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RESEARCH ARTICLE

Russian Federation-Ukraine War as an environmental security issue on the Black Sea

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Abstract

The conflicts between the Russian Federation and Ukraine since the beginning of 2014 have caused many environmental, economic, cultural and sociological problems. Ukraine has the vast majority of Europe's biodiversity. The fact that the important water resources feeding the Black Sea are within the borders of Ukraine raises concerns about the environmental impacts of the conflicts in this region. These concerns increase due to the weight of nuclear energy and the heavy chemical industry in Ukraine's economic activities. This study examines the environmental effects of the Russian Federation-Ukrainian war before, during and after the war and how these effects could damage the Black Sea. Also, the study discusses the environmental security problem caused by the war in Ukraine, as well as the potential environmental security and envirocide that it may cause at the regional and global levels in the medium and long term.

Keywords: War, Black Sea, conflict pollution, environmental security, envirocide, ecocide

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Introduction

Yanukovych[1], who won the election in 2010 with his promises of membership in the European Union (EU), announced that a Free Trade Agreement would be signed with the EU and that Ukraine's ultimate goal is membership in the EU, causing tension between Ukraine and the Russian Federation (Euronews 2022a).

[1] Viktor Yanukovych, a Ukrainian politician who served as Prime Minister of Ukraine (2002-2005, 2006-2007) and President of Ukraine (2010-2014).

Most of the Russian Federation's pipelines that deliver natural gas to Europe pass through Ukraine and a significant part of the Russian Federation's naval power is located in Sevastopol (Aqyar), in the Crimean Autonomous Region in the Black Sea. This rapprochement between the EU and Ukraine worried the Russian Federation (McMahon 2014 cited in Baharçiçek and Ağır 2015). The Russian Federation Foreign Minister Sergei Lavrov repeatedly underlined that Free Trade Agreement would be a disastrous mistake for Ukraine, at one point saying *"... My country will not benefit Ukraine if Russian Federation goods have to compete with a flood of products from Europe. ..."* (Şahin 2016).

This tense diplomatic environment caused the signing of the Agreement to be delayed and this triggered social movements in Ukraine (Euronews 2022a). Moving away from the EU paved the way for the demonstrations that lasted for days and gradually increased in violence in the square known as *Maidan Nezalezhnosti (Independence Square)* in Kyiv. Yanukovych, who previously agreed to get a natural gas discount, risking the NATO membership process so that the Russian Federation could use its naval base in Sevastopol (Aqyar), 20-25 years which was supposed to be evacuated in 2017 (Akman 2014). Getting closer to the Russian Federation and attacking *EuroMaidan protesters* by the Ukrainian Special Police Teams called *Berkut*, the tension increased and movements extended until Yanukovych fled the country and pro-EU Petro Poroshenko was elected as the new president (Şahin 2016). Poroshenko's signing of an association agreement with the EU a few months later caused an increase in the tension between Russian Federation and Ukraine.

The Ukraine-Russian Federation war threatens environmental security of planet by causing damage that is difficult or impossible to rehabilitate in the long term-short term, besides the direct and indirect effects of military activities. Environmental security is based on the idea of ensuring the safety of the ecological system of the planet we live on and the human who is a part of it (Tekeli *et al.* 2002). The various descriptions of environmental security that are offered in the literature converge around four broad issues. One is *environmental* (or resource) degradation. Environmental degradation may then result in *economic* losses and/or increased international economic competition. Environmental and economic problems can escalate into *political* conflict within and among nations. If these political conflicts become severe enough, *military* conflict may ensue. For example, biodiversity is still largely an environmental issue, water pollution is mainly an economic question, and climate change is now a political problem. Whether any current environmental security issue poses real threats of military action is debatable. Other ways of classifying environmental security issues include their geographic scope (global, regional, or local), or whether they are "environment-based" (climate change, stratospheric ozone depletion, air and water quality, biodiversity, oil spills, micro-organisms) or "resource-based" (water quantity, minerals, land degradation and fisheries) (OECD 1999 cited Algan 2004). In this study, we claim that the Ukraine-Russian Federation War is

an environmental security problem beyond national security by directly and indirectly damaging both the human and the planet he/she lives on.

Materials and Methods

The fundamental data of this study is the examination of satellite images, observations, news and reports that they have examined with a limited number of personnel of various media, observation organizations, and intergovernmental, international and regional organizations since the beginning of the conflicts. The situation has been interpreted with the texts of international conventions in light of the information received from the region. In the meantime, a limited number of scientific publications, especially in social environmental science, have been examined.

Results and Discussion

Environmental Impacts of the Pre-War Period

In February 2014, irregular groups and the Russian Federation troops in Sevastopol, took control of strategic points in Crimea in a short time and occupied the Parliament of Crimea. The pressure was exerted on member of the parliament to first declare independence of Crimea and then decide on a referendum on reunification with the Russian Federation (Morvka 2021). At the end of this referendum, which was held under pressure, the Russian Federation illegally occupied Crimea. During the same time period, separatist movements in the Donbas Region (Donetsk and Luhansk) were allegedly sparked by the Russian Federation. After the first intense operations in the eastern regions of Ukraine in 2014, there was a long period of low-intensity conflict between 2015 and 2022 (Babin and Plotnikov 2022). These low-intensity conflicts, which gradually increased in intensity, turned into an all-out war on February 24, 2022 by the Russian Federation's attempt to occupy Ukraine, as the problems could not be resolved through diplomatic means after Zelensky, who won the election.

The tension between the Russian Federation and Ukraine, which has been going on since 2014, affects both the region and the world in many areas economically, ecologically and sociologically. There are problems with the water supply in the Donbas Region, which has been in conflict since 2014. On the other hand, in Mauripol, located on the Black Sea coast, it has been claimed that since 2015, there have been cases where sewage and drinking water mix and sewage overflows into the streets (CEOBS 2022a). According to the UN International Children's Emergency Fund (UNICEF), six million people in eastern Ukraine struggle for access to potable water (Pereira *et al.* 2022b).

There are also problems with the water supply in the Crimean Peninsula. After the Russian Federation took control of the peninsula in 2014, the flow of water to the North Crimean Canal, which is the Island's most important clean water

source, stopped. The Canal has led to the north of Crimea, which has problems with water supply, an agricultural region where various agricultural products can be grown on the peninsula since its construction in 1975, and the emergence of new industries that are heavily dependent on water, including the chemical and petrochemical industry. The Ukrainian State Water Resources Authority, an organ of the central government, owns and operates the Canal. In March 2014, the Russian Federation seized the Crimean part of the Canal. According to some Ukrainian officials, the occupiers removed personnel and stopped payments under commercial contracts, causing the State Water Resources Department to stop water distribution. Due to this situation, which has a devastating effect on both agricultural production and the industrial sector, the Russian Federation accuses Ukraine of deliberately making this move that will leave the peninsula without water (Babin and Plotnikov 2022).

According to datas of The Conflict and Environment Observatory (CEOBS) in 2015, many facilities were damaged during the conflict in the Donbas Region. These include the Zasyadko coal mine, a chemical warehouse in Yasynivskyi and coke and chemical plants in Makiyvka, the Lysychyansk oil refinery, an explosives plant in Petrovske and a fuel storage facility at the Sloviansk thermal power plant. In addition, due to power cuts in the region, ventilation systems and water pumps in the coal mines have malfunctioned, causing gas accumulations and mine floods. These accidents can cause air pollution, contamination of ground and surface waters and worker deaths (CEOBS 2015). A fire at the Coke and Chemicals Plant in Donest Avdiivka in 2015 resulted in the emission of coke gas containing high concentrations of benzene, toluene, naphthalene, hydrogen sulfide, mercaptan, hydrocyanic acid and ammonia (OSCE 2017 cited UN 2022a).

According to Maxar Satellite Company data from December 2021, a new brigade-level contingent of military vehicles carrying infantry fighting vehicles, tanks, motorized artillery, and air defence equipment has been deployed in a Russian Federation garrison in Crimea. In addition, according to this satellite company, it has been reported that military activity has increased in three regions in Crimea and five regions in the west of the Russian Federation (Euronews 2021a). Moreover, statements were made by the Russian Federation that military activities have increased (Euronews 2021b) and that 400 km of trenches were dug by Ukraine, which could damage defensive biological diversity and soil structure (Euronews 2021c). It is expected that this increasing military mobility will have harmful effects on biodiversity by doing so that heavy tonnage and large vehicles can make way for themselves to move forward, and the carbon and halon gas emissions will disrupt the fight against ozone layer depletion and also climate change.

Environmental impacts during and post-war

"Conflict pollution describes pollution resulting from direct damage to infrastructure, the use of certain weapons, and the lack of or collapse of environmental governance during and after conflict" (Cottrel *et al.* 2022). The use of explosive weapons and the contents of weapons, and the release of a range of toxic and hazardous chemicals from damaged buildings and infrastructure can cause pollution (Cottrel *et al.* 2022). "During the Ukraine-Russian Federation war, there is ample evidence of intense fighting on the ground, heavy vehicle circulation, explosions at oil, gas and ammunition facilities" (Pereira *et al.* 2022a). The war created a threat of radiation pollution by threatening nuclear power facilities in Ukraine; causing water, air and soil pollution by damaging many mining and chemical industries in the region in various ways. It has been observed by international and intergovernmental organizations that all elements of biodiversity in the war zone are damaged and the infrastructure of many cities is damaged and presented to the public. In addition, according to UNESCO, 161 cultural heritage sites were destroyed due to the bombardment (Pereira *et al.* 2022b).

Ukraine's long-standing environmental problems due to rapid industrialization, intensive agriculture and lack of pollution control have led to severe environmental degradation and pollution in today's war situation (UN 2022a). In this case, it is possible to say that Ukraine's environmental protection and monitoring policies were not very solid even before the war. This situation makes it difficult to evaluate the pollution caused by the war. In addition, the war situation often prevents necessary analyses. Intergovernmental, international and regional organizations try to inform the public with the official data from the region, satellite images and the data they collect with a limited number of observers.

Ukraine's economy is largely based on chemical industry, nuclear energy and agriculture. The list of chemical enterprises of the State Emergency Service of Ukraine in 2021 includes 609 industrial plants where more than 219,000 tons of toxic chemicals are stored or processed, including 3,200 tons of chlorine and 177,800 tons of ammonia. Due to the high-water consumption of the chemical industry, many of the production facilities are located near rivers and water reservoirs. In support of this, important cities for the chemical industry were established near the Dnieper, Donets Rivers and the Black Sea (UN 2022a). This situation may cause pollution that will occur as a result of damage to the production facilities and infrastructures during the war, by chemical mixing with the surface and groundwaters as well as polluting the Black Sea.

According to a United Nations (UN) report on the subject, some incidents have occurred during the war that support this threat. In Chernihiv, near the Dnieper River, one of the largest rivers feeding the Black Sea, a fire broke out at the facility after a tank filled with 12 tons of liquid ammonia failed. The radius of the

affected area reached 3.5 km as a result of the release of 80 tons of nitric acid due to the missile hitting the storage tank in Rubezhn-Luhansk, near the Donets River, which dump into the sea by mixing with the Don River, another large river feeding the Black Sea. At Severodonetsk, near the same river, one of the largest ammonia producers in Ukraine was heavily bombed. There is no data on the damage caused by the fire here. In Mariupol on the Black Sea coast, an area with a radius of 2.5 km was affected by the release of liquid ammonia due to damage to one of its stations (UN 2022a).

Most of the primary energy supply in Ukraine comes from the country's uranium and important coal resources. The rest is oil and gas imported mostly from the Russian Federation but increasingly from the European Union (EU) (World Nuclear Association 2023). The State Environmental Inspectorate of Ukraine has recorded more than 20 cases of attacks on reservoirs with gasoline, diesel, liquefied petroleum gas and diesel (fuel oil) (UN 2022a). Furthermore, the region is monitored by satellite images from a variety of organizations. With satellite images, it was determined that there was a fire in the oil depot in Kalynivka between March 24 and March 26 and the smoke spread up to 35 km. In total, more than 10,000 tons of fuel was claimed to be burned, which is equivalent to about 30,000 metric tons of carbon dioxide (CEOBS 2022b). This is a situation that will cause the Black Sea to be polluted by the atmosphere, as well as hinder the fight against the climate crisis. It is thought that the oil depot fire in Kalynivka affected the sunflower field near the depot and Riznytsia, which is an important water source for the local people. It is reported that the deterioration detected by satellite images and the official statements made by Ukraine are fish deaths in the lake, drop in water level, obvious petroleum smell, petroleum products are found in the water 40 times more than the national limits and 16 times more in the soil (CEOBS 2022b).

In addition to the examples of pollution and the North Crimean Canal, the damage to the infrastructure during the bombing of the cities affected the treatment waters as well as the clean water supply. Damage to the wastewater treatment station of the city of Zaporizhzhia, located in the village of Vasilivka, leads to the leakage of untreated wastewater into the Dnieper River. The treatment plant is no longer operational (UN 2022a).

The wastewater discharge in the Dnipro River is displayed in satellite images dated March 15, 2022. On February 26, 2022, a flood occurred as a result of the damage to the dam between the Irpin River and the Kyiv Reservoir. Observed by the Sentinel-2 satellite from February to August, the flood spread over an area of 46 km^2 on March 21, 2022. It is thought that wastewater, heavy metal and fuel oil from settlements, gas stations and construction sites are mixed with river waters. In addition, a large number of burned and broken military vehicles were found in Irpin valley. There is a concern that hazardous materials mixed with floodwaters

from all these sources will mix with surface waters and rivers, and that these materials will precipitate and contaminate the soil (CEOBS 2022a).

On April 4, 2022, it was reported that a cruise missile damaged an undetermined hazardous waste facility in the Kremenets region of Ternopyl Oblast. On-site tests showed high levels of ammonia in the soil and the Ikva River, and residents of the Kremenets region were advised not to use water from the wells as drinking water (UN 2022a).

In the northern, eastern and southeastern parts of the country, shelling resulted in large amounts of debris in cities and towns. The use of asbestos in building materials and infrastructure in Ukraine is widespread, estimated at 60%. Given this situation, asbestos is likely to be found in the debris (UN 2022a). During demolition and debris removal, asbestos is likely to enter the air, water and soil.

Ukraine has four nuclear power plants with 15 reactors that meet about 50% of the local electricity needs (World Nuclear Association 2023). The International Atomic Energy Agency (IAEA), International Radiation Monitoring Information System (IRMIS) and State Nuclear Regulatory Inspectorate of Ukraine (SNRI) share information about Nuclear Power Plants located in war zones in Ukraine with the public. It is known that the Chornobyl NPP, Zaporizhzhia NPP, Neutron Source Nuclear Research Facility- Kharkiv, State Specialized Interregional Enterprise- Kyiv, and Southern Ukraine NPP have been affected by the conflicts (CEOBS 2022c). These facilities have been the target of explosives from time to time during the war, but it is stated in the aforementioned information that the damage caused did not cause an increase in radiation. In addition, the Chornobyl NPP, which was inoperative in 1986 due to the melting of the nuclear core, and the Zaporizhzhia NPP, Ukraine's largest nuclear power plant, is completely under the control of the Russian Federation. There have been cases where the information flow from both power plants was cut off for months, their employees had to work under pressure or without rotation, and the cooling processes had to be done with diesel or without electricity due to the interruption of external power supplies. The IAEA stated that the radiation level was measured high between 24-25 February 2022 in the measurements made near the Chornobyl NPP, which came under the control of the Russian Federation on February 24, 2022, but the regulatory agency stated that this may be an increase experienced due to the re-airing of the pollution left in the soil by the accident in 1986, due to military activity (IAEA 2023).

In Wood *et al.* (2022), it is argued that the values measured on these dates cannot be explained by military activity alone. However, it is also emphasized that the values returned to normal as of February 28, 2022. On the other hand, as a result of a joint study by Greenpeace Germany with Ukrainian scientists, it was claimed that the IAEA did not correctly explain the increase in radiation levels

(Greenpeace 2022). The statements of a Greenpeace Belgium chief radiation expert Jan Vande Putte, who participated in the research, are as follows:
"We measured gamma radiation levels inside abandoned Russian Federation trenches, which qualify as low-level nuclear waste. The Russian Federation military was operating in a highly radioactive environment, but that's not what the IAEA is communicating. Our research makes it clear that there is nothing normal about radiation levels within the Chernobyl Exclusion Zone, despite what the IAEA would like the world to believe."

The possibility of the explosion of nuclear power plants in the region due to war and the conditions created by the war environment is interpreted as a human and environmental disaster, an environmental genocide that will result in the emergence of radioactive pollution in and around the Black Sea, which will last for hundreds of years. Considering in the first 10 years of the Chornobyl nuclear disaster, cancer rates increased by 230% in Ukraine and 180% in Belarus, compared to the previous situation, and Zaporizhzhia, one of the largest nuclear power plants in Europe. It is claimed that if the Nuclear Power Plant explodes, it will be a disaster for Europe, including Türkiye, whose traces will continue for centuries (Algan 2022a).

Ukraine's biodiversity represents 35% of Europe's biodiversity (Pereira *et al.* 2022a). Ukraine has more than 70,000 species of plants, animals and fungi, including many rare and endemic species (CBD 2023). Ukraine has a significant number of protected areas. It covers about 10% of the country with 371 Emerald Network areas (COE 2022) in Ukraine's 2022 list (WWF-Ukraine 2022 cited by UN 2022a). In addition, the country has 50 Ramsar sites (Ramsar 2022), 4 of which are located on the Crimean Peninsula, and 49 national natural parks, 45 regional landscape parks, 3,078 natural areas (UN 2022a). The situation is considered critical as 44% of Ukraine's most important natural areas are currently affected by the war (Pereira *et al.* 2022a). 20% of all Ukraine's nature reserves have been affected by current war (Nature Reserve Fund of Ukraine 2022). About one million hectares of protected areas are affected and 812 specific areas in protected areas; About 160 regions of the Emerald network with an area of 2.9 million hectares; 14 Ramsar sites with an area of slightly less than 400,000 hectares and 4 biosphere reserves are also considered threatened (Nature Reserve Fund of Ukraine 2022). Areas of special importance for cetaceans in the Black Sea, according to the Agreement on the Conservation of Cetaceans in the Black Sea, the Mediterranean and the adjacent Atlantic region (ACCOBAMS): a. Kerch Strait (Ukraine-Crimea Autonomous Republic) for bottlenose dolphin and harbour porpoise b. From Cape Sarych to Cape Khersones for bottlenose and common dolphin and harbour porpoises (Ukraine- Autonomous Republic of Crimea) c. These are the areas from Anaklia Cape to Sarp (Georgia) for common dolphin and harbour porpoise (ACCOBAMS 2022). However, according to the UN report, approximately 3,000 dolphins are estimated to have died in the Black

Sea. In addition, it is known that on 20 June 2022, three offshore drilling platforms in the Black Sea burned down after missile attacks.

With reference to the UN report, wildfires occurred in various forestlands during the war. It is known that 15,000 hectares of land in Luhansk and 6,000 hectares in Kherson were burned. Fires also broke out in the Svyate and Kinburn Spit Reserve conservation areas (UN 2022a). Destruction of wildlife habitats can lead to increased interaction between wildlife, domestic animals and humans, thereby spreading pathogens (FAO 2022a). According to FAO, the most important disease risks are related to African swine fever (ASF), avian influenza (HPAI), rabies and leptospirosis, and foodborne zoonotic diseases (e.g. brucellosis, salmonella) (FAO 2022a).

It is thought that it will take time for fishing and other economic activities to return to normal in the Black Sea. There are two main reasons for this. First, abandoned sea mines threatens to the use of navigation and industrial fishing gear (UN 2022a). According to Gündüz and Kutluk, Ukraine has laid about 420 sea mines in Odesa and its neighbouring cities for defence against Russian Federation amphibious operations. However, it was not estimated how much these mines would drift due to sea and/or hydrographic conditions (Gündüz and Kutluk 2022). So far, the Turkish Navy detonated all the mines they have found before they reach the Marmara Sea and the Aegean Sea, and also before more disasters such as deaths and ship explosions occur (Gündüz and Kutluk 2022). However, according to a study, it was determined that the bans imposed due to mines released into the sea resulted in both the decrease in the income of small coastal fishermen and the increase in fish prices (Zengin 2022). The second is the damage or destruction of some maritime industrial vessels anchored in the areas (UN 2022a). According to the allegation of the General Staff of the Armed Forces of Ukraine, 15 ships filled with fuel were sunk in the open sea and the port of Berdiansk (UN 2022a). One of the most important causes of damage to fisheries, apart from the damage caused by mines and sea vehicles, can be added to the damage that the Black Sea ecosystem has suffered or will suffer due to pollution during war.

Both Ukraine and the Russian Federation are important exporters of agricultural products. The two countries produce 78% of the world's sunflower oil. In addition, nearly 50 countries import at least 30% of their wheat from Russian Federation or Ukraine. Locally, agriculture has been the backbone of Ukraine's economy, producing 20-22% of the country's GDP and more than 40% of its total export revenues (FAO 2022a). However, agricultural lands have been affected by the war in three ways: (1) physical deterioration due to military mobilization, (2) chemical pollution from mines and affected industries, and (3) landmine pollution (UN 2022a). Experts from the Kyiv School of Economics concluded that all farmland in war zones would require a comprehensive inspection and some areas would require clearing of mines (Neyter *et al.* 2022).

A third of chernozem, which is considered one of the most fertile soil types in the world, is found in Ukraine. About 68% of Ukrainian chernozem is arable. Soil degradation and pollution caused by war can affect the structure of this fertile soil. The effects of this war on chernozem degradation are expressed in academic studies that it may be one of the causes of expected food (supply) security crises (Pereira *et al.* 2022a). According to the FAO, approximately 30% to 40% of sunflower, grain and corn fields will not be harvested or planted. In Russian Federation, effects on harvests may not occur. However, the imposed sanctions will have effects on exports and farmer incomes (Pereira *et al.* 2022b). In addition to the security of food supply due to war pollution, there is also the concern that food grown on contaminated soil and water will increase the heavy metal and petroleum product exposure of the people of Ukraine and the countries importing food from Ukraine.

Besides pollution, there are approximately 16 meat processing plants (Kyiv, Kharkiv, Donetsk, Chernihiv); 6 oilseed crushing plants (Kharkiv, Donetsk, Zaporizhia, Kherson); 12 furnaces (Chernihiv, Sumy, Kharkiv, Zaporizhia, Luhansk, Donetsk); 6 flour millers (Chernihiv, Kharkiv, Kherson, Kyiv), 3 dairy processors (Sumy, Chernihiv, Kyiv) and 6 confectionery manufacturers (Kyiv, Sumy, Kharkiv) damaged, suspended or limited production (FAO 2022a).

According to research by the Kyiv School of Economics, livestock and pets were also harmed in various ways. Neyter *et al.* (2022) reported that livestock dies because farmers cannot access farms or obtain animal feed and provide animals with necessary veterinary support and care. “The estimated number of animals that died due to the aggression of the Russian Federation is 42,000 sheep and goats, 92,000 cattle, 258,000 pigs and more than 5,700,000 poultry” (Neyter *et al.* 2022). The number of animals raised per farmer has decreased, with the pig population most affected (FAO 2022b). Disruption of the pork supply chain increases the risk of African swine fever, a transboundary viral disease due to the emergence of an informal market (FAO 2022a). It has also been reported that 3000 dogs died in the Kyiv region and animal deaths in zoos due to cold, starvation and injury. In addition, the abandonment of domestic animals has led to an increase in the number of unattended and neglected animals (UN 2022a). According to the FAO, these situations will hinder the early detection, prevention and control of animal and zoonotic diseases. Uncontrolled movements of animals and abandonment of dead animals will lead to the spread of epidemic diseases (FAO 2022b). The violence and adverse living conditions of non-human animals in the war zone threaten the environmental security of the region. The difficulties faced by non-human animals as individuals, the danger of the spread of epidemics and the dangers to biodiversity create an unsafe environment.

Ukraine is one of the world’s largest honey producers and a major honey exporter to the EU with its growing domestic market. It is estimated that the loss in the beekeeping sector is approximately 30%. Another negative impact on

beekeeping, with reference to the UN, is the reduction in sunflower planting by large farms in 2022, which has shifted crop production from oilseeds to grains that are not a good source of feed for bees (UN 2022a).

Wars, directly and indirectly, deepen the climate crisis. It is known to raise greenhouse emissions directly into the atmosphere as a result of explosions, fires, leaks, military vehicle circulation, uncontrollable fires, and pollution that accumulates in glaciers and contributes to melting. Indirect effects include damaged infrastructure, use of energy from harmful sources, the number of refugees fleeing their homes for protection, humanitarian aid and deforestation for charcoal production (Pereira *et al.* 2022a). In addition, the cessation of fossil fuel imports from Russian Federation to Europe has led to an energy crisis in many countries. Pereira and colleagues suggest that many countries, especially Europe, are trying to reduce their dependence on the Russian oil and gas, and this situation, which causes the EU to reduce its dependence on fossil fuels and invest in renewable energy sources, has a positive effect on reducing fossil fuel-based greenhouse gases that cause climate change (Pereira *et al.* 2022b). It is seen that European countries are turning to domestic fossil fuels. Germany has started to reuse 14 thermal power plant units that it has not used (Anadolu Ajansı 2022) and England has started to issue new fossil fuel licenses because there is demand from Europe (İklim Haber 2022). France, on the other hand, has announced that it will restart the Saint-Avold coal-fired power plant in case of need (Euronews 2022b). In addition, since the war between the Russian Federation and Ukraine who is the two largest users of Halon 2402 gas (UNEP 2014), one of the Halon gases listed in Annex A of the Montreal Protocol, under the Controlled Substances, increased the emission of this ozone-depleting gas, is concerned. Considering that the military, oil, natural gas and fire extinguishing sectors, which were the most active during the war, are the sectors that use this Halon 2402 the most, this concern is justified.

Another problem with uranium is that depleted uranium is used by both NATO and Russian Federation as anti-armour munitions (The New York Times 2023). Ukraine's receiving weapons aid from NATO member states and Russian Federation's military aggression increases the risk of using depleted uranium. Depleted uranium was used in the Gulf Wars and the Balkans in the 90s. The United Kingdom Parliament had to make a statement about the depleted uranium used in its weapons in 2001 due to the unexplained diseases seen in veterans. Accordingly, the depleted uranium in the armour-piercing ammunition burns when it makes a heavy hole in the armour upon impact, and a cloud of depleted uranium emerges (POST 2001). According to the UN report, depleted uranium can accumulate in soil and water and cause neurological and nephrological problems in mammals. In addition, the contamination of soil and water with uranium can threaten food security (UN 2022a).

As can be seen, the Ukraine-Russian Federation war causes environmental security issues to emerge in the Black Sea Region and the world, as is the case in Ukraine, and deepen the existing problems. Due to the ongoing war, the inability to provide appropriate conditions for the evaluation of the damage to the environment using scientific techniques creates uncertainty and insecurity about the dimensions of the problem and the accuracy of the information coming from the region.

Legal regulations on the protection of the environment in war

There are many multilateral legal regulations to prevent the adverse effects of war on the environment. Some of them have been mentioned in this chapter concerning the Russian Federation-Ukraine war. Although it is possible to date back to the 1868 Declaration of Saint Petersburg, the history of international legal regulations regarding the prevention of the negative effects of war on the environment, the basic legislation on this issue developed mainly after the World War II and the Vietnam War. The St. Petersburg Declaration of 1868 draws attention as a first step that the environment will not be targeted in war, like civilians, with the following regulation "*the only legitimate object which states should endeavour to accomplish during war is to weaken the military forces of the enemy"* (Schwabach 2004).

The most important event in which the damage done to the environment during the war was the subject of jurisdiction as seen in the Nurenberg war crimes court after the World War II. "Nuremberg war crimes trials after World War II included what may have been the first recognition of a purely environmental war crime. "Nine German civilian administrators in occupied Poland were charged with ruthless exploitation of Polish forestry including the wholesale cutting of Polish timber to an extent far in excess of what was necessary to preserve the timber resources of the country" (Schwabach 2004).

It is possible to say that the human and environmental consequences of the use of Agent Orange, a toxic herbicide, by the USA between 1962 and 1971, during the Vietnam War, accelerated international legal regulations on the protection of the environment during wartime. These legal regulations are given below:

According to "1976 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD)" which Ukraine and the Russian Federation are also parties, the states that are parties accept the obligation not to use the hostile environmental modification techniques prohibited by the Convention in accordance with Article 1, and not to encourage

or assist other states and international organizations to use these techniques. According to ENMOD[2];

"States party to the Convention undertake "not to engage in military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party" (Article I, para 1). The States Parties should be further to "assist, encourage or induce" any State, group of States or international organization to engage in such activities (Article I, para. 2). The environmental modification techniques covered are those intended to change "through the deliberate manipulation of natural processes, the dynamics, composition or structure of the Earth" (Article II). to be banned by Article I, the use of prohibited techniques must meet all the following criteria: be for hostile purposes; cause destruction, damage or injury to another State Party; have widespread, long-lasting or severe effects" (ICRC 1976, UN 1976).

The consequences of the Russian Federation-Ukraine War must be evaluated with a post-conflict assessment regarding whether hostile environment modification techniques are used or not. Parties have been accusing each other about Crimean Canal which has gone without water after the occupation of Crimea. This situation must be assessed with objective criteria in the post-war process.

These articles of "Additional Protocol I to the 1949 Geneva Conventions, Article 35(3) and Article 55(1) (1977)" are as follows[3]:

Article 35 - Basic rules
1. In any armed conflict, the right of the Parties to the conflict to choose methods or means of warfare is not unlimited.
2. It is prohibited to employ weapons, projectiles and materials and methods of warfare of a nature to cause superfluous injury or unnecessary suffering.
3. It is prohibited 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.

Article 55 — Protection of the natural environment
1. Care shall be taken in warfare 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 the prejudiced health or survival of the population.

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[2] For the states party to the convention, see. https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVI-1&chapter=26&clang=_en

[3] For the states party to the protocol, see. https://indicators.ohchr.org/

2. Attacks against the natural environment by way of reprisals are prohibited (IHL 2023).

Environmental entities do not only consist of natural or ecological entities. In addition to these, cultural, historical, archaeological and intangible cultural entities are also environmental entities. In times of war or armed conflict, it is necessary to protect the environment by considering this integrity. In this context "1954 The Hague Convention on the Protection of Cultural Property in an Armed Conflict and its annexed Protocol 1999**"** also stipulate the wartime protection of historical and cultural entities. (1954 Convention for the Protection of Cultural Property in the Event of Armed Conflict with Regulations for the Execution of the Convention and 1999 Second Protocol to The Hague Convention of 1954 for the Protection of Cultural Property in the Event of Armed Conflict[4].)

According to the convention (UNESCO 1954);

Article 1 – Definition of cultural property
For the purposes of the e present Convention, the term "cultural property" shall cover, irrespective of origin or ownership: (a) movable or immovable property of great importance to the cultural heritage of every people, such as monuments of architecture, art or history, whether religious or secular; archaeological sites; groups of buildings which, as a whole, are of historical or artistic interest; works of art; manuscripts, books and other objects of artistic, historical or archaeological interest; as well as scientific collections and important collections of books or archives or of reproductions of the property defined above; (b) buildings whose main and effective purpose is to preserve or exhibit the movable cultural property defined in sub-paragraph (a) such as museums, large libraries and depositories of archives, and refuges intended to shelter, in the event of armed conflict, the movable cultural property defined in sub-paragraph (a); (c) centers containing a large amount of cultural property as defined in sub-paragraphs (a) and (b), to be known as "centers containing monuments"

Article 2 – Protection of cultural property
For the purposes of the present Convention, the protection of cultural property shall comprise the safeguarding of and respect for such property.

Article 3 – Safeguarding of cultural property
The High Contracting Parties undertake to prepare in times of peace for the safeguarding of cultural property situated within their own territory against the foreseeable effects of an armed conflict, by taking such measures as they consider appropriate.

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[4] For contracting parties, see. https://indicators.ohchr.org/)https://en.unesco.org/protecting-heritage/convention-and-protocols/states-parties

The 1999 Additional Protocol stipulates the following obligations:

Article 5 – Safeguarding of cultural property
Preparatory measures taken in times of peace for the safeguarding of cultural property against the foreseeable effects of an armed conflict pursuant to Article 3 of the Convention shall include, as appropriate, the preparation of inventories, the planning of emergency measures for protection against fire or structural collapse, the preparation for the removal of movable cultural property or the provision for adequate in situ protection of such property, and the designation of competent authorities responsible for the safeguarding of cultural property.

Article 6 – Respect for cultural property
With the goal of ensuring respect for cultural property in accordance with Article 4 of the Convention: (a) a waiver on the basis of imperative military necessity pursuant to Article 4 paragraph 2 of the Convention may only be invoked to direct an act of hostility against cultural property when and for as long as: The 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict and its two (1954 and 1999) Protocols – Basic Texts(i) that cultural property has, by its function, been made into a military objective; and (ii) there is no feasible alternative available to obtain a similar military advantage to that offered by directing an act of hostility against that objective; (b) a waiver on the basis of imperative military necessity pursuant to Article 4 paragraph 2 of the Convention may only be invoked to use cultural property for purposes which are likely to expose it to destruction or damage when and for as long as no choice is possible between such use of the cultural property and another feasible method for obtaining a similar military advantage; (c) the decision to invoke imperative military necessity shall only be taken by an officer commanding a force the equivalent of a battalion in size or larger, or a force smaller in size where circumstances do not permit otherwise; (d) in case of an attack based on a decision taken in accordance with sub-paragraph (a), an effective advance warning shall be given whenever circumstances permit.

Article 7 of this Protocol regulates the use of the "precautionary" principle in the protection of cultural entities in times of war (UNESCO 1999).

On the other hand, the documents listed below, which do not contain a special provision regarding wartime, are also legal documents that should be taken into account in practice, regardless of war or peace time, as they contain important provisions for the protection of the environmental entities of both Ukraine, the Black Sea environment and other coastal countries:

- Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention) its Related Protocols,
- Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea,

- Vienna Convention for the Protection of the Ozone Layer and Montreal Protocol
- Convention on Long-range Transboundary Air Pollution its Related Protocols,
- Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat,
- Convention on Biological Diversity,
- Framework Convention on Climate Change and Paris Agreement,
- Convention Concerning the Protection of the World Cultural and Natural Heritage,
- Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS).

Of these, the Ozone Convention also covers the armed forces. For this reason, the use of vehicles and actions that will damage the ozone layer in wartime must not be contrary to the provisions of this Convention.

"Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention)" It is of particular importance for the protection of regional commons to keep in mind that its **"**Related Protocols and Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea" and the obligations undertaken by all countries bordering the Black Sea are in force without distinction of war or peace. In this context, it is thought-provoking that the Black Sea Commission Secretariat, hosted by Türkiye in Istanbul, has not made any statement about the impact of the war on the Black Sea environment and coastal areas until today.

Considering the call of the UN Environment Assembly at its 5th session in March 2022, the statement of the OSCE Secretary General on 7 April 2022 and the latest decision of the UN General Assembly on 23 February 2023 to immediately end the war and withdraw Russian Federation from the country. This silence of the Black Sea Commission Secretariat is intriguing. In this decision of the UNSC (UNGA)*; "The Assembly, through the resolution, urged Member States to cooperate in the spirit of solidarity to address the global impacts of the war on food security, energy, finance, the environment and nuclear security and safety. Underscoring that arrangements for a lasting peace should consider these factors, the Assembly also called upon all nations to support the Secretary-General in his efforts to address these impacts."* He also drew attention to the effects of war on the environment (UN 2023).

On the other hand, environmental damage was also counted among the reasons in the call of the Court of Justice dated March 16, 2022, that "*Russian Federation should immediately end its occupation of Ukraine"* (ICJ 2023).

74. The Court considers the throne the right of Ukraine that it has found to be plausible (see paragraph 60 above) is of such a nature that prejudice to it is capable of causing irreparable harm. Indeed, any military operation, in one on the scale carried out by the Russian Federation on the territory of Ukraine, inevitably causes loss of life, mental and bodily harm, and damage to property and to the environment.

PERAC of the UN General Assembly on 11 November 2022 DECISION (27 legal principles for the Protection of the Environment in Relation to Armed Conflict / PERAC) can also be considered an important step in monitoring environmental damage and destruction in all countries affected by this war and in the Black Sea, and in establishing the legal basis for future compensation (UN 2022b).

"The aim of owning environmental entities such as land, water resources, sea and coasts, and mineral deposits has led to wars for centuries. It is often overlooked that the purpose of dominating environmental resources is among the causes of wars because these resources are not considered to be environmental entities. Similarly, the damage caused by wars to the environment is not a subject of much thought. However, due to war, the environment is either damaged in a way that will last for many years, or it is destroyed, in a way, it is subjected to environmental destruction. The ongoing eco-occurrence caused by the atomic bombs dropped on Hiroshima and Nagasaki by the USA and the orange gas used in Vietnam has generally remained only in the interest of those working on environmental policies. Those who study the interaction between war and the environment generally approach this problem in three stages; the effects of war preparations on the environment, environmental destruction during the war, and the problem of destroyed environmental entities after the war" (Algan 2022b). Ukraine is still experiencing the second of these stages. However, the third phase, in which the state of the post-war environment will be discussed, should also be addressed now.

The ongoing war in Ukraine creates environmental security issues by destroying the environment due to both the military vehicles, weapons and bombs used, and the pollutants caused by the bombed facilities. The destruction of built environmental entities, including forests, rivers and groundwater, the Black Sea marine environment, biodiversity, historical and cultural entities is the embodiment of this. Toxic gases emitted into the air from the bombed facilities threaten to cross borders and cause pollution and acid rain in a very wide area. Problems such as the release of these toxic gases and particles into the atmosphere and sea mines can create devastating results not only for humans but also for other non-human species and other creatures. Especially the risk of serious reduction of terrestrial and marine biodiversity is a current problem for Ukraine. However, this is a common regional environmental security threat not only for Ukraine but also for the Black Sea marine environment and all coastal countries. On the other hand, the problem of the use of gases such as chlorofluorocarbon and halon, which

depletes the ozone layer, by military land and aircraft used in this war, may create a global environmental security problem in the medium and long term. While this situation causes the depletion of the ozone layer, it also carries the risk of increasing the climate crisis.

In this context, the Ukraine-Russian Federation war is currently a serious environmental security issue for Ukraine at the national level. On the other hand, this problem carries the risk of continuing to expand in the short, medium and long term at the regional and global levels. It is possible to prevent these threats and risks in accordance with the rules of international law. The Black Sea Commission Secretariat, especially the Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention) its Related Protocols and Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea contracting parties, should take an initiative to monitor and prevent adverse effects of war to the Black Sea marine environment. The Black Sea Commission is the most important platform where Ukraine and the Russian Federation, the parties to this Convention, can come together for environmental security discussions in the Black Sea. It should not be forgotten that the crimes committed against the environment during the war are crimes against humanity as well as the crimes of envirocide (ecocide, urbicide). This should constitute one of the priority agenda items of the international community as a “high policy” issue. It would be appropriate for Türkiye to take the initiative and make the premise of activating the Black Sea Commission Secretariat to monitor and prevent this crime.

Karadeniz'de bir çevresel güvenlik sorunu olarak Rusya Federasyonu-Ukrayna Savaşı

Öz

2014 yılının başlarından itibaren Rusya ve Ukrayna arasında yaşanan çatışmalar, çevresel, ekonomik, kültürel ve sosyolojik açıdan pek çok soruna neden olmuştur. Avrupa'nın biyoçeşitliliğinin çok büyük bölümüne sahip olması; Karadeniz'i besleyen önemli su kaynaklarının Ukrayna'nın sınırları içinde bulunması bu bölgede yaşanan çatışmaların çevresel etkilerinin büyüklüğü konusunda endişe yaratmaktadır. Bu endişeler Ukrayna'nın ekonomik faaliyetleri içinde nükleer enerji ve ağır kimyasal sanayinin sahip olduğu ağırlık nedeniyle artmaktadır. Bu çalışma savaş öncesi, sırası ve sonrası dönemlerde Rusya-Ukrayna savaşının çevresel etkilerini incelemekte ve bu etkilerin Karadeniz'e nasıl zarar verebileceğini incelemektedir. Çalışmada, savaşın Ukrayna’da yarattığı çevresel güvenlik sorunsalı ile bölgesel ve küresel düzeyde orta ve uzun dönemde oluşturabileceği olası çevresel güvenlik ve çevrekırım tehditleri tartışılmaktadır.

Anahtar kelimeler: Savaş, Karadeniz, çatışma kirliliği, çevresel güvenlik, çevrekırım, ekokırım

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