначення ядерного тероризму та порушує принцип ядерного табу (Таненвальд), викликаючи ядерний страх. Такого роду страх розглядається як солідарність з усіма формами життя, яким загрожує ядерна небезпека (Ульрих Бек). Російський ядерний тероризм є спекуляцією на ядерних страхах людства та експлуатацією цього почуття. Евристика страху Ганса Йонаса може стати ключем для трансформації страху в ефективні дії для того, щоб зупинити російську агресію, ядерний шантаж і тероризм.

Ключові слова: *російсько-українська війна, екологічні впливи війни, екоцид, ядерний страх, ядерний тероризм, евристика страху.*