



100 DAYS OF WAR:

CONSEQUENCES FOR THE UKRAINIAN ENVIRONMENT



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Both individual natural components and ecosystems as a whole are significantly affected by hostilities. According to the Ministry of Ecology and Natural Resources of Ukraine, the full-scale Russian war against Ukraine, which began on 24 February 2022, has already caused unprecedented damage to the Ukrainian environment. “We are gathering information on a permanent basis. All the recorded cases are added daily to the Ecozagroza mobile app which anyone can join. To date, this figure has already exceeded UAH 200 billion,” said Ruslan Strilets, Minister of Ecology and Natural Resources. The adverse impacts of Russia’s environmental crimes are not limited to the territory of Ukraine, and in some cases have a cross-border impact, as pollutants with air masses or surface and groundwater can be transported over long distances.

The worst thing is that it is often impossible to monitor the extent of such an impact or to promptly eliminate the consequences due to the fact that active hostilities continue at the place of its occurrence. However, the State Emergency Service of Ukraine makes an effort to localize the consequences of environmental disasters as soon as possible, minimize damage caused to the environment, and the State Environmental Inspectorate of Ukraine makes an effort to quickly assess the extent of pollution and record damage caused to the environment in places which are possible to reach.

The Russian invasion of Ukraine caused the greatest environmental damage to Donetsk, Luhansk, Zaporizhzhia, Kherson, Kyiv, Chernihiv and Sumy regions. In particular, it is the pollution of air, soils and, water bodies, flooding of territories, disturbance of wildlife habitats, destruction and damage of nature reserves, and forest fires (including in the Exclusion Zone of the Chernobyl NPP), etc. As of [24 May 2022](#), the Ministry of Ecology and Natural Resources of Ukraine confirmed **254** cases of ecocide and accounted for **1,500** cases of destruction of the Ukrainian environment.



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This explainer describes the main types of likely effects of hostilities on individual components of the environment and natural complexes as a whole (air, land, and water resources, forests, wildlife, territories of nature reserves, etc.) based on specific examples that have already taken place throughout Ukraine during the first 100 days of the full-scale war with Russia.

A number of events should be singled out, which carried the risk of large-scale environmental catastrophes, and which, thanks to the heroism of the Armed Forces of Ukraine and/or a successful course of events, were avoided. Instead, in some cases, such as the sinking of warships with full ammunition or oil tankers in the waters of the Black and Azov Seas, the risk of large-scale adverse environmental impacts remains. The scale of such impacts is difficult to predict due to the lack of access to the scene by professionals of the State Environmental Inspectorate due to the continuation of the war.

Air

How do hostilities affect the air?

Air pollution during hostilities is caused by:

- volley emissions of hazardous and toxic substances as a result of shell burst;
- combustion of large quantities of petroleum products (explosions at oil depots and fuel and lubricant depots, at airports and aerodromes);
- emissions of hazardous chemicals as a result of the bombing of enterprises/warehouses and damage to containers in which such substances are stored for production purposes;
- damage to the integrity of equipment and treatment systems at production sites (such as TPPs/CHPPs, coke plants, metallurgical production, etc.);
- ignition (burning, smoldering) of waste disposal sites and landfills;
- numerous fires in forests, houses, markets, warehouses with goods (especially harmful to the environment is the burning of synthetic substances, such as plastics, rubber products, etc.).

Examples:

- As of 23 May, since the beginning of the full-scale war, the Russian army has launched [1,474 missile strikes on Ukraine, using 2,275 different missiles, and more than 3,000 air strikes](#). According to the State Emergency Service, from 24 February 2022 to 25 May 2022, [120,789 explosive devices were neutralized](#) in the territory of Ukraine, including 1,978 aviation bombs. The explosions caused high levels of local pollution of the environment with toxic gases, carbon monoxide and dioxide, sulphur dioxide, dust, soot, fly ash, lead and its compounds, copper, nickel, toxic and carcinogenic substances with various physicochemical properties.

Bombing of fuel and energy facilities with adverse impacts on the environment

- Since the beginning of the full-scale armed aggression of the Russian Federation in Ukraine, **at least 30 oil depots and fuel and lubricant warehouses** have been damaged by bombing (see Appendix 1), excluding filling stations. According to the information resource [EcoZagroza](#) of the Ministry of Ecology and Natural Resources, **84,979 tons of petroleum products** burned during the war, resulting in 294,242 tons of emissions in the air.
- Russian troops have fired on Ukrainian refineries several times. So, the Lysychansk Oil Refinery in the Luhansk region came under fire on [22 March](#), [16 April](#), [24 April](#), [8 May](#), and [24 May](#). This oil refinery has not been operating since 2012, so the shelling caused burning of oil sludge residues in the area of 5,000 sq. m. And on 8 May, a sulphur installation and a substance mixing station caught fire, and a nearby group of tanks was threatened with explosion because firefighters were unable to complete the fire extinguishing due to new artillery shelling. [On 2 April](#), enemy missiles damaged the Kremenchuk Oil Refinery in the Poltava region for the first time. [On 24 April](#), 9 Russian missiles struck the plant for the second time and also hit the Kremenchuk CHPP, causing large-scale destruction and fires. [On 12 May](#), Russian troops once again fired a missile at the Kremenchuk Oil Refinery, which caused another fire.
- Explosions of gas pipelines with blasts and large-scale fires occurred in Kharkiv ([27 February](#)), near Svitlodarsk in Bakhmut area of the Donetsk region ([10 March](#)), on the Donetsk-Mariupol gas main ([10 March](#)), on the gas pipeline in the district of the city of Lyman, Donetsk region ([25 April](#)). In the first two weeks of the war, shells hit Ukraine's gas transmission system with

subsequent uncontrolled burning of natural gas which was [recorded](#) in Kharkiv, Mykolaiv, Zaporizhzhia, Kyiv, Donetsk, and Luhansk regions.

- On [12 March](#), as a result of shelling of the comprehensive gas treatment plant of the Shebelinkagasvydobuvannya gas pipeline in the village of Hlazunivka, Izyum area, Kharkiv region, the operator's and gas separator building caught fire. The area of the fire was about 300 sq. m.
- On [19 April](#), as a result of shelling by the Russian Federation, coal lava caught fire in the city of Novodruzhesk in the Luhansk region.

Bombing of chemical industry facilities with adverse impacts on the environment

- Due to the shelling of the Russian Federation, ammonia was released at Sumykhimprom on [21 March](#).
- In the city of Rubizhne, Luhansk region, the Russians hit a tank with nitric acid for the first time on [5 April](#), the second time on [9 April](#), while both times resulted in an explosion with the release of significant amounts of nitric acid into the air.
- On [17 May](#), the Russian military fired on the Knauf plant in Bakhmut, Donetsk region, which produced construction mixtures, resulting in a large-scale fire in the plant's territory, causing hazardous substances released into the atmosphere.
- On [13 March](#), the Avdiivka Coke and Chemical Plant (AKHZ) of the Metinvest Group came under massive shelling by the Russian occupiers, as a result of which the plant's CHPP had to be shut down. The shells hit the first and second coke shops, tar-distilling and coal preparation shops as well as the warehouse. The plant was also shelled on [24 April](#), [3 and 4 May](#).

Bombing of agricultural facilities and mineral fertilizer storage facilities

- On [1 May](#), shelling by the Russian Federation led to fires at an agricultural enterprise in the Synelnykove area of Dnipropetrovsk region, at the mineral fertilizer storage facility in the Mykolaiv region (nitrates and ammonium nitrate phosphate fertilizers), as well as at warehouses with tires and herbicides in Kharkiv. On [11 May](#), due to military shelling in the Kramatorsk area of the Donetsk region, a warehouse with ammonium nitrate was damaged, and on

[16 May](#), the Russian military hit a warehouse with ammonium nitrate in the Kharkiv region. On [20 May](#), Russian troops launched a missile attack on a fertilizer plant in the Odesa region which sparked a fire. The air smelled of ammonia. On the same day, a missile hit one of the infrastructure facilities in the city of Mykolaiv, as a result of which the city also began to smell of ammonia.

Bombing of other facilities

- On [3 March](#), in the village of Chaiky near Kyiv, a shell hit a warehouse with polyurethane foam, and a fire broke out in the warehouse and the adjacent office building. The products of polyurethane foam combustion cause poisoning of people and animals, and contribute to the appearance of acid rain, which poses a significant danger to plants. On [7 March](#), as a result of active hostilities in the city of Bucha in the Kyiv region, warehouses in the territory of the Research Institute of Fiberglass and Fiber caught fire. As a result of a large-scale fire, a thick smokescreen was formed, covering the cities of Bucha and Irpin. And on [8 March](#), the plant of polyethylene products of Planet Plastic LLC was bombed in Irpin. The main shops caught fire, possibly with chemical materials and plastic products.
- On [7 May](#), Russian missiles destroyed a furniture production shop in Odesa, and a large fire broke out due to the presence of paints and varnishes at the production site.
- On [21 May](#), Russians launched a missile attack on a construction base in the Mykolaiv region, resulting in the ignition of building materials which caused a fire with heavy smoke.
- On [17 March](#), Russian troops fired on the largest market in Eastern Europe, the Barabashov market (warehouses) in Kharkiv. As a result, a large-scale fire broke out. The situation was complicated by the burning of large warehouses with industrial goods as well as flammable plastic materials which were widely used in the construction of trade pavilions. After that, the market burned three more times. On [9 May](#), Russians fired on a shopping and entertainment center in Odesa, resulting in a large-scale fire (in the center with an area of 1,000 sq. m and at 3 commodity warehouses with an area of 1,200 sq. m).

Soils, rocks and terrain

What impact may hostilities have on soils, rocks and terrain?

Contamination of the fertile layer of soils and rocks is caused by:

- burst of shells, which leads to the ingress of chemicals into the soil;
- leakage of pollutants and hazardous substances from damaged tanks, petroleum products as well as fuels and lubricants, including from broken military equipment;
- leakage of waste on the terrain due to the destruction of dams of filtration fields, destruction of treatment or hydraulic facilities;
- contamination of soils and groundwater with cadaveric poison due to mass deaths of animals and humans;
- degradation of vegetation cover, increased wind and water erosion due to the movement of heavy machinery, construction of fortifications and hostilities;
- terrain disturbances are caused by the burst of missiles and air bombs which form large craters in the field.



Newly created landfills of broken military equipment, remnants of shells, missiles, etc., as well as construction materials formed after the removal of debris and demolition of buildings destroyed during hostilities will also have an indirect impact on the territories.

Examples:

- On [2 March](#), as a result of enemy shelling, the electricity supply to the large Chornobaiivska poultry farm of the Ukrlandfarming agricultural holding near Kherson was interrupted, which led to the shutdown of the automated poultry feeding system. The farm was left without the opportunity to feed the poultry and maintain sanitation. As a result, 4 million chickens died at the poultry farm. Dead poultry were [buried](#) trying to avoid the danger of bacterial contamination and to protect groundwater and soil from contamination. Burial pits were made deep enough for the soil to act as a filter for methane, which could be released due to the decay of the poultry. However, this situation may have adverse environmental impacts on areas, especially soils and groundwater.
- At the end of March, phosphorous bombs banned by international conventions were used in the Luhansk region during the shelling of Popasna and Rubizhne. On [30 March](#), russian troops dropped phosphorous bombs banned by international conventions on the city of Marinka in the Donetsk region, causing a dozen fires. On [22 March](#), they also used these munitions on the outskirts of Kyiv. On [9 April](#), the cities of Mariupol, Avdiivka, Marinka, Vuhledar, Sloviansk, Pokrovsk, Toretsk, Solodke, Novomykhailivka, Troitske, Stepove, and Katerynivka were bombed with phosphorus munitions. Such attacks threaten large-scale fires and the chemical contamination of soils. On [19 April](#), russian troops used phosphorus bombs during their attack on the city of Huliaipole in the Zaporizhzhia region, and on [26 and 27 April](#), twice struck by phosphorous shells on Avdiivka of Donetsk region, on [11 May](#) – on the Kryvyi Rih area of the Dnipropetrovsk region, and on [18 May](#) – on the school in Avdiivka, Donetsk region. As a result of the strikes, strong fires broke out with the release of caustic white smoke, which does not stop until the phosphorus burns out. Phosphorus combustion products and their solutions form salts in soils. Excess phosphates are very harmful to flora and fauna.
- On [25 February](#), as a result of shelling by russian troops, a fire broke out at the oil depot of the Kharkiv Tractor Plant. As a result of the damage, petroleum products spilled, which probably caused pollution of the air and land resources with hazardous substances. On [11 April](#), as a result of an explosion, the depressurization of the Samara-Western Direction oil product pipeline took place in the territory of the Ovruch community in the village of Rudnia which is in the Zhytomyr region. State inspectors and laboratory professionals recorded a spill of diesel fuel.

- On [4 April](#), in the Kremenets area of the Ternopil region, the fragments of an enemy cruise missile damaged 6 tanks with mineral fertilizers with ammonia, resulting in a leakage of chemicals. In the samples taken, which are checked by the Ternopil Laboratory Center of the Ministry of Health of Ukraine, an excess of ammonia in the soil and the Ikva river was found.
- On [14 March](#), Russian troops fired a projectile that hit the Mykolaiv Alumina Refinery Company Limited decomposition site. One decomposer was damaged and had to be pumped out. Due to this, contamination of land resources with hazardous substances may occur. In addition, on [14 March](#), enemy shelling damaged the pumping station of methanol supply to the site of a gas intake point in the village of Olyshivka, Chernihiv region, which could have caused the pollution of air and land resources with hazardous substances.
- Since the beginning of the full-scale war, [95%](#) of buildings in Mariupol and [90%](#) in Severodonetsk have been destroyed as a result of the bombing. The city of Volnovakha in the Donetsk region is destroyed by [90%](#), the village of Horenka in Kyiv region is destroyed by [77%](#), the city of Irpin was caused damage by [71%](#), Hostomel – by [58%](#), Bucha – by [26%](#). It is reported that there are [no undestroyed buildings](#) in the city of Rubizhne, Luhansk region. Destruction of buildings leads to environmental pollution with construction debris and asbestos; these substances get into the soil in large quantities. The consequences of such pollution for the environment will be felt for years.

Surface and ground water

What impact can water bodies have?

As a result of hostilities there is pollution of surface and ground water, in particular:

- emissions of pollutants due to damage to treatment facilities, equipment of industrial facilities, violation of the integrity of chemical warehouses, etc.;
- leakage of petroleum products as well as fuels and lubricants, including from broken military equipment on river crossings, from ships in the Black and Azov Seas;

- due to mining of water bodies and their coasts, explosions of shells, missiles and mines in the waters of the reservoir;
- as a result of spontaneous burials, unauthorized landfills, waste in cities with damaged municipal infrastructure, broken equipment in areas of active hostilities near water bodies;
- pollution as a result of disruption of pumping stations that provide pumping of water from unused coal mines.

In addition, shallowing, contamination of water bodies and destruction of the entire reservoir ecosystem can also occur due to damage to dams and levees.

Examples:

- As of [5 March](#), due to military actions by the Russian Federation, such important infrastructure facilities as sewage treatment facilities of water management enterprises (water utility enterprises) Severodonetskvodokanal Municipal Enterprise, Lysychanskvodokanal Municipal Enterprise, Rubizhne Production Department of Water Supply and Sewerage Municipal Enterprise, Popasna Vodokanal Municipal Enterprise were damaged. Due to this, untreated wastewater from Severodonetsk, Lysychansk, Rubizhne, and Popasna pollutes water resources. On [14 March](#), as a result of shelling by Russian troops of sewage treatment plants of the Vasylivka operational shop of water supply and sewerage, which is located in the village of Verkhnia Krynytsia, Zaporizhzhia region, the building and equipment of the sewage pumping station No. 1 were destroyed, and the power line was damaged. Return water from several districts of the city of Zaporizhzhia now enters the Dnipro River without any treatment.
- As a result of active hostilities, the infrastructure for water intake, treatment and supply, as well as sewage treatment facilities in the Donetsk region (cities of Mariupol, Druzhkivka, Vuhledar, Toretsk, Volnovakha area, Yasynuvata territorial community) [were damaged](#). Discharge of untreated sewage impairs the microbiological safety of water, leads to the death of fish and aquatic organisms, and will increase the risk of outbreaks of infectious diseases in the warm period.
- The [destruction of the Irpin Dam](#), which occurred as a result of the explosion on 26 February, could threaten an ecological catastrophe in the Kyiv region.

Among the potential adverse impacts of the spill are infection through flooded landfills and cesspits, contamination of water with oil and fuel.

- On [8 May](#), the Russian army attempted to force the Siverskyi Donets River near Bilohorivka in the Luhansk region and transported personnel, tanks, infantry fighting vehicles and armoured personnel carriers to the opposite bank of the Siverskyi Donets River. The Armed Forces of Ukraine struck a pontoon crossing, killing about 400 Russian servicemen and destroying at least 15 armoured vehicles. On [12 May](#), the occupiers tried to evacuate their landing force, which was trapped after the crossing. They arranged another pontoon which was also hit by the Armed Forces of Ukraine. In general, after an unsuccessful attempt to force the river, at least 73 units of the Russian machinery failed. Part of the machinery was destroyed; part was left at the site of the destroyed crossing. Fragments of machinery, remnants of fuel were in the waters of the river, causing a negative man-made impact.
- As a result of bombing and destructing one of the gates of the Oskil Reservoir dam in the Kharkiv region, which occurred on [2 April](#), the water level in the Siverskyi Donets River rose. The water flooded the settlements of Studenok and Sviatohirsk. As a result of this flood, the Siverskyi Donets River was polluted with municipal wastewater, organic matter and solid waste. Due to the water leak, the Oskil Reservoir has become shallow, which has had adverse impacts both on the water body itself and on the entire ecosystem that has been forming in and around the reservoir for years. A large area [\(9,000 hectares\) of the silted bottom of the reservoir has been exposed](#) and is being eroded by wind. The vegetation of the shores of the former Oskil Reservoir has lost its usual hydrological regime and is unlikely to exist as before. This also applies to rare species, such as *Gladiolus tenuis*, etc. Shallow waters were a place of feeding and nesting for a large number of waterfowl, including rare ones. All living organisms inhabiting the thick layer of now-exposed silt will now perish and this will cause a separate layer of problems. Most of the young fish and the fish population as a whole have been swept downstream, and there is not enough space to restore the former populations.
- Russian troops attack infrastructure along the Black and Azov Seas and ships at anchor, polluting water and spreading toxins into the sea. Between [24 February and 16 March](#), 5 commercial vessels were hit by Russian missiles, two of which sank. Thus, [on 25 February](#), the aggressor fired on two foreign ships near the Pivdennyi Sea Port, in particular NAMURA QUEEN (flag of Panama) and the MILLENNIUM SPIRIT bunkering tanker (flag of Moldova) on a raid before the ports of Pivdennyi and Odesa. The MILLENNIUM SPIRIT

bunkering tanker, which carried more than 500 tons of diesel, sank on 10 March in a 12-mile zone near the Pivdennyi Sea Port (Odesa region). The damage caused by the impact resulted in a local spill and fire of fuel in the sea. On [3 March](#), the HELT cargo ship (flag of Panama) sank not too far from the coast of the Odesa region (Ovidiopol area, settlements of Zatoka and Karolino Buhaz). On [4 May](#), the Russian occupiers fired on the MTM RIO Grande tanker from Singapore in the Nika-Tera Port of Mykolaiv.

- In the port city of Berdiansk in the Sea of Azov on [24 March](#), the Armed Forces of Ukraine destroyed and sank Saratov, a large landing ship. Caesar Kunikov and Novocherkassk Large landing ships were damaged. On [14 April](#), there was official confirmation of the sinking in the Black Sea of the Russian Moskva (Moscow) missile cruiser with a displacement of more than 11 thousand tons. The sinking in the Black Sea likely resulted in the ingress of unused fuel from the ship as well as some ammunition, including missiles and torpedoes, which contain harmful chemicals. In addition, [according to Defense Express](#), with reference to the designers and naval officers, the ship could have nuclear warheads.
- The *Hurriyet* Turkish newspaper, citing Hulusi Akar, Turkish Minister of Defense, [reported](#) that there could be 400 dangerous floating mines in the Black Sea. The Minister said that since the end of March, Turkish underwater security groups have cleared 3 such mines, all of them made in Russia. Another mine that came to the surface in Odesa Bay was [cleared](#) by professionals of the subversive team of the Ukrainian Naval Forces of the Armed Forces of Ukraine.
- The State Environmental Inspectorate [has made public](#) the results of a study of surface water samples in the Ikva River in the Rivne region, which was polluted upstream due to damage on 4 April to the tank with fertilizers by the wreckage of a Russian missile in northern Ternopil region. According to the results of the detailed analysis, water samples at two sampling points showed deviations from the standard indicators: ammonium – 163 times (near the village of Bereh); nitrites – 7 times (near the village of Sapanovchyk); nitrates – 49.7 times (near the village of Sapanovchyk); total iron – 7.4 times (near the village of Bereh); biological oxygen consumption – 1.9 times (near the village of Sapanovchyk).
- As a result of the shelling of the oil depot in the city of Lviv [on 26 March](#) and the ingress of petroleum products into the Western Bug River, there is a threat of pollution of cross-border water bodies. After all, the Western Bug River, into which oil products got, is a left tributary of the Narva (Vistula basin).

- On [22 May](#), as a result of missiles fire in the Pavlohrad district of the Dnipropetrovsk region, the missile hit the Samara River.
- Due to the spontaneous burial of the dead, lack of quality drinking water and medicines the russian-occupied, [city of Mariupol is on the verge of an epidemiological disaster](#). Due to the critical situation with sewerage and rupture of sewerage utilities in the city, there is a threat that sewage will get into the sea and on the streets.
- Due to the war in Donbas, which has been going on since 2014, mine water is not being pumped out properly, especially given the power outages in the regions of active hostilities. Mine waters go beyond the mines themselves, overflow and fall into aquifers. In one of the independent [studies](#) conducted by the Truth Hounds public organization, water samples were taken from the Komyshuvakha River in the Luhansk region, which belongs to the Siverskyi Donets River. The content of sulphates in water is exceeded 8 times, and manganese exceeds the maximum allowable concentration by 70 times. Uncontrolled flooding of mines with groundwater causes the risk of subsidence or even soil failures and methane release to the surface.

Flora and forest resources

What is the impact on the flora due to hostilities?

- Forest fires due to the explosion of shells, the explosion of military machinery lead to the destruction of hundreds and thousands of hectares of vegetation, the destruction of valuable plant species;
- Vegetation suffers from the movement of armoured vehicles;
- The burning of timber to meet the living needs of people in cities where utilities are destroyed as well as its use outside the city for military purposes, including the construction of fortifications, leads to unauthorized and unregulated felling;
- Vegetation suffers from the harmful effects of acid rain, which occurs due to increased levels of sulphur dioxide (SO₂) and various nitrogen oxides (NO_x) in the atmosphere as a result of numerous explosions and large-scale fires.

Examples:

- As of the end of May, [250,186 hectares](#) of Ukrainian forests were affected by fires during the full-scale russian invasion of Ukraine. It often happens that due to ongoing artillery shelling it is impossible to start extinguishing fires in time. For example, on [17 May](#), it was reported that a fire had been going on in the forest behind Lyman, Nortsivka in the direction of Izyum during 24 hours. During the week [from 25 April to 1 May](#), forest fires in the Kherson region, which was temporarily occupied by russian troops, covered a total area of more than 800 hectares. At the same time, the occupiers did not allow Ukrainian forestry workers and local residents to extinguish the fire.
- Fires in the territories of the nature reserve fund are especially harmful. Professionals of the State Environmental Inspectorate in the Luhansk region with the help of modern space technology have discovered large-scale forest fires in the Luhansk region (as a result of military actions of the russian federation, fires affected [17 thousand hectares of forest](#)). As a result of fires, the territory of the nature reserve fund was damaged: Kreminna Forests National Nature Park, Kreminna Catchments Hydrological Reserve of Local Significance and part of the Trohizbenskyi Steppe Luhansk Nature Reserve. [On 28 April](#), a large-scale fire broke out in the reed beds of the Dnipro River near the city of Kherson temporarily occupied by russian troops. Dnipro reed beds are silted, swampy, flooded areas with rich biodiversity and are part of the Lower Dnipro National Nature Park.
- The Central Intelligence Agency of the Ministry of Defence of Ukraine [has received](#) information that the russian occupiers want to organize mass deforestation of Ukrainian forests in the temporarily occupied territories. This is evidenced by a [letter](#) from the Minister of Defence of the russian federation to the president of the russian federation, in which he asked for permission to total felling of Ukrainian trees, regardless of age, form of ownership and category of land to meet the needs of the occupiers (construction of fortifications, crossings, etc.). It follows from the text of the document that even forests in protected areas may fall under the felling. At the same time, it is proposed to sell unused wood and use the proceeds to support the russian occupation corps.
- Residents of settlements (Mariupol, Chernihiv, Izyum, Rubizhne, Severodonetsk, Popasna, etc.), where there is no supply of gas and electricity due to hostilities, are forced to [cut down trees](#) and shrubs within the settlement or in neighbouring forest protection zones for heating and cooking.

Fauna

What is the impact on the flora due to hostilities?

- Excessive pollution of water bodies can kill hundreds of thousands of fish, and some populations may even perish;
- Influence of acoustic systems, powerful explosions and vibrations disturb the quiet existence of animals and disorient them;
- Shell bursts and forest fires lead to the death of wild animals, including species listed in the Red Book.

Examples:

- According to the employees of the Tuzly Lagoons National Nature Park, [the deaths of dolphins](#) have been recorded due to the actions of russian warships off the coast of the Odesa region. Military sonar has an adverse impact on animal health. Russian warships use sonar with sounds over 200 decibels. Dolphins fall into the zone of powerful acoustic radiation of ship navigation devices. This leads to damage to their hearing and disorientation. Mammals lose their orientation and are thrown ashore. Turkish marine biologists report that [more than 100 dolphins](#) have been found thrown ashore the Black Sea since February. This figure is much higher than in previous years.
- The presence of the military in places where they should not be, in particular in the territories of the nature reserve fund, has a negative impact on birds. [According to the Ukrainian Nature Conservation Group \(UNCG\)](#), this problem has become acute in the south of the Donetsk region, in the Meotyda National Nature Park. The occupiers came there and dug fortifications, destroying the nesting places of such birds of the wetland complex as the Pallas's gull, the Eurasian oystercatcher, the Dalmatian pelican and the Sandwich tern. These birds nest only in that place. Some species of birds will be able to find another place to nest, but, for example, the Eurasian oystercatcher will miss the breeding season and they will not have offspring all year round.
- Another example of the impact of the war on birds was the consequences of russia's seizure of the Kryva Kosa wetland on the Azov coast in 2014. After the occupiers started using it for military purposes in 2015, [the nesting group](#)

[disappeared there](#). Ukraine has lost nesting places of: Dalmatian pelican; the largest in Europe colony of 3,000 pairs of the Pallas's gull listed in the Red Book; about 60 thousand pairs of Sandwich terns.

- During the survey and demining of the deoccupied territories, the remains of [wild animals blown up by landmines](#) were found. The Ministry of Ecology and Natural Resources [reported](#) that the numerous mines and booby traps are regularly detonated by wild animals in the Chornobyl Exclusion Zone. As a result, animals die or are maimed, and explosions increase the risk of fires.
- It is estimated that russian troops have placed [400 to 600 mines in the waters of the Black Sea](#) threatening not only shipping but also marine animals.
- Due to bombing by the russian army, the MILLENNIAL SPIRIT ship (flag of Moldova) sank on [10 March](#) in a 12-mile zone near the Pivdennyi Sea Port (Odesa region). Due to the fact that this ship is a tanker transporting hazardous substances, according to the information from unconfirmed official documents, more than 500 tons of petroleum products, it, along with fuel and technical fluids, could be a "source" of environmental disaster not only on the coasts several Black Sea areas but could also cause inevitable changes in the ecosystem of marine flora and fauna. In the current conditions of war, neither the State Environmental Inspectorate nor the representatives of rescue and border guard authorities can take any preventive measures in order to prevent pollution of the Black Sea coast and preserve the Ukrainian environment. On the part of the russian federation, such actions, which do not make it possible to prevent damage to the environment, are a violation of Article 3 of the [Aarhus Convention](#).



Complex impacts on ecosystems

Complex impacts of hostilities and their consequences on all components of the environment should be paid special attention.

- These impacts are especially critical for **protected areas**, because, being centers of biological and landscape diversity, they need a special regime and scientifically sound monitoring measures even in peacetime, but during hostilities such a special regime is not implemented within the nature reserve fund.
- Hostilities around **nuclear power facilities and in the Chernobyl Exclusion Zone** have complex impacts on the environment and significant risks. As a result of destructing the surface protective layer of the soil in the hazardous radioactively contaminated zone, there is an increase in the radioactive background, which has a negative impact on natural complexes as a whole.

Large-scale forest fires have adverse impacts for all components of nature; they destroy vegetation, lead to the death of animals, cause air pollution and, through precipitation, surface water and soil cover.

Examples:

- Hostilities within the Chernobyl Exclusion Zone [resulted](#) in the violation of the upper protective layer of the soil. Large-scale fortifications and positions were dug by the occupiers in one of the parts of the highly polluted territory of the Red Forest. There are a lot of burnt grass and bushes around the fortifications. The actions of the occupiers led to the release of highly radioactive dust. An increased radiation background has been recorded in the Exclusion Zone since 24 February, as heavy armoured vehicles and other machinery moved on contaminated soils and lifted radioactive dust into the air. On 24-25 February, during the capture of the Chernobyl Exclusion Zone by russian troops, the radiation background was exceeded up to 7.6 times. According to the automated radiation control systems of the Exclusion Zone, the gamma radiation dose rates were recorded at the following level (in Sv) on February 25:

Fire depot – 9,460, with an average annual dose in 2021 – 1,900

Yaniv station – 3,460, with an average annual of 670;

Mashevo – 8,040, with an average annual of 840;

Krasne – 3,340, with an average of 720;

Zymove – 8,220, with an average of 780;

Vector – 2,050, with an average of 130.

- According to satellite images from NASA and the European Space Agency, the actions of russian troops during the occupation of the Exclusion Zone near the Chernobyl Nuclear Power Plant [recorded fires](#) in natural complexes and abandoned villages on an area of 13,989 hectares. For comparison, 30 fires on an area of 38 hectares were eliminated for the whole year of 2021 in the Chernobyl zone. During forest fires in the Exclusion Zone, aerosols are released into the air, which are harmful in themselves and may contain radiation-contaminated particles. Fires cause risks of removal of radionuclides outside the exclusion zone and deterioration of the radiation situation in the territories adjacent to the exclusion zone.
- As a result of the full-scale russian invasion of Ukraine, [812 nature reserve fund sites were in danger, within their borders the aggressor has performed hostilities or continues to perform hostilities, i.e. 20% \(or 900 thousand hectares\) of all protected areas affected by the war](#). Ukraine's natural heritage is being caused significant damage. 160 territories of the Emerald Network with an area of 2.9 million hectares are under threat of destruction, and sites protected by the Ramsar Convention are of particular concern. [14 Ramsar sites with an area of 397.7 thousand hectares](#) are used by russian invaders during hostilities against the Ukrainian people. This concerns the coasts of the Azov and Black Seas as well as areas in the lower reaches of the Danube and Dnipro rivers. In particular, the Ramsar sites such as Kryva Zatoka and Kryva Kosa occupied since 2014 in Donbas and the Opuk Cape Water Coastal Complex in Crimea have been used for military training. So far, more than 20 biosphere nature reserves and national nature parks have been affected by the aggression of the russian federation. On [20 April](#), the Marine Guard of the State Border Guard Service of Ukraine declared a mine danger at the mouth of the Danube. This area is part of the Danube Biosphere Reserve. On [15 May](#), a missile fired by russian troops in Zaporizhzhia hit a protected part of the Khortytsia island, causing a fire.
- As of 20 May, fires caused by hostilities continued to be localized in the forests of the temporarily occupied Kherson region. The fire covered [more than 4,000 hectares](#). Due to hostilities, minefields and occupation, rescuers and foresters are not always able to fully prevent and eliminate fires. On [20 May](#), the russian shelling caused a fire in the Halitsynovskiy Forest near Mykolaiv. On the same day, a part of the forest caught fire as a result of a russian missile falling on the territory of the Chuhiv forestry in the Kharkiv region.

Risks for the Ukrainian environment

Risks in this case mean the likelihood of adverse environmental events, environmental disasters, which occurred as a result of illegal military action by the russian army against Ukraine.

Examples:

- On [26 February](#), Ukrainian anti-aircraft warfare shot down a russian missile trying to hit the dam of the Kyiv Reservoir. If that happened, the radioactive sludge hidden there since the 1986 Chernobyl disaster could rise from the bottom of the reservoir. Violation of the integrity of the dam would lead to flooding of large areas downstream with radioactively contaminated waters. This would make it impossible to use agricultural land in Ukraine and kill large numbers of people in these areas.
- On [16 April](#), a video surveillance camera recorded the flight of a russian missile directly over the South Ukraine Nuclear Power Plant, which Ukraine officially reported to the IAEA. On [25 April](#), two cruise missiles fired by the russian military were recorded over the Khmelnytskyi NPP cooling reservoir, probably in the direction of the cities of Rivne and Zdolbuniv. On [26 April](#), two russian cruise missiles flew at low altitude over the Zaporizhzhia NPP site in the direction of Zaporizhzhia. The flight of missiles at low altitude directly over the sites of Ukrainian nuclear power plants, where nuclear facilities with a significant amount of nuclear material are located, poses enormous risks. Missiles can hit one or more nuclear facilities, threatening a nuclear and radiation disaster around the world.
- On [4 March](#), russian tanks entered the territory of Europe's largest Zaporizhzhia Nuclear Power Plant and opened artillery fire on power unit 1 and office buildings. Later, the State Nuclear Regulatory Inspectorate of Ukraine reported that the critical security systems of power unit 1 were not damaged, and no emissions of radioactive materials occurred. But [the Zaporizhzhia nuclear power plant is currently under the control of the russian armed forces](#) and is used by the occupiers as a military base. Heavy weapons and ammunition are stored in its territory. In addition to the military, there are 11 employees of the russian state company "Rosatom" at the NPP, who interfere in the work of personnel. On 10 March, National Nuclear Energy

Generating Company "Energoatom" reported that the russian occupiers, who seized the Zaporizhzhia NPP, had mined the shores of the Kakhovka Reservoir, which borders the nuclear power plant.

- On [6, 26 and 28 March](#), russian troops fired missile artillery at the Kharkiv Institute of Physics and Technology, where the Neutron Source reactor is located. The reactor was loaded with 37 nuclear fuel assemblies. According to the Security Service of Ukraine, the building in which the reactor is located was fired at from the Grad multiple missile launchers. The State Nuclear Regulatory Inspectorate reports significant damage to the installation (the switchgear 0.4 kV substation was completely destroyed), the cooling system, buildings and the heating main. According to the agency, radiation still remains normal.
- On [27 February](#), the missile attack caused a powerful explosion in the suburbs of Kyiv near the location of the Radon Central Production Association. Radiation background after the impact did not exceed the levels recorded before the invasion, surface contamination was not detected, no radionuclides were released into the air. However, it is not possible to say with certainty that during such a powerful explosion there was no damage (cracks, splits, etc.) to the integrity of radioactive waste storage facilities. Thorough inspections must be carried out to prevent depressurization and further destruction of storage facilities, the release of radionuclides into the environment and adverse effects on humans.
- On [9 March](#), russian troops damage high-voltage power line, leaving the Chernobyl site, the entire exclusion zone and the city of Slavutych without electricity. The supply of electricity is crucial to ensure the operation of ventilation and cooling systems for spent nuclear fuel storage facilities. Backup diesel generators with limited fuel reserves have been launched to supply power to Chernobyl NPP facilities. For three days, facilities in the Chernobyl NPP exclusion zone were left without external power supply, threatening to disrupt the radiation safety of the New Safe Confinement and the spent nuclear fuel storage facility (SNF-1), where about 20,000 fuel assemblies are stored in the cooling water basin. As of 13 March, the power supply to the Chernobyl NPP and the Exclusion Zone facilities was restored by Ukrenergo NPC, which repaired the high-voltage line. On 14 March, the Chernobyl NPP power supply was cut off once again after russian troops damaged the high-voltage power line for the second time. On 15 March, the invaders restored the power supply to the Chernobyl NPP and the city of Slavutych by connecting them to the Belarusian power system. The "green corridor" for the restoration of energy supply from the Ukrainian side, despite

all attempts, was not provided. After the deoccupation of the territories, Ukrenergo restored the normal power supply to the Chornobyl NPP and the facilities of the Exclusion Zone.

- On [25 February](#), there were five explosions near CHPP-6 in Kyiv. Major damage to CHPP-6 was avoided; the power plant continues to operate. Large fires and toxic air pollution over densely populated areas could occur if munitions got into fuel oil tanks. Further shelling of the facility could also threaten the integrity of the ash and slag dumps. The same applies to many other Ukrainian CHPPs.
- On [5 May](#), Russian military fired on the railway site of the Azot plant in Sievierodonetsk, Luhansk region. This enterprise is the third largest producer of ammonia in Ukraine and one of the largest chemical enterprises in Europe. As a result of the fire, which covered an area of 400 sq. m, there was a risk of burning the enterprise's tanks with hazardous substances. After that, the plant was shelled multiple times, and cases of damage to tanks with ammonia leaks were recorded.
- On [17 May](#), Dorit Nitzan, WHO European region Health Emergencies Coordinator said that the destruction of the water supply system in Mariupol may spread infectious diseases, including cholera.



Oil depots, fuel and lubricants depots and filling stations that suffered losses due to the bombing

Date	Scene	Event	Type and amount of fuel
25 February 2022	fuel and lubricants depot of the Odesa Railway Locomotive Depot in the city of Mykolaiv	fire	approximately 1,200 tons of diesel fuel
25 February 2022	oil depot at the Industrialnyi Avenue in Kharkiv	destruction of tanks	Petroleum products
25 February 2022	oil depot of the Kharkiv Tractor Plant	fire and spill	Petroleum products
26 February 2022	Rovenky Oil Depot State Enterprise, in the city of Rovenky, Luhansk region		
27 February 2022	oil depot in the Vasylykiv area of Kyiv region near the village of Kriachky	fire	10 tanks of 2,000 cub. m of gasoline and diesel fuel each
27 February 2022	fuels and lubricants warehouse of the Vepryk-Agro LLC agricultural enterprise in Hadiach area of Poltava region	fire	
28 February 2022	oil filling station in the city of Okhtyrka, Sumy region	fire	10 tons of diesel fuel
1 March 2022	oil depot of Amic-Ukraine Company with Foreign Investment in Bucha area of Kyiv region	fire and spill	petroleum products of the volume of 2,000 cub. m
3 March 2022	oil depot in the territory of Kombinat Aistra State Enterprise in Chernihiv	detonation and destruction of fuel storage/fire	jet fuel – 4,500 tons, diesel fuel – 11,000 tons
6 March 2022	Luhansk Oil Depot State Enterprise		

7 March 2022	oil depot in Zhytomyr	fire	2 tanks of 10,000 cub. m of oil each
7 March 2022	oil depot in Cherniakhiv, Zhytomyr region	fire	2,000 cub. m of fuel
8 March 2022	Kachanivka Gas Processing Plant of Ukrnafta PJSC in the village of mala Pavlivka, Sumy region	tanks damaged	2 tanks with raw materials, 1 commodity tank, pipelines
11 March 2022	fuels and lubricants warehouse in the territory of Lutsk military airfield in Volyn region	fire and spill	
12 March 2022	fuels and lubricants warehouse of the military unit at the Vasylkiv City Territorial Community of Obukhiv area, Kyiv region	damage to the fuel tank	6 tanks of 900 cub. m (kerosene)
12 March 2022	fuels and lubricants warehouse of Kanatove airfield in Kirovohrad region	damage to the fuel tank	
12 March 2022	filling station of UKRNAFTA PJSC in the city of Rubizhne, Luhansk region	damage to the fuel tank	diesel fuel (8 tons)
13 March 2022	filling station of Parallel-M LTD in the city Sievierodonetsk, Luhansk region	damaging of tanks	propane
13 March 2022	oil depot of TT-Nafta in Chernihiv	damage to the fuel tank	kerosene – 10,000 tons; diesel fuel – 15,000 tons
13 March 2022	fuels and lubricants warehouse of the Alliance LLC agricultural enterprise in Romny area of Sumy region	fire	
13 March 2022	filling station of Propane-Trade LLC in Zaporizhzhia region	damaging of tanks	propane
13 March 2022	2 filling stations, including KLO LLC, on the Zhytomyr highway near the village of Stoianka, Kyiv region	fire, damaged tanks	gasoline and diesel fuel
22 March 2022	fuels and lubricants warehouse in Kramatorsk		

24 March 2022	fuels and lubricants warehouse in the city of Novohrad-Volynskiy, Zhytomyr region		
24 March 2022	oil depot in Kalynivka, Fastiv area, Kyiv region	fire	
26 March 2022	oil depot of Oil Terminal Lviv Oil Depot Private Enterprise in Lviv	fire	2 tanks of 2,000 tons of gasoline each and 3 tanks of 400 tons of diesel fuel each, total volume of 5,200 tons
26 March 2022	WOG oil depot in the city of Dubno, Rivne region	fire	5,000 tons of diesel fuel and 2,500 tons of gasoline
27 March 2022	WOG oil depot in Lutsk	fire	500 tons of diesel fuel
28 March 2022	oil depot in Rivne area of Rivne region	fire and spill	
29 March 2022	fuels and lubricants warehouse in the territory of the airport in Starokostiantyniv, Khmelnytskyi region	fire	
29 March 2022	oil depot of military base near Starokostiantyniv, Khmelnytskyi region		
30 March 2022	oil depot in Dnipro		
1 April 2022	filling station in Kryvyi Rih	fire	
2 April 2022	fuels and lubricants warehouse at the Kremenchuk Oil Refinery	fire	
3 April 2022	fuels and lubricants warehouse of the BRSM oil depot in the city of Shepetivka, Khmelnytskyi region	fire	
3 April 2022	oil storage facility of Odesa Refinery PJSC in Odesa	damage to the oil storage facility	

<u>5 April 2022</u>	fuels and lubricants warehouse in Synelnykove area of Dnipropetrovsk region	fire	
<u>5 April 2022</u>	oil depot at the plat in Novomoskovsk, Dnipropetrovsk region	fire	6 tanks with fuel oil
<u>9 April 2022</u>	filling station in Lysychansk, Luhansk region	fire	
<u>12 April 2022</u>	oil depot in the territory of the military airfield in Khmelnytskyi region	fire	
<u>19 April 2022</u>	filling station in Snihurivka, Mykolaiv region	fire	
<u>22 April 2022</u>	oil depot of 777 LLC in the city of Chuhuiv, Kharkiv region	fire	2,000 tons of diesel fuel
<u>1 May 2022</u>	fuels and lubricants warehouse of an agricultural company in Zolochiv Community of Kharkiv region	fire	