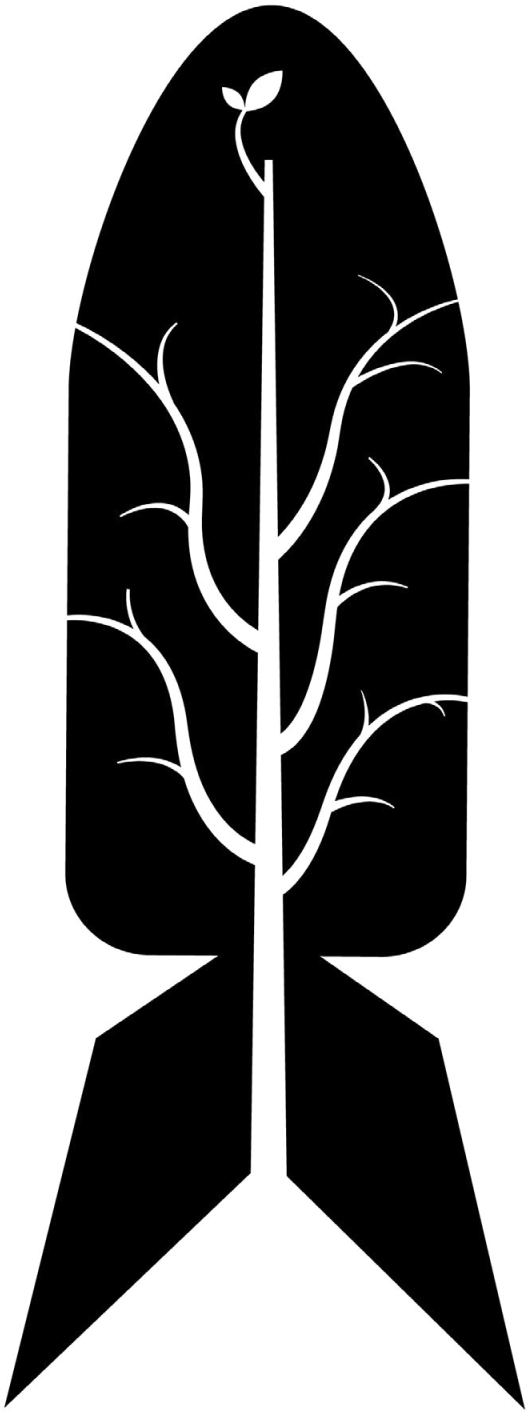


UWEC

Ukraine War Environmental Consequences Work Group

Issue #21

2024 UWEC work group

Dear Friends!

Today, fires caused by military operations are one of the main drivers of ecosystem destruction and biodiversity losses in Ukraine. Moreover, comprehensive impact monitoring is impossible in wartime, and there is no quantitative data regarding the burning of forests and steppes since the full-scale invasion began over two years ago. Damage resulting from the last decade of fires has yet to be calculated as well. Generally less forested, agricultural and steppe landscapes in eastern Ukraine are especially affected by the fighting. **Burned forests in those areas will be more difficult to restore, and their role in mitigating climate change in the region will be almost impossible to replace.** *This month, Ukrainian Nature Conservation Group director Oleksiy Vasyliuk examines monitoring of forest fires caused by military operations:*

- **Flames of war: How Ukraine lost over 1,000 square kilometers of forest**

In conditions of the ongoing war, it is generally very difficult to effect environmental protection measures in nature reserves and national parks. **Since the full-scale Russian invasion began, 812 protected area sites totalling roughly one million square kilometers have been damaged by military operations.** *Taken together, this jeopardizes achievement of the European Union's Biodiversity Strategy, an important focus for Ukraine's European integration. Expanded implementation of rewilding practices in wartorn areas offers one potential solution. Ukrainian journalist Viktoria Hubareva explores this topic:*

- **Ukraine's protected areas: defended or degraded?**

Despite the ongoing hostilities, nature continues to spontaneously recuperate. Today, there is even a special term for this – war-wilding. War-wilding can occur in areas affected by the full-scale war in Ukraine and is essentially a natural process of ecosystem restoration in areas abandoned by humans. That said, it is important that restoration contributes to the conservation of the country's biodiversity rather than becoming ground zero for the spread of invasive species. **Despite the ongoing war, Ukrainian environmentalists are carrying out initiatives to rewild territories.** *Learn about how rewilding occurs and explore examples of rewilding in an article written by Ukrainian experts for UWEC Work Group:*

- **Spontaneous recovery in wartime: How Ukraine can become a testing ground for unique environmental projects**

This month we focus on energy in our monthly review of stories related to the war's environmental consequences in Ukraine. Intensified shelling of energy infrastructure in early April again raised the issue of how to restore Ukraine's energy system. **UWEC experts propose that electricity generation and the distribution grid be decentralized and become more energy efficient**, *in other words, moving away from large generation units such as thermal power plants, nuclear power plants, and hydroelectric power plants:*

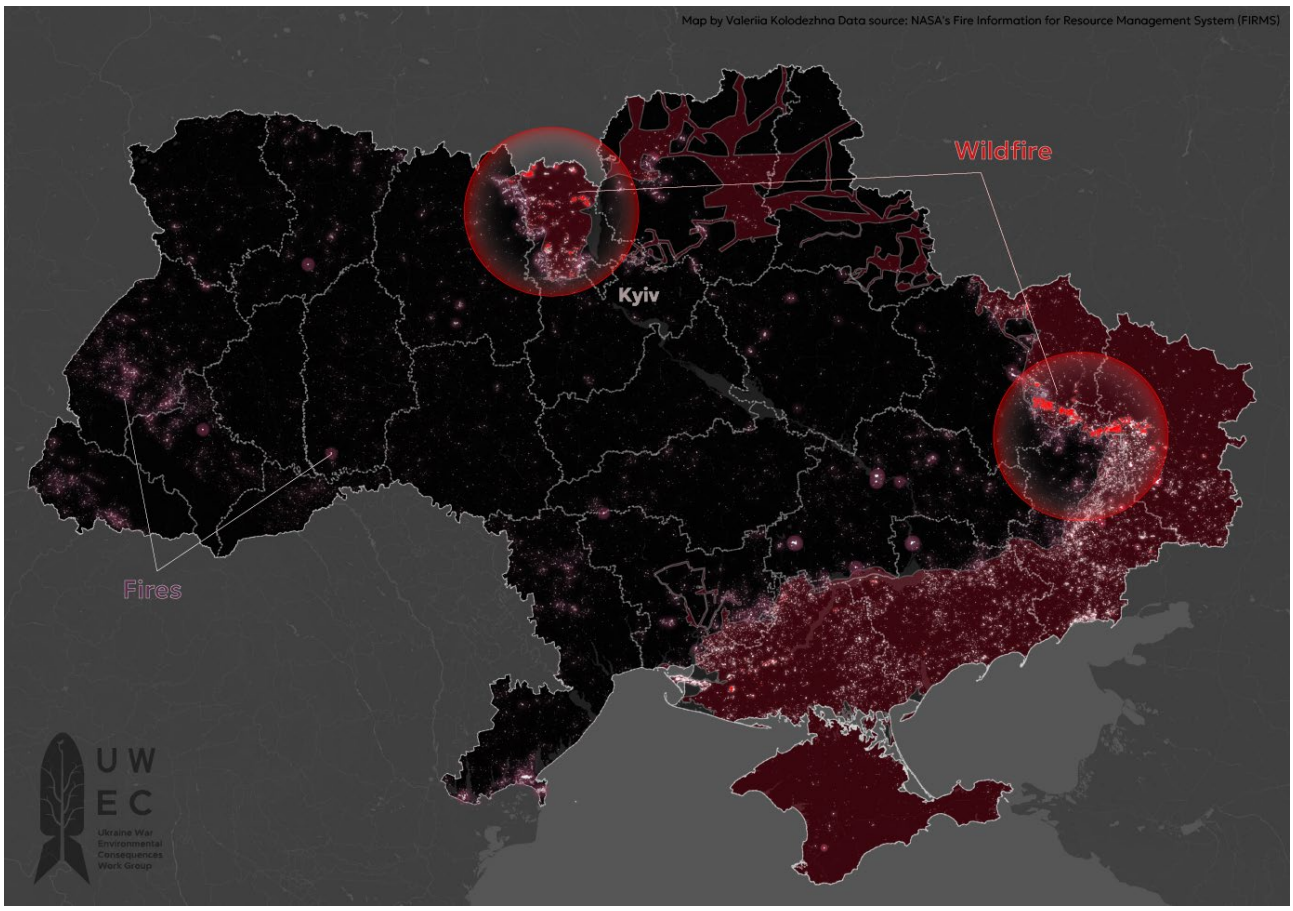
- **Environmental consequences of the war in Ukraine: April 2024 review**

UWEC Work Group experts Eugene Simonov and Oleksiy Vasyliuk also studied the question of decentralizing Ukraine's electric industry and explore how development of renewable energy generation relates to conservation practices as well as the role of "green energy" in Ukraine's integration with Europe:

- **Distributed electricity generation in Ukraine: the risks and opportunities**

You can read more of our analysis and news of the environmental consequences of Russia's invasion of Ukraine on our website, as well as on Twitter (X), Facebook and on Telegram.

We wish you strength and peace!
Alexej Ovchinnikov
Editor, UWEC Work Group



Flames of war: How Ukraine lost over 1,000 square kilometers of forest

Oleksiy Vasyliuk, Hrihory Kolomitsev and Viktor Parkhomenko

Forest fires are one of the most tangible and long-lasting consequences of military action, both in nature conservation and economic terms. When the Russian army began using "scorched earth" tactics in 2022, the destruction of Ukraine's forests increased significantly.

Examining the impacts of military action on the environment, fires that occur in the course of warfare are a particularly powerful factor. A side-effect of both combat operations and a deliberate tactic used by the warring sides, once started, fires can spread uncontrollably, both within active combat zones and far beyond their borders (in mined and occupied territories, for example).

This article presents the results of a recent UWEC investigation into forest

fires in Ukraine. In just two years of war, 8,096 square kilometers of Ukrainian territory where fighting has taken place have been affected by fire. Of those, 1,047 sq km is forest that has burned as a result of military action and the inability of Ukrainian emergency services to extinguish them.

Calculation methodology and results

In preparation for this investigation, information was obtained from satellite imaging from Landsat 8 Global Fires I and images from Terra MODIS earth remote sensing (ERS) units. This set of geodata includes information about 131,498 fires recorded by NASA satellites within Ukrainian borders in the period 22 February 2022 to 22 February 2024 – that is, over the first two years of the full-scale invasion.

Data is updated four times a day on average: the orbit paths of the two satellites mean that each passes over the same territory twice daily. They use automatic fire detection algorithms that pick up the powerful infrared spectrum radiation emitted by conflagrations.

On the basis of this data, the satellites record powerful fires that burn for extended periods of time. Despite the possibility of fires spreading rapidly, for instance, in steppe landscape or in floodplains when they can occur between satellite overflights, the majority of fires last long enough to appear on their sensors.

In general, a fire lasts a relatively long period of time, with sufficient persistence to be recorded by means of ERS. So, while undoubtedly genuine, the data obtained by the authors is unquestionably incomplete and the real area of burned biotopes (ecosystems) is significantly bigger. As demonstrated in this investigation, the results of modeling show the locations of fires fairly well, allowing affected conservation zones and valuable biotopes to be identified. Geospatial modeling technologies were used to determine the extent of burned areas. The resulting data has a small error margin, but permits evaluation of the scale to which natural areas suffer from burning.

Too much talk, too little data

A substantial number of publications devoted to the impact of the war on Ukraine's forests since Russia's full-scale invasion already exist in both the Ukrainian and international press. Ukrainian politicians also regularly speak out on the subject (estimates of the loss of three million hectares of forest have been voiced several times). Scientific publications with the first estimates of losses are now being published, authored by both Ukrainian scientists and specialists from other countries. Ukrainian societal interest in the topic of forest fires has generated a great number of articles, reposts and comments, especially in the wake

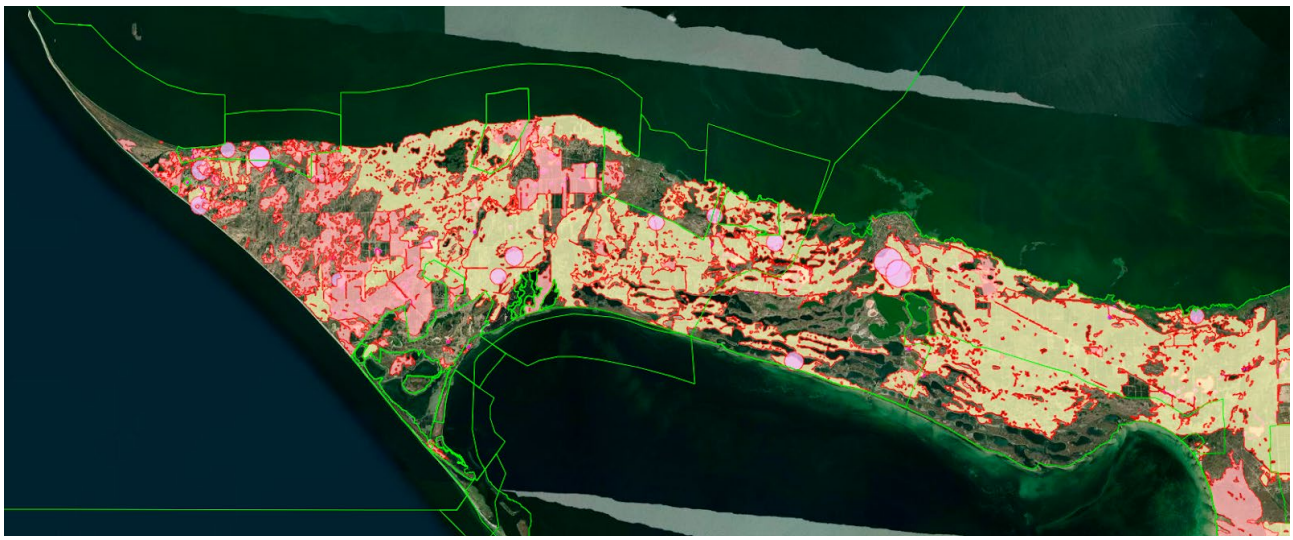


Fig. 1. A satellite photograph showing completely burned areas (in pink and green) of the Black Sea Biosphere Reserve and the Biloberezhia Sviatoslava National Park: with the exception of lakes and swampy areas, all visible land is almost totally scorched. Source: Web Map by csdeant2.

of public statements by Ukrainian President Volodymyr Zelensky, as well as senior figures in the forestry industry.

Scientific publications are far more restrained in their estimates of the scale of such losses, but their data also differs significantly. This happens not only because of a lack of accurate data, but also because authors approach the concept of "loss" or "damage" differently, from the land mines that have made forests off-limits for economic activity to the presence of military operations in an area and complete incineration of forest areas as a result of crown fires. Unfortunately, in the majority of published cases, the studies are not accompanied by an explanation of the precise nature of the damage. Only two very detailed studies are known to exist, both of which should be seen as extremely reliable – these were carried out by staff of the Biloberezhia Sviatoslava Research and Production Enterprise for the Kinburn Spit and by specialists from the Ukrainian Nature Conservation Group for the Chernobyl Radiation and Ecological Biosphere Reserve. These two local studies show truly enormous areas of burned land.

As for other forest territories in Ukraine, although they have suffered badly from fires, it is hard to provide accurate data, since they are inaccessible for field research due to being mined or in close proximity to active combat zones. It is therefore impossible to carry out precise mapping of burned areas, including, for example, ground fires, which can last for an entire season but can usually only be seen from a satellite or in aerial photographs in the first months. Consequently, evaluation is

Fig. 2. A forest fire in a protected area. Source: Biloberezhia Sviatoslava National Park

currently only possible using remote methods. When planning their research methodology, the authors relied on the above two cases of precision mapping as a source of verification.

Why 'military' fires have such a powerful impact on nature

Fire is one of the most destructive consequences of war, especially in natural areas, it leads to the destruction of all living beings, including significant losses of soil fauna. Depending on the type of biotopes and time of year, fires also have a wide spectrum of effects on flora: from the insignificant – in the case of winter fires in the steppe – to the catastrophic, i.e. in the forest. In the latter case, this impact also leads to the loss of forest biotope for an extended period. Grassy biotopes, however, take just months to recover. Therefore, assessing the impact of burning becomes more meaningful if it is considered in the context of a separate type of biotope. For example, fires in anthropogenic biotopes (say, on arable land) have no real substantial impact on biodiversity or on whether this particular biotope will recover after the fire, since this depends exclusively on whether the farmers will sow that particular land in the following year.

Weather conditions, soil moisture levels, and the length of time since plant residues were last removed from the area are also a factor in the spread of fires. Thus, in pastures and hayfields, where excess biomass is constantly removed, or in areas where fires are common, this effect will be insignificant. However, in forests or in other biotopes where a large amount of dry vegetation has accumulated, long-lasting fires will destroy roots, grass seeds, bulbs and corms in the soil, along with the animals that live in them.

Fig. 3. Dozens of hectares of burned-out pine forest: the result of Russian shelling near the town of Stanytsia Luhanska in 2015. Source: V. Parkhomenko.

Forest fires mean devastation

Forests are perhaps the only type of natural ecosystem in Ukraine in which several separate government bodies are responsible for fire prevention and firefighting: the State Emergency Service, forestry enterprises, and local municipalities. Each has its own particular obligations and resources, and they all work unstintingly to prevent forest fires. Of course, forests have this special status due to their social and economic significance, as well as the fact that in the steppe zone forest fires are usually fatal for the forest involved.

In terms of their cumulative effect, the impact of military factors on biotopes make the consequences of blazes in natural areas far worse than if the fires happened in peacetime. For example, the first thing to occur when Russian armed forces invaded the Donbas (both in 2014 and 2022) was that the occupiers seized all accessible administrative institutions, resulting in government work coming to a standstill.

Occupation of Ukraine's eastern regions in 2014 not only saw the seizure of premises belonging to Ukrainian state entities, but also their property. All firefighting equipment located in the occupied territories was confiscated and subsequently used against Ukraine for military purposes. Even at that early stage of the war, it became clear that of all the various negative factors on ecosystems caused by military

Fig. 4. The results of a forest fire: charred remains of trees fall over time, shrub and grass layers are destroyed, and bare topsoil is open to erosion. Source: Serhiy Nuzhnenko, Radio Liberty

operations, forest fires had a particularly virulent impact.

Under normal conditions – that is, in peacetime – fires in forests would quickly be extinguished by units of the State Emergency Service and forestry workers. There are numerous methods for preventing and extinguishing forest fires.

But when faced with ongoing active hostilities, or even afterwards, when an area has been mined and fire equipment has been stolen, it is impossible to organize firefighting operations.

Explosions of military equipment and munitions, as well as incendiary ammunition used by Russian troops, also contribute to fires.

The situation is aggravated by the peculiarities of the forest ecosystems that are typical of Ukraine's steppe zone. This region contains a wide range of steppe biotopes, floodplains, and ravine forests that are dominated by mixed tree species (in all cases broadleaf forests), as well as "chalk forests", a biotope eligible for protection under the Bern Convention on the Conservation of European Wildlife and Natural Habitats. In occupied areas, the sandy soils of the Siverskyi Donets river valley and other parts of the region are dominated by pine plantations. Just a few such forests consist of deciduous trees, mainly invasive alien species such as Robinia pseudoacacia, or black locust.

In fact, pine forests in the steppe zone are the most fire-prone category of forests in Ukraine: they ignite the most easily,

and once alight, these fires are particularly destructive. If not extinguished promptly, they will spread freely through the forest in the leeward direction until they run out of trees to burn or are halted by water barriers or rainfall.

As for plantation pine forests, they are not only especially vulnerable to fire, but also quickly break down, even if only partially damaged. The superficial root system of pine requires good soil moisture, so any loss of forest integrity exposes the soil to direct sunlight and rapidly decreased moisture. Insufficient moisture causes pines to weaken and dry out, making the damaged forest even more vulnerable to fire as a result. The main tracts of forest within the combat zone are artificial plantings on the site of post-glacial sand terraces, they are left exposed after burning and become vulnerable to erosion.

It is important to note that steppe zones are characterized by a continental climate, with hot dry summers and cold winters. Under current conditions, the creation of new forests in this zone is extremely complicated: young saplings do not take root well, and more than half of them die within the first year after planting. This means that today it is almost impossible to plant new forests in the steppe zone. Consequently, the loss of plantation pine forests in this region due to fire almost guarantees that it will be impossible to restore these forests in the future.

Historically, forest planting in the steppe zone was carried out to create areas with a favorable microclimate for human life. Today, most forests that surround settlements were created in the past with the aim of creating a climate that was more humid and cooler than the natural one in the steppe zone. The loss of forests thus inevitably causes a deterioration in living conditions for local populations, whose residents, thanks to these forests, have enjoyed a continuous supply of moisture, coolness and decreased wind intensity for several generations.

At the same time, the studied area features natural broadleaf ravine forests (in the steppe zone, such forests occupy deep ravines and gorges, forming a relatively humid microclimate beneath a canopy that allows the growth of full-fledged mature trees) – the "cells" of the region's forest biodiversity. When creating artificial forest plantations, forestry enterprises often situated them next to natural ravine forests, in order to use the natural moisture and shade of the existing forests for the young artificial forest plantations. The result is that today natural forests and artificial pine forests often form stretches of continuous woodland. Fires that spread easily in artificial pine plantations also lead to the destruction of natural broadleaf forests.

Damage to forest plantations entails considerable economic damage for the

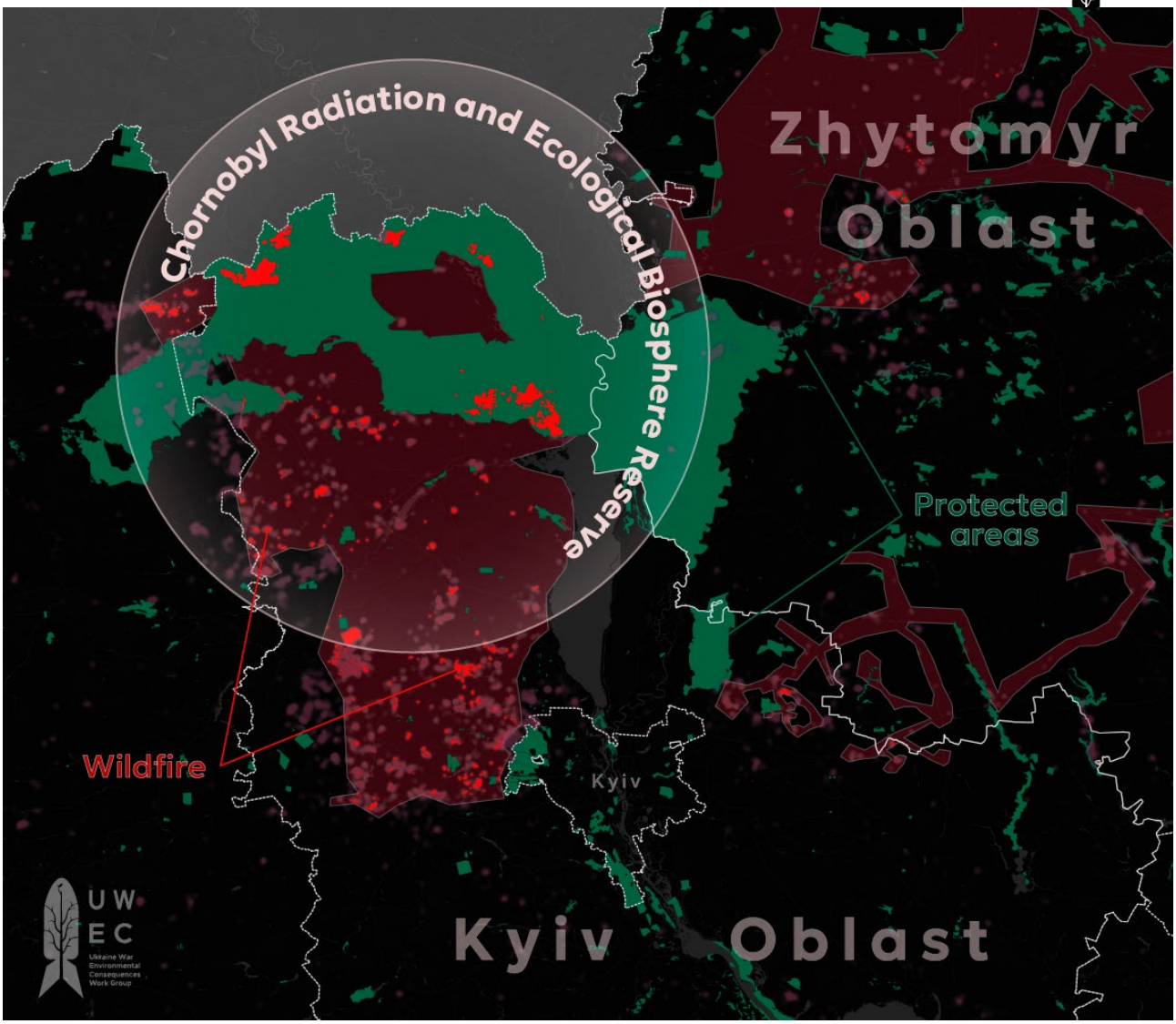


Fig 5. Wildfires on the territory of the Chernobyl Radiation and Ecological Biosphere Reserve during the military invasion. Infographics: Valeria Kolodezhna

region, while the destruction of natural ravine forests has a significant impact on the region's biodiversity: forest species distributed across Ukraine's eastern regions are found in relatively small areas.

A good example is the forests of the Siverskyi Donets river valley, where the largest groups of Ukraine's diurnal birds of prey gather. Most birds of prey are protected both at national level as well as part of Ukraine's implementation of international agreements. However, today the majority of these birds have moved away to other parts of Europe from the Siverskyi Donets valley, now an active combat zone where fires are common.

Forest fires and radiation

In February 2022, as has been well-documented, one of the main vectors of attack for Russian troops invading Ukraine was an assault on Kyiv from Belarus via the exclusion zone of the Chornobyl Nuclear Power Plant. Many reports have since been published about the radiation threats caused

Fig. 6. Forest in the exclusion zone of the Chornobyl nuclear power plant after fires. Source: yourforestpodcast.com

by the invasion and Russian troops taking up positions on radiation-contaminated land. These events were also accompanied by fires in the forests, which by then were impossible to put out. It is important to note here that even in the pre-war years the absence of roads throughout most of the exclusion zone did not allow fires to be extinguished here. As a result, Russia's brief occupation of this area cost Ukraine 22,000 hectares of burned forest.

Products of combustion enter the atmosphere in massive volumes as a result of these fires, threatening the effectiveness of the exclusion zone's barrier function – it was established to prevent radioactive particles from escaping the area again. In other words, it is fires such as these that are now the sole genuinely likely way of radiation being carried beyond the exclusion zone and over large distances.

Studying the fires in Ukraine's forests caused by the war

The authors first began their research into the consequences of fires resulting from military action back in 2014, when Russian troops seized part of the Donbas. In the period from 2014-2021, although military activities were on a significantly smaller scale than the invasion of 2022, it was natural ecosystems that were affected to a large degree, rather than infrastructure and settlements. Following the full-scale invasion, Russian troops focused increasingly on the deliberate

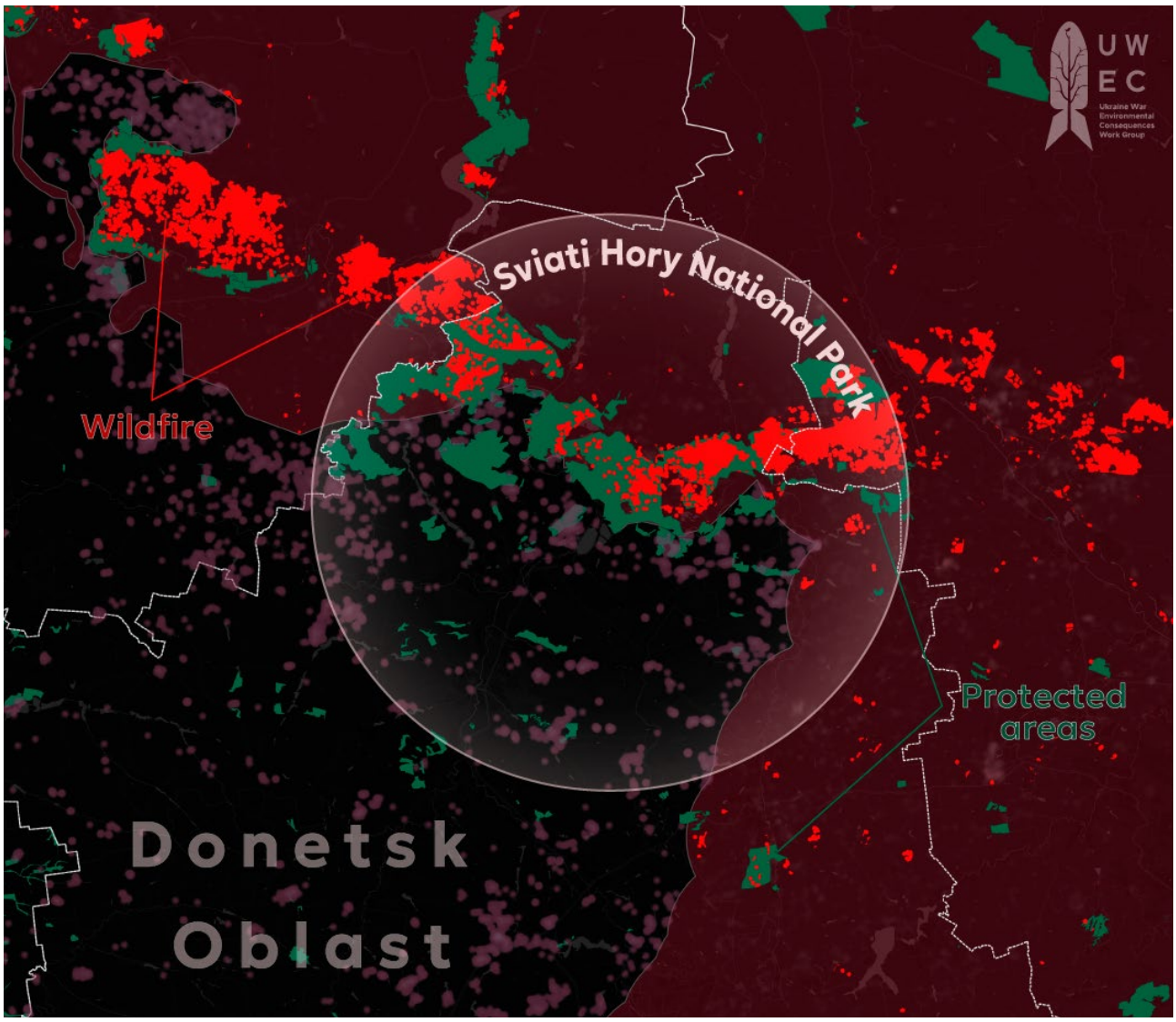


Fig 6. Extent of wildfires in the Holy Mountains National Park. Infographic by Valeria Kolodezhna

destruction of settlements, employing "scorched-earth" tactics in an attempt to gain ground. For this reason, the losses of natural ecosystems in Eastern Ukraine were possibly even greater during the first phase of the war, starting in 2014, than now, when there is a full-scale war – at least in percentage terms.

It was during this period that some of Ukraine's particularly valuable nature reserves suffered damage for the first time in many decades, or in some cases for an even longer period. For example, for the first time since the 1920s forest fires occurred in parts of the Sviati Hory National Park, including the Mayatska Dacha and Hora Artema (both protected since 1927), as well as in both the strictly protected (since 1926) Melova Flora and Khomutovsky Steppe areas of Ukrainian Steppe Nature Reserve.

The fact that these fires have occurred in itself represents lost conservation value, for the sake of which these conservation areas have been protected

Fig. 7. The results of fires and military action in Serebryansky Forest Department in Serebryansky Refuge. Source: DeepStateUA

from the least negative human impact for so long, as remaining shining examples of wilderness.

Another case occurred in Luhansk Oblast back in 2014-2017 when the Provallia Steppe area in Luhansk Nature Reserve was almost completely burned, and its central sector, located in the floodplain of the Siverskyi Donets River, was almost completely engulfed by fire. Until then the territories listed above had never suffered.

In other regions of Ukraine, where the war arrived only in 2022, the situation was similar: powerful fires damaged Black Sea Biosphere Reserve, Askania-Nova Biosphere Reserve, and all national parks in southern Ukraine. In Dzharylgatskyi National Park, for instance, almost the entire land-based section of this reserve was consumed by fire in 2023.

It is important to underscore that absolutely every single one of the most important protected areas within the conflict zone have been damaged by fire.

Unfortunately, from 2022 onward, the amount of Ukrainian territory affected by the war expanded significantly, and later – as a result of the war's transition to positional warfare and the use by Russian forces of "scorched-earth" tactics – the intensity of shelling per unit area during combat significantly increased the loss of natural ecosystems from fires.

According to DeepStateUA data, as of the start of March 2024, 7.2% of Ukraine's total territory has been liberated, while 18% remains occupied. The statistical

information on the areas damaged by fire presented in this article applies only to these parts of Ukraine.

In 10 years of war, Russia has carried out actions in Ukraine that closely match the concept of 'ecocide', and this can be seen most clearly in the case of forest fires. The fires studied by the authors represent just one of many aspects of the war's consequences for Ukraine's nature. •

Translated by Alastair Gill

Main image: Concentration of wildfires in Ukraine during the russian invasion. Infographic by Valeria Kolodezhna

Ukraine's protected areas: defended or degraded?

Viktoria Hubareva

Environmentalists argue that Ukraine is moving too slowly toward fulfilling the terms of its European Union Association Agreement, according to which the country must confer protections on 15% of its territory by 2030. Even in wartime, it is possible to begin to fulfill these obligations, a process that facilitates restoration of the nation's biological diversity, the health of which has suffered a significant blow during hostilities.

What is happening in Ukraine's protected areas in wartime?

Since 24 February 2022, approximately **812 protected areas (PAs) totaling almost one million hectares in size have been in the active combat zone or under occupation**. Among them are biosphere reserves Askania-Nova, Black Sea, Ukrainian Steppe, Luhansk Nature Reserve, and many others.

Read more:

- Wartime challenges for Ukraine's protected areas
- Protected areas and war: two years of humanitarian aid

Some protected areas have been liberated, but are faced with colossal consequences as a result of the war. For example, approximately 24,000 ha

Fig. 2. Sviati Hory National Park in Donetsk Oblast in winter 2023. Source: Ministry of Environmental Protection and Natural Resources

of forest were destroyed in Chornobyl Reserve alone. In Donetsk Oblast, 80% of Sviati Hory National Park was destroyed. Shelling and fires inflicted significant damage on many protected areas including National Parks Biloberezhia Sviatoslava, where more than 6,000 ha burned, and Nyzhnodniprovskyy, which was completely flooded after the terrorist attack at Kakhovka Hydropower Plant.

While their protected status has not disappeared, **biodiversity in PAs** has suffered significantly. Moreover, not only military actions lead to the destruction of nature, there are also many cases of negative impacts for protected areas associated with economic activities, pollution of water bodies with agrochemicals, agricultural plowing, and illegal logging. The list is endless.

Some PAs within the border zone will be completely eliminated

In February 2023, the Ukrainian Parliament adopted Law 2952-IX, according to which the country's border zone with both Russia and Belarus will be expanded from a few tens of meters to a width of two kilometers. In other words, these lands were withdrawn from protected areas and transferred to Ukraine's State Border Service.

Read more:

- Protected areas and border zones in Ukraine: How to harmonize them?

The purpose of the law, as explained by the document's authors in an explanatory note, is to create defensive infrastructure and a minefield along those borders. The process of fortifying the border area is proceeding slowly. Despite this, some community associations (as primary land users) are already disagreeing with proposals by environmental activists to convert their lands to protected areas if they are located on the border. Ukrainian Nature Conservation Group (UNCG) executive director and UWEC Work Group expert Oleksiy Vasyliuk, commented on one such case:

"We were going to create a protected area in a community in Sumy Oblast that shares a border with the Russian Federation. However, the community responded that it does not agree to protecting the lands since it is in a border zone and all protected areas within that zone have already been liquidated," comments Vasyliuk.

Activists have repeatedly pointed out the ineffectiveness of such a defensive measure: "*Almost all areas bordering Russia and Belarus in northern Ukraine are forests and impenetrable swamps, both of which represent insurmountable obstacles to the passage of military equipment. Preserving areas in a natural wetland state is the best preventative against a future large-scale reinvasion,*" UNCG warned in 2022, when the law was still a bill.

Vasyliuk added that eliminating these protections can not only make lands more accessible to the military, but can also harm wildlife. While minefields may not be noticeable for small fauna, its presence can have deadly consequences for large mammals.

Read more:

Beasts and barriers: Obstacles along international borders and their impact on land-based vertebrates

Creating more PAs by 2030 and the actual state of affairs

In May 2020, the European Commission presented perhaps the most ambitious environmental conservation document in European history — the "European Union Biodiversity Strategy 2030: Bringing Nature Back into Our Lives". The Strategy contains specific commitments and actions to be implemented throughout the EU by 2030.

Its most ambitious goals include:

- 30% of land and 30% of marine areas should receive protected status;
- 10% of agricultural lands should no longer be cultivated and their natural ecosystems should be restored;
- 50% reduction in pesticide use; and
- 25,000 kilometers of rivers should be restored to free-flowing condition.

Due to the ongoing war and Russian occupation, Ukraine cannot meet the 30%

Fig. 3. On a tour of Yermakov Island you may encounter water buffalo, which were introduced here in 2019 by the Rewilding Ukraine organization as part of a project titled "Restoration of the wetlands and steppes of the Danube Delta region". Marvelous "architects" of nature, water buffalo help preserve the patchwork landscapes and biodiversity of the islands. Source: Zhanna Sribna

requirement contained in the Biodiversity Strategy, and European partners understand this. At the same time, the country has other obligations under the Ukraine-EU Association Agreement, signed in 2014.

The Association Agreement became the basis for the State Strategy for Sustainable Development, which states that by 2030 Ukraine should protect 15% of the country's total area. The country has room to improve in this category. Today, Ukraine has reached less than half of that goal. At present, **protected areas account for only 6.7% of the country's total area instead of the 15% required by 2030.**

Despite the war, the process of converting lands to protected areas has not stopped, but the pace of protected area creation is significantly lower than that which is required to achieve the 2030 goal. For example, in 2022, only 0.085% of Ukraine's entire territory was added to protected areas, and in 2023 that number was just 0.02%. Over two years of war, only 0.1% of Ukraine's territory received protection.

At the same time, UNCG environmentalists calculate that the rate

Fig. 3. Site of the former Kakhovka Reservoir, fall 2023. Photo: Vladyslav Kutsenko

of environmental destruction stemming from the war significantly exceeds the rate of its conservation. For example, burned forests in the Chernobyl Reserve alone are almost twice the area protected in 2023.

What's the solution?

Considering lands damaged after the Russian terrorist attack – in particular the explosion of the dam at Kakhovka hydropower plant – restoration of Velikiy Luh watershed is a good example of a potential solution. At present, Ukraine's Zaporizhzhia Oblast already contains a national park with the same name, and ,prior to the war, plans were afoot to expand the park to include territories on Kakhovka Reservoir's eastern side.

Velyky Luh (Eng., 'Great Meadow') is one of Ukraine's most important natural and historical landscapes. The site was flooded during the creation of Kakhovka Reservoir more than 70 years ago. This area was once home to a Cossack state, and as a result many historical Zaporizhzhyy Sich sites rested beneath the reservoir's waters. Prior to its flooding, the area also contained numerous rare plant and animal species.

Velyky Luh was lost to nature, science, and Ukrainian identity for 70 years, but today there is an opportunity to influence the government's premature decision to rebuild Kakhovka Hydropower Plant-2, an act that could render restoration of the Great Meadow impossible.

Read more:

- Is it time to restore Velykyi Luh?

UNCG environmentalists are convinced that restoration of

Velyky Luh is not only timely and environmentally-justified, but has the additional potential to serve as worthy compensation for lost wildlife during the full-scale war.

The solution, however, is not limited to restoring Velyky Luh.

UNCG expertise also resulted in the creation of a series of protected areas in 2023, including Katalinski Refuge, Sukhobalkivsky Refuge, and Balka Zarubyna Refuge in Mykolaiv Oblast and Oblapska Linden Natural Monument in Volyn.

"Our initiative resulted in conservation of 4,688 ha of lands in protected areas, an area equal to one-third of all new lands receiving protection during the previous year. That said, this is an insignificant amount relative to what could have been created," a UNCG representative noted.

Although some lands awaiting conversion to protected areas are under temporary occupation, this is not a legal obstacle to awarding them protection. For example, two years ago, the Ministry of the Environment was preparing decrees to expand in Dzharylgatskyi National Park in Kherson Oblast, Dvurechenskyi National Park in Kharkiv Oblast, Velyky Luh in Zaporizhzhia Oblast, Vyzhnytskyi in Chernivtsi Oblast, and even Charivna Gavan (Eng. 'Magic Harbor') National Park in Crimea (occupied since 2014). Other natural landscapes await protected status, including Nivetskiy Refuge near Kyiv, a significant number of planned refuges in Mykolaiv Oblast, Berezanska National Park, and many others.

It is encouraging, however, that the process of creating more protected areas has not come to a complete halt during the war. For example, in November 2023 the Ministry of the Environment approved the expansion of Biloberezhia Sviatoslava National Park to include an area known historically as Olviyska Hora. And in March 2024, state-owned enterprise Lesa Ukrainy (Eng., "Forests of Ukraine"), the land user in all Ukrainian forests, supported the creation of Arshitsa Refuge in the Carpathian Mountains.

These moves give hope that despite the war that has been going on in Ukraine for over a decade, the country will slowly move toward achieving European goals for biodiversity conservation. •

Translated by Jennifer Castner

Main image: Serebryansky Refuge, a regional protected area in Luhansk Oblast, March 2024. Photo source: Ukraine National Guard

Spontaneous recovery in wartime: How Ukraine can become a testing ground for unique environmental projects

Oleksiy Vasyliuk, Viktoria Hubareva

Most of Ukraine's protected natural areas have been damaged by the war and have now been deprived of their environmental value, although nature is showing a striking ability to spontaneously recover in belligerent landscapes. So what is the potential for the preservation and recovery of ecosystems and biodiversity in these areas?

UWEC has already covered the subject of rewilding and post-war recovery, including the surprising recovery of nature on the site of the former Kakhovka Reservoir on the Dnipro River and the Oskil Reservoir on the Oskil River, where the dams were blown up for military purposes. We have also featured the recovery of the valley of the Irpin River in Kyiv Oblast, after it was flooded by water from the Kyiv Reservoir back in the very first days of the full-scale Russian invasion.

The recovery of these and other territories and ecosystem services will be the primary task once the war ends.

However, there are also plenty of cases in which the renewal of ecosystems begins completely spontaneously.

What does war-wilding mean for Ukraine and what potential does it have?

Despite the colossal damage inflicted on ecosystems, species have shown an astonishing ability to return to damaged areas. The concept of war-wilding, introduced in 2022, is a very apt description of this process. Large-scale military impacts on the landscape create unique conditions in which people abandon territory for an extended period, leaving nature the chance for spontaneous recovery. We are not saying that this is a positive process, since after all it inflicts suffering on protected conservation areas and causes irreversible destruction and colossal losses. In addition, the vegetation that appears on fields and in settlements riddled with craters and shell damage is predominantly made up of invasive species, the spread of which is highly undesirable. However, spontaneous recovery in places where ecocide has taken place is today's reality.

Good examples of war-wilding include the recovery of natural ecosystems on the site of the former Kakhovka Reservoir and the mass overgrowth of damaged territory along the frontline. The fact that many of these areas are heavily mined will ensure that huge tracts of land will continue to have the status of spontaneous recovery zones long after the war's conclusion. Essentially, this means that there will be millions of hectares of land where it will be impossible to influence the processes underway in local ecosystems in the coming decades.

But there is also a positive side to this issue. Given the right circumstances, Ukraine's abandoned territories, which in the coming decades will be economically useless, can help Ukraine or Europe as a whole to achieve environmental goals, which until now had seemed pretty distant and unrealistic. If spontaneous natural recovery processes for vegetation are given proper support from sponsors, we will have a world-class modern environmental conservation project. And this is just one of the scenarios that will be discussed down the line.

Scenarios of this kind are possible all over Ukraine, given the number of international obligations we have taken upon ourselves, signing up to a multitude of conventions, such as the Convention on Biological Diversity, the Berne Convention, the Association Agreement with the EU, etc.

Where is spontaneous recovery taking place and what needs to be done for it to continue?

Many of the international pacts, plans, and conventions that Ukraine

has joined, and which aim to improve biodiversity and conserve ecosystems, have set goals to be achieved by 2030. Reaching these targets requires nature restoration on an unprecedented scale in areas where it has already been lost or degraded (most of these areas are now used for agriculture). Making decisions of this scale would be a challenge for any country, and the right to private ownership of land will prevent such goals from being reached in millions of individual cases. However, such difficult and unpopular reforms must still go ahead for the sake of a sustainable future, and developed countries understand this.

Objectively speaking, the only place in Europe where we can see large-scale recovery of nature is the part of Ukraine which has suffered from military action. Despite much of the land being privately owned, having a designated purpose or being subject to other legal circumstances, vast areas will remain contaminated and mined for many decades after the war, unavailable for a return to their usual economic use. Until the hypothetical return of agricultural activity on these territories in the distant future, nature will continue to recover and flourish here.

Of course, this scenario should be considered, since nature will recover whether conceptual decisions are made or not, and this process is already under way. However, significant changes in legislation will have to be made to "legalize" spontaneous natural processes, and funds will probably have to be sought to compensate landowners. These could be sourced from Russian reparations or European environmental programs. But the effective and sustainable restoration of nature will only be possible with proper legal protection.

It is important to note that in the majority of cases forests are expected to recover (within river valleys local species will dominate, while alien tree species will appear on abandoned fields and in settlements). For now it is hard to assess the total area of "spontaneous recovery" but it can be expected to cover no less than 20-30,000 square kilometers. This natural recovery on territories lost to the economy can be a mutually beneficial scenario for Ukraine and its Western partners, since the situation Ukraine has found itself in is actually the most convenient scenario for achieving European goals.

It is no less important to also look strategically at the fact that the steppe climate zone (in which the majority of the lands directly affected by the war are concentrated) is dominated by steppe ecosystems and it is precisely they that are most effective in carbon sequestration in this region. So environmental management will be important in planning nature restoration activities with the potential to facilitate

Fig. 1. Oleksiy Burkovsky at the pilot site for restoration of steppe vegetation in the Donetsk region. Source: Oleksiy Burkovsky, personal archive

the rapid replacement of spontaneous invasive vegetation with local species of steppe plants that effectively sequester carbon and restore soil fertility.

In southeast Ukraine there is already an innovative project **by the environmentalist Oleksiy Burkovsky**, who for several years already has been testing a methodology for restoring steppe ecosystems on a site specially removed from agricultural use for this purpose.

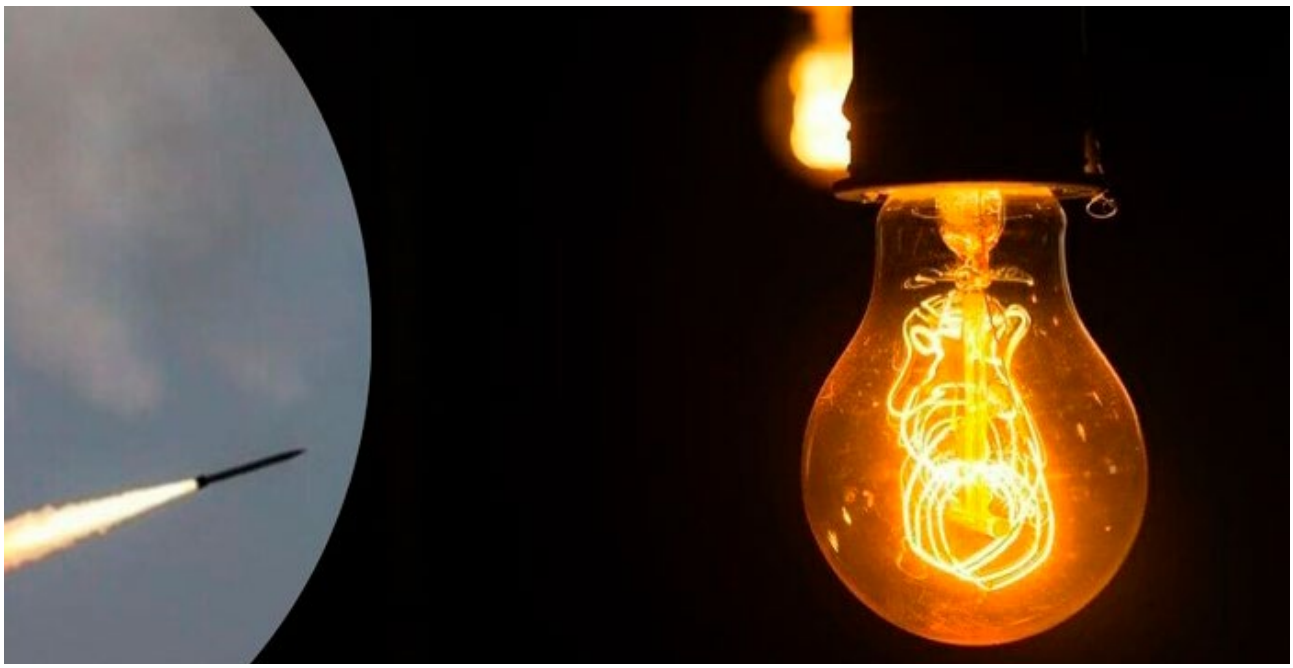
You could say that Burkovsky is growing steppe on his plot of land. This local experiment, which already looks like a clearly working model, can be scaled up in the future to restore natural vegetation over much larger areas. In the years to come it will also help the transition of southern Ukraine's economy from destructive arable farming and irrigation to an ecologically established model of pasture livestock farming.

For other states it may be of potential benefit to compensate Ukraine financially for the loss of agricultural areas and support the recovery of nature in Ukrainian territory, while preserving the country's economic status quo. In such conditions the presence of additional resources will enable Ukraine

Fig. 2. A sector of recovered steppe vegetation in the Donetsk region. Source: Oleksiy Burkovsky, personal archive

to establish a new, compact industrial sector and a system for resettlement in safe areas, and to leave areas damaged and contaminated during the war as spontaneous restoration zones. •

Main image credit: Alex Klochkov



Environmental consequences of the war in Ukraine: **April 2024 review**

Alexej Ovchinnikov

Each month, the UWEC editorial team shares highlights of recent media coverage and analysis of the Ukraine war's environmental consequences with our readers. As always, we welcome reader feedback, which you can leave by commenting on texts, writing to us (editor@uwecworkgroup.info), or contacting us via social networks.

Russia's latest attack on Ukraine's energy network

In late March and early April 2024 Russia renewed its campaign of mass attacks on Ukraine's energy network. From April 8–11 alone, two thermal power plants, six electrical substations, two energy facilities, one gas, and one oil storage facility were hit by missile strikes. The Trypilska thermal plant, located just outside Kyiv, was destroyed. It is one of Ukraine's biggest heating facilities.

According to representatives of Ukraine's largest energy company DTEK, six thermal power plants have been hit over the past few weeks, with five of them sustaining serious damage. Returning them to operation will require time and resources, and there is a high probability that it will not be possible to restore the power grid before the start

of the next heating season in the fall. These missile attacks have already led to a series of blackouts across the country: Kharkiv, Ukraine's second-largest city, was left without power and heat for several days after attacks in late March.

As Elena Pavlenko, president of the **Dixi Group** analytical center, explained in an interview with BBC Ukraine, in the last few weeks the Russian army has altered its tactics. Instead of mass bombardments, they have begun to conduct more precise strikes on specific targets. And while previously their aim was to cut off power-generating regions from the rest of the country by disrupting power lines, they are now seeking to carry out attacks that will cause general disruption to the energy grid itself, destroying thermal power plants and major substations. Pavlenko also pointed out that the attacks may also be aimed at seeking out weak spots in the air defense.

It is not only Russia's tactics for attacking energy facilities that have changed: there is a cynical and cruel dimension to the way it now targets Ukraine's civilian infrastructure using missiles. Several attacks are often carried out on one site within a short space of time in order to increase the number of victims. This is exactly what happened in mid-March in Odesa, when a team of rescuers who had arrived on the scene of a fire that had broken out as a result of an initial missile attack were hit by a secondary strike. Repeat attacks are also being carried out against already restored energy facilities.

The energy network is also suffering in occupied areas of Ukraine. Following a recent drone attack (which, according to the results of an investigation by British analysts McKenzie Intelligence Services, may have been a false-flag operation by the Russians), the last operating power unit at the occupied Zaporizhzhia nuclear power plant was put into cold shutdown, in response to recommendations by the International Atomic Energy Agency (IAEA). Today all six of the plant's power units are in cold shutdown, although, as the agency's director general Rafael Grossi points out, the situation remains unstable. The frontline is not far away, and IAEA representatives at the plant say that explosions can be heard from the station itself.

The destruction of civilian infrastructure and the potential threat of air strikes on nuclear power plants increase the risks of another environmental disaster in Ukraine. The bombardment of oil depots and thermal power plants results in air, soil and water pollution, while the ongoing attempts to repair damaged facilities require additional resources. In addition, the use of repeat strike tactics causes fire patrols to act with greater caution, with a knock-on effect on the quality of firefighting and responses

to emergency calls. When it comes to nuclear power plants, the greatest danger is posed by spent nuclear fuel storage facilities, which run the risk of becoming accidental or special targets during attacks.

Why decentralizing the system is the solution to energy security

If Russia continues with its tactics of firing missiles at large thermal power plants, hydroelectric power stations, and other power-generating stations, then Ukraine will obviously be faced with a choice: either to restore the centralized carbon-based power network, which can always be destroyed again, or to move to a more decentralized energy system based on energy efficiency principles and the use of renewable energy sources.

The idea of decentralization is being actively promoted by the Ukrainian organization Razom We Stand, which is also campaigning for the strengthening of sanctions against Russian hydrocarbon fuels. On 21 March 2024, the organization joined forces with E3G, Berlin Economics, and Low Carbon Ukraine Project to hold an event titled "Rebuilding Ukraine's Power Sector with Green Technologies: Opportunities for German-Ukrainian Cooperation."

Specialists from Razom We Stand have prepared a policy paper titled **"Prospects for the Ukrainian Electric Power Industry for 2023-2024: Investments in Old Coal-Powered Plants or New Decentralized Green Generation?"** The document highlights a number of advantages that modernizing the energy system and abandoning centralized, coal-based energy units would bring. These advantages include energy security, and achieving sustainable development goals, adaptation to climate change, as well as the development of new green technologies.

"Every crisis creates an opportunity, and the war damage sustained by Ukraine's energy system can provide the opportunity to build back better," said Pavel Bilek, deputy director of the "Low-Carbon Ukraine" project, speaking at the event. *"Replacing its damaged coal plants with renewable and storage technologies and boosting interconnectors with the EU will now help continue to improve Europe's energy security and fight climate change,"* added Pieter de Pous from E3G.

According to Maksym Bevz, head of the Renewable Energy and Green Recovery group at Razom We Stand, in order to completely move away from coal-powered generation by 2034, Ukraine will need 12 gigawatts of new installed capacity and $17.2 billion in investment. For a country whose economy has suffered significantly from the Russian invasion, such projects are only possible with the financial support of partners from other countries.

In any case, restoring Ukraine's energy grid will require a huge investment. Kyiv will make a decision this year on whether the country's energy network will continue to be based on large thermal power plants, hydroelectric power stations, and other units that are attractive targets for attack, or on a more extensive decentralized power-generation system lacking critical facilities as such.

Environmental organizations are taking an active role in projects for the green restoration of Ukraine, especially the development of energy-efficiency projects

The war may still be going on, but projects for rebuilding Ukraine are not only already being discussed, but are being implemented. At a recent conference on the energy efficiency of rebuilding Ukrainian cities, the Kyiv-based environmental organization Ecodiya ("Ecoaction") and Berlin Economics presented a study titled **"Green Recovery of Housing Stock: A Technical and Economic Analysis for the Town of Bucha."**

> Bucha is a small satellite town northwest Kyiv. Before the war, the town was seen as an up-and-coming suburb, and many young families moved here to live in multi-story apartment blocks and growing numbers of single-family homes. During the full-scale invasion of spring 2022, Bucha and nearby Irpin were the scene of intense fighting on the approaches to Kyiv, which resulted in a significant portion of the town being destroyed. Bucha also acquired a tragic notoriety as the site of a massacre of civilians by occupying Russian troops in March 2022.

The study, which is freely accessible (in Ukrainian) online, makes the case that if homes in Bucha are rebuilt or new buildings are constructed according to a "minimum needs" principle, it will be possible to reduce the amount of natural gas used for heating by 45%, while the "Near Zero Energy Building" scenario will allow consumption to be reduced by up to 75%.

As researchers note, increasing energy efficiency levels will not only make homes more energy-independent, but also to reduce emissions of greenhouse gases, thereby contributing to the goal of achieving climate neutrality.

"Our research has shown that any recovery projects must be realized in accordance with high energy efficiency standards, such as nZEB, which will become mandatory for new construction in Ukraine from 2027," says Anastasiia Horbach, an energy policy expert from Ecodiya. "Complying with them will lead

Fig. 1. The strikes launched on April 8–11 targeted energy hubs across Ukraine. Source: Texty.org.ua

to enormous savings in energy resources and costs, which Ukrainian municipalities will then be able to effectively use for their own sustainable development. In the national context this will make a major contribution to the state's energy security and the decarbonization of the economy, and will also create new jobs."

Naturally, energy-efficient construction projects will come at a higher cost than conventional construction. However, the period needed to recoup the initial investment for a project like this is naturally affected by the degree to which energy consumption is reduced. Taking reduced gas tariffs into account, this period ranges from 27 to 33.6 years. In the case of more realistic energy tariffs, the payback period falls to 15.3 years under the "Minimum Needs" scenario and to 19.4 years under the "Near Zero" scenario.

Ecodiya has also joined the Ukrainian network "Vikno Vidnovleniya" (Recovery Window), whose goal is to bring together journalists, experts and leaders from local communities to rebuild the country. As part of the project its participants are planning to describe the processes of recovery in different regions of the country,

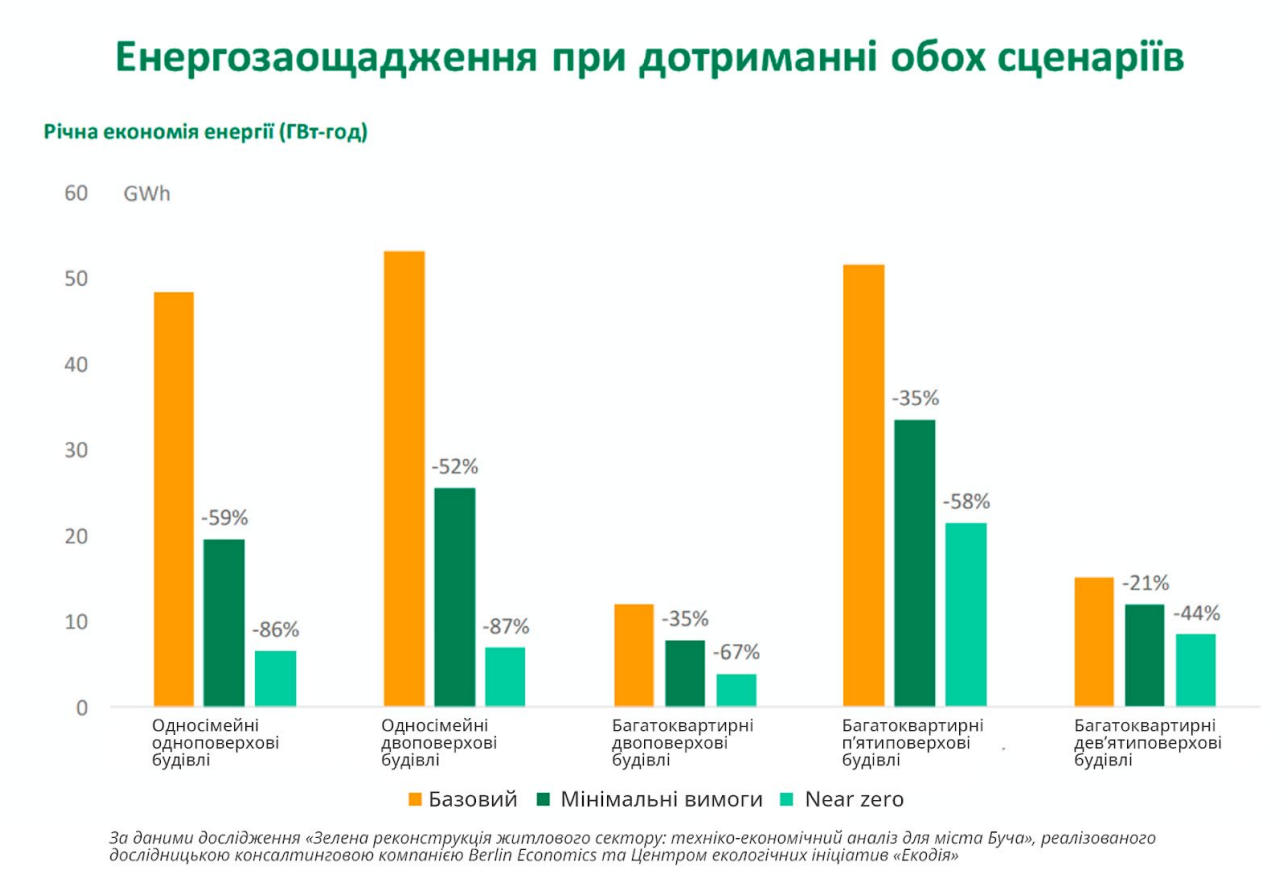


Fig. 2. Energy consumption for three different scenarios. The orange column represents basic consumption, dark green shows consumption in the "Minimal Needs" scenario, while light green shows "Near Zero." Five different residential categories are depicted (from left to right): single-family one-story house, single-family two-story house, multi-apartment two-story, multi-apartment five-story building, multi-apartment nine-story building. Source: Ecodiya

ensure that these processes are green and socially sustainable, develop the most effective and modern recovery projects, and allow for the participation of environmental organizations.•

Main image source: glavcom.ua

Distributed electricity generation in Ukraine: the risks and opportunities

Oleksiy Vasyliuk, Eugene Simonov

The decentralization of Ukraine's energy sector, which has gained new impetus in 2024 as a result of Russian missile attacks, is currently the subject of intense discussion – one which has an important environmental dimension. Using solar energy as an example, this article analyzes possible ways forward for the development of renewable energy sources in Ukraine and examines the challenges that must be overcome in order to quickly resolve the conflict between the need for renewable energy and nature conservation in the country.

Decentralizing everything but energy

In 2014, Ukraine finally signed an Association Agreement with the EU, marking the official beginning of the country's journey toward European integration. Among the many specific legislative amendments provided for in the agreement, perhaps the most fundamental was decentralization, currently one of the most important areas of reform in Ukraine.

The decision to move away from vertical government and the decentralization of budget flows and taxes, coupled with a significant widening of decision-making capabilities at a local level, has breathed

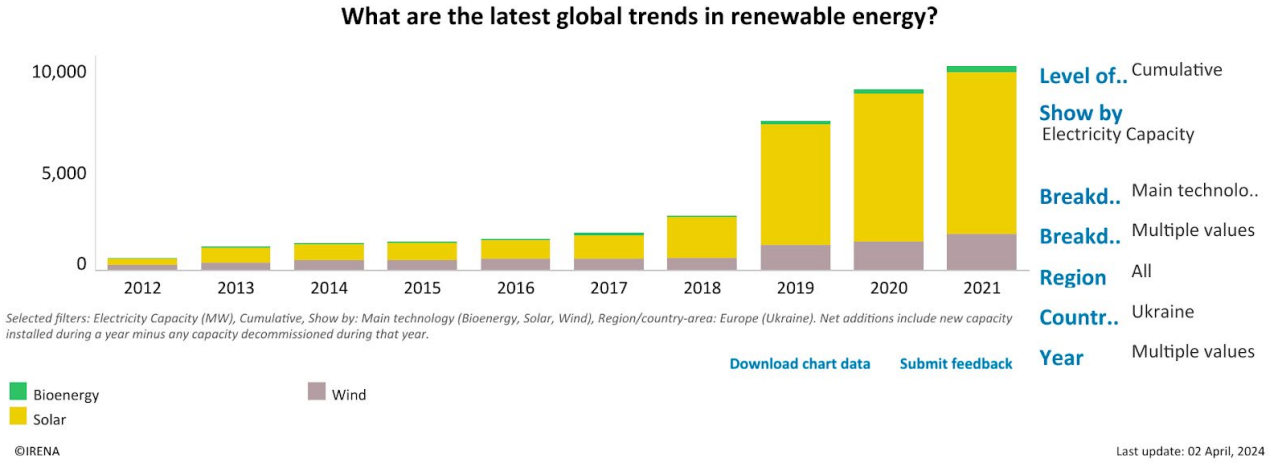


Fig. 1. Growth in installed capacity of renewable energy sources in Ukraine from 2011-2021, showing solar power (yellow), wind power (gray) and biogas (green). Source: International Renewable Energy Agency (IRENA)

new life into the regions and instilled belief in the capacity of local authorities to self-govern. Administrative decentralization followed, as a result of which Ukraine has been divided into hromady (communities) – a completely new type of administrative unit, with new borders and judicial capabilities. The process of transferring land in the hromady into communal ownership is now underway.

But decentralization has yet to reach the energy sector. This is owing largely to the way the power network was developed in Ukraine – as it was all over the USSR – during industrialization in the mid-20th century. The network was based on providing cities with heat and electricity supplied by large-scale energy hubs: large nuclear power plants, hydroelectric and thermal power plants. In these circumstances, small power plants were not traditionally assigned any importance and were seen as either a source of profit for their owners or as a kind of symbolic gesture to global trends for the development of green energy. The country's national energy network, which includes large nuclear power plants, hydroelectric power plants and thermal power plants, continues to play the main economic role.

Nonetheless, Ukraine's rapid development of green distributed generation has set it apart among post-Soviet countries. It has introduced a "green tariff" and set up a technological support base. From 2011 to 2022, solar power plants (SPPs) with a combined capacity of 8 GW were put into commission, five times more than in vast Russia (1.66 GW) and 50 times more than in comparably-sized Belarus (160 MW). Most of Ukraine's renewable energy plants were built in the south of the country, with its optimal solar radiation conditions and the steady winds characteristic of the steppe climate zone.

Fig. 2. The construction of a solar power plant on the slopes of a steppe ravine in the Mykolaiv region, as recorded in satellite images from 2018 and 2020. Source: Google Maps

Renewable energy and nature conservation in Ukraine

However, the development of renewable energy was not accompanied by reasonable environmental requirements, especially when it came to the selection of sites for new facilities, bringing the goals of economic decarbonization and environmental protection into conflict.

The south of Ukraine, which is the most suitable area for the construction of wind turbines and solar power plants, remains the most agricultural part of the country, with up to 80% of land used for crop farming in some areas. There are very few natural areas left in the south and they are constantly shrinking due to crop farming. Yet the ban on the use of agricultural land for energy and industrial needs and limited opportunities to situate renewable energy sources in populated areas mean these last remaining natural areas are essentially the only places where large solar power plants can be located. The hromady had no incentives (and nothing has changed) to preserve the remnants of southern Ukraine's distinctive ravine-based balka steppe ecosystems (a balka is a level, dry turf-covered river valley with seasonal water flow) and happily surrender them for development. The state does not fund nature conservation, and residents of agricultural regions still subscribe to Soviet-era mantras that all available land should be used.

The situation is aggravated by the fact that under Ukrainian legislation, SPP projects are not subject to an environmental impact assessment (EIA), meaning that conflicts with protected areas and other environmental harm caused by their construction are not taken into consideration. Often,

Fig. 3. The construction of a solar power plant on the sandy steppes of Lower Dnipro National Park in Kherson Oblast, as recorded in satellite images from 2018 and 2022. Source: Google Maps

environmentalists only learn about the construction of a solar power plant in a nature reserve or national park after it has been put into operation. At the same time, the laws do not provide any alternative mechanisms for resolving such conflicts in advance. As a result, remnants of natural steppes, ravine, or sand dune ecosystems, floodplain meadows, and even parts of local reserves and natural monuments were often allocated as sites for the construction of solar power plants – the Stepnohirsk reserve in the Zaporizhzhia region, for example.

Why energy decentralization is feasible – and desirable

In the spring of 2024 Russia embarked on its second serious attempt to destroy Ukraine's energy infrastructure, and the country was faced once again with the task of restoring and bolstering the resilience of the energy network. While, after the Russian attacks of winter-spring 2023 the swift restoration of centralized energy resources was seen as the sole solution, in 2024 a number of high-ranking officials have already spoken out in favor of redirecting resources to the rapid creation of distributed generation.

"When we have 5-10 large power plants, then they are targets and can be hit. When we have hundreds of small power plants, attacking small objects with missiles will be basically unrealistic or extremely expensive," said Andriy Herus, Chairman of the Committee on Energy, Housing, and Utilities in the Verkhovna Rada of Ukraine. Volodymyr Kudrytskiy, head of state-owned energy company Ukrenergo, also spoke about

Fig. 4. Results of a missile attack on a solar power plant in Merefa, Kharkiv region. Source: Zmina

the need to urgently establish distributed generation in the country.

In the economic sense this is a perfectly viable idea, since in the course of 2023 solar panels have again almost halved in price, as a result of which a total of 473 GW of new renewable energy capacity has been commissioned around the world. Of this, 346 GW is produced by solar power plants, which has made solar power the world leader among all renewable sources in terms of installed capacity. For Ukraine, it appears that creating a network of 100 solar power plants with battery storage will be cheaper than restoring destroyed thermal power plants and hydroelectric power plants (which will only become a renewed target for missile attacks). The energy system will still need some additional maneuverability, but once it is connected with the European Union grid, this problem will probably be easier to solve using on-demand energy transmission.

It should be acknowledged that some SPPs, even those located deep in the Ukrainian rear, have been purposefully targeted and destroyed by missile strikes (in the Kharkiv, Dnipro and Mykolaiv oblasts, among others). Solar power plants near the town of Oleshky in Kherson region were also ruined, as they were located in the zone inundated by floodwaters from the Kakhovka hydroelectric power plant. But damaged solar power plants require minimal time for restoration, since all that is needed is to install new standard modules to replace the broken ones.

Ukraine's transition to renewable energy sources will reduce the cost of energy supply, lower greenhouse gas emissions and make the energy system more inclusive: it will be directly owned by the population, not just by corporations. However, to ensure that this transformation does not destroy biodiversity and ecosystem functions, it is essential that energy development programs are harmonized with the tasks of protecting wildlife.

Green transition and nature conservation in the EU

The European Union, for which the war has also raised questions of energy security, has taken a number of radical steps to hasten the commissioning of renewable energy sources. For instance, Brussels has abolished the requirements for conducting an EIA for renewable energy projects located in zones specially designated for the development of electricity generation. It was assumed that when conducting strategic environmental assessments (SEA), countries would ensure in advance that locations selected for large renewable energy facilities did not conflict with other interests (such as environmental). Considering that by 2050, renewable energy facilities will need to cover an area equal in size to Sweden in order to cover the EU's needs, this is no easy task.

Read more:

- Does REPowerEU Reinforce or Contradict the Green Deal?

Environmental organizations consistently criticize the acute weakening of environmental standards, since the SEA process cannot assess all specific local risks, and it does not offer the same mechanisms for public participation and control as EIA. In a recent report, CEE Bankwatch proposed a phased approach to hastening the introduction of renewable energy sources, with a first stage focused on installing renewable energy sources in already intensively developed areas. This will give time for mapping other potentially "conflict-free" territories and for public discussion of the acceptability of locating renewable energy facilities in each of them. At the first stage, priority should be given to decentralized energy in the form of solar panels and heat pumps, which will give time to prepare for the sustainable use of other types of renewable energy. On the whole, the report suggests an emphasis on the rapid deployment of solar energy as the most feasible and efficient element of the modern energy system and the creation of all possible support mechanisms for this process, including accelerated training for solar panel installers.

Other environmental organizations have already conducted comprehensive spatial analyses for the least conflict-prone placement of renewable energy sources. April 2024 saw the publication of the results of this mapping for the location of wind farms and solar power plants in 33 European countries, conducted by specialists at The Nature Conservancy. They propose a step-by-step planning algorithm that makes it possible to select areas for the development of renewable energy sources with low biodiversity value and where there is greater support for projects from the local population,

Fig. 5. A solar power plant built on degraded agricultural lands near Shcherbani, Mykolaiv Oblast. Satellite images from 2018 and 2022. Source: Google Maps

which ultimately reduces the cost of projects and reduces the time needed to obtain permits for the construction of power plants.

How to create decentralized renewable energy sources in Ukraine

In order for Ukraine to accelerate its development of decentralized energy, Kyiv must establish similar safeguard mechanisms based on environmental planning and public participation. From a technological perspective, solar power is currently the preferred option for the development of renewable energy: it is the cheapest, the least vulnerable and convenient to integrate into the development of settlements and communities. A strategic environmental assessment of the available land needs to be conducted in order to identify areas most suitable for the construction of solar power plants, where there is minimal conflict with environmental concerns and the needs of the local population. It is likely that, as in the European Union, the most promising lands will be degraded areas of agricultural land located right next to populated areas.

Unlike the European Union, however, Ukraine also has the option to use land plots damaged during military operations to locate solar power plants. These can be built on the sites of buildings that are too badly damaged to be reconstructed and on agricultural land that has been hopelessly contaminated as a result of shelling. Both are often located along roads and near populated areas. It is also possible to use other anthropogenically transformed landscapes, such as slag heaps in coal mining areas. On the other hand, as large-scale restoration proceeds, it is necessary to focus not only on increasing the energy efficiency of buildings, but also for the mandatory installation of solar panels on all buildings, whether they have been repaired or are newly built.

An energy transition is impossible without public participation

The experience of democratic countries (and Ukraine itself) shows that for such programs to be effective, it is essential to have mechanisms that ensure public participation and oversight. In March 2024 the European Commission received a joint letter from European environmental NGOs with a list of demands to the Renewable Energy Guidance on Designating Renewables Acceleration Areas, which the EU is preparing to publish. The letter demands the use of scientifically based planning methods, as well as a multi-level mechanism for involving the public. On one hand, it is important to create incentives for both municipalities and individual households to use renewable energy sources. On the other hand, broad public participation is necessary in planning energy development and conducting strategic environmental assessments to select potential locations for power generation.

Restoring mechanisms for public participation in the planning and evaluation of development projects is also one of the central ideas advanced in the Environmental Compact for Ukraine report compiled by the High-Level Working Group on the Environmental Consequences of War (the Andriy Yermak and Margot Wallström Group). The report states: "Ukraine should review its laws as well as any wartime exceptions that are currently in place and make the necessary changes to ensure that all building or reconstruction projects are assessed for their environmental impacts, and that compliance with the EU's environmental impact assessment and strategic environmental assessment directives is ensured." •

Translated by Alastair Gill

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Ukraine War Environmental Consequences Work Group