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- CLIMATE CHANGE
- POST-WAR RECONSTRUCTION
- GREEN DEAL AND UKRAINE

CLIMATE

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CLIMATE PERSPECTIVES FOR POST-WAR UKRAINE

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This article describes the effects of the active hostilities on the environment in the short and long term, as well as examines the EU's nature-oriented policy and solutions for energy safety in the global climate context of the war. The new opportunities for low-carbon post war development in Ukraine are considered.

By 2040, an increase in the average annual temperature in Ukraine is expected, within the range of 0.8–1.1 C¹. Taking into account the drastic influence of the war, the worst scenario can be foreseen. Temperatures are expected to rise significantly during the summer months, leading to more drought and more heat. During the next several years, a redistribution of precipitation is expected, with an increase in the cold season and a decrease in the warm one. At the same time, the intensity of precipitation will increase in the warm period of the year. This could lead to an increase in flash floods. The number and frequency of spontaneous hydrometeorological phenomena will rise.

In the territories where active hostilities are taking place, we observe deliberate destruction of the environment by Russia, in order to create economic and infrastructural problems. The movement of heavy military equipment, bombings and air strikes, missile

attacks, the construction of fortifications, and the use of phosphorus ammunition all cause a negative impact on every aspect of the ecosystems. The destruction of potentially dangerous industrial facilities, in particular the nuclear, chemical, and oil refining industries, is constantly taking place, and generating a negative impact on the environment. The cost of damage to Ukraine's ecosystems, according to preliminary estimates of the Ministry of the Environment, at the beginning of June had already exceeded UAH 200 billion².

Military operations on the territory of Ukraine directly affect the environment by changing the landscape; causing loss of natural resources and damage to the soil; as well as losses to the forest and nature reserve fund; polluting water, atmospheric air, and soil. The frequency of fires in Ukraine's ecosystems have increased due to the hostilities. This, in turn, leads to the degradation of vegetation

1 Official website of the Ministry of Environmental Protection and Natural Resources of Ukraine (MEP) [<https://mep.gov.ua>]

2 Digest of the MEP of Ukraine about the environmental consequences of the Russian aggression in Ukraine [<https://mep.gov.ua/news/39034.html>]

and increases wind and water erosion, and causes the loss of biodiversity. In addition, there are obvious threats to nuclear security through radiation leaks.

Military actions threaten the sustainable development of the entire planet, in particular in the context of achieving climate goals. According to the National Oceanic and Atmospheric Administration (NOAA), in May, 2022, the carbon dioxide concentration index was 420.99 ppm. In the same period in 2020 it had been 417 ppm³. Military actions undoubtedly increase the concentrations of GHG (Greenhouse gases), mainly due to the use of large amounts of fossil fuels, as well as specific components that cause other negative reactions in the atmosphere.



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Thus, as a result of the hostilities on the territory of Ukraine, the number of emissions of pollutants into the atmospheric air is increasing, including greenhouse gases (CO₂, methane, nitrogen oxides, and chlorofluorocarbons). During the detonation of rockets and artillery shells, a number of chemical compounds are formed:

carbon oxides, water vapour, nitrous oxides, formaldehyde, and vapours of cyanic acid, as well as a large number of toxic organics. During the explosion, all substances undergo complete oxidation, and the products of the chemical reaction are released into the atmosphere. For example, 1 kg of explosives also forms several tens of cubic meters of toxic gases among which there are also dangerous under-oxidized organic compounds, in particular aromatic ones⁴.

Reducing the transparency of the atmosphere due to the accumulation of a large amount of dust, ash and soot also affects the strengthening of the greenhouse effect. Forest fires lead to a significant reduction in the area of green vegetation, which in turn reduces CO₂ fixation (assimilation) and deepens the consequences of climate change. Since the beginning of 2022, fires have been recorded in the forests of Ukraine on a total area of 5.5 thousand hectares – this is 96 times higher than the previous year's⁵. Currently, according to EcoZagroza⁶, 85,000 tons of petroleum products have been burned during the war, resulting in about 300,000 tons of emissions from combustion products.

Currently, we do not have open up-to-date statistical data on the dynamics of air pollution in the regions of Ukraine where active hostilities are taking place, but “the amount of emissions of pollutants into the atmospheric air during hostilities on the territory of Ukraine can already be equal to the emissions of one metallurgical enterprise for the entire year of operation”⁷.

3 Global Monitoring Laboratory at Manua Loa [<https://gml.noaa.gov/ccgg/>]

4 Assessment of environmental damage and priorities of environmental restoration in Eastern Ukraine [https://www.osce.org/files/f/documents/6/3/362581_0.pdf]

5 Digest of the MEP of Ukraine about the environmental consequences of Russian aggression in Ukraine [<https://mepr.gov.ua/news/39034.html>]

6 Ecozagroza – Dashboard of the Ministry of Environmental Protection and Natural Resources of Ukraine with data on environmental threats [<https://ecozagroza.gov.ua/>]

7 Digest of the MEP of Ukraine about the environmental consequences of the Russian aggression in Ukraine [<https://mepr.gov.ua/news/39034.html>]

The experience of eight years of armed conflict in the Donetsk and Lugansk regions also does not give grounds for optimism. A significant increase (by 5-8 times) in the concentration of SO₂, NO₂ and CO₂ had already been recorded by the automated monitoring station operating in Shchastya by mid-August 2014⁸.

All of this adds up to costs for future generations, jeopardising public health, infrastructure, economic growth, and overall human survival. There is a risk that Ukraine will not fulfil the already set climate goals, because the war is a contribution to climate change, and the recovery of the country will inevitably be accompanied by significant emissions of greenhouse gases.



Foreign investments will require a clear position to be taken by the authorities and foreign donors regarding the prevention of further damage to the environment

In terms of climate, unusual features are coming into play that can interact in many ways with the consequences of the war in Ukraine, such as the lingering effects of the pandemic and protracted conflict situations, and either these may lead to or aggravate the major humanitarian crisis⁹. Such changes will lead to the profound need to rebuild the energy system and infrastructure of settlements and communities in the post-war period. Hence, climate adaptation policy has to be embedded into the strategies for the post-war restoration of the local economic and social development, as soon

as possible. Although Ukraine has gradually modernised its production capacity by introducing new technologies, many of its capital and production technologies were outdated. The reconstruction gives Ukraine the possibility of making a “technological leap”. The most obvious possibility is to create a carbon-free economy as a way to coordinate investments in the future, and to reduce dependence on fossil fuels as much as possible.

Foreign investments will require a clear position to be taken by the authorities and foreign donors regarding the prevention of further damage to the environment. This means a check-up of all state institutions providing safety, including those involved in environmental safety and climate change prevention. Although the war is not fully controllable, it reveals areas for development in the sphere of public administration and areas of risk. The following environmental risks are expected to be very high:

1. A risk of maximising the use of natural resources for the post-war reconstruction, destruction of natural areas with the “mandate to prevent famine”;
2. A risk of increasing carbon emissions due to the production of building materials for the reconstruction;
3. A risk of exploiting part of the natural territories that decrease the carbon footprint during the development or restoration of the Ukrainian cities and towns;
4. A risk of reconstruction of destroyed buildings without meeting environmental standards, thus reducing the resilience of buildings in terms of climate change;

8 Assessment of environmental damage and priorities of environmental restoration in Eastern Ukraine [https://www.osce.org/files/f/documents/6/3/362581_0.pdf]

9 REPowerEU: A plan to rapidly reduce dependence on Russian fossil fuels and fast forward the green transition, 18 May 2022 Brussels [<https://www.eurointegration.com.ua/experts/2022/07/7/7142746/>]

5. A risk of shifting the accent from investments in RES to investments in Nuclear Power Stations (including small modular nuclear reactors with a capacity of 50 to 300 MW) that are very vulnerable to terrorist attacks;

6. A risk of increasing the capacity of the country's own gas production and neglecting Green Deal decarbonisation principles;

7. A risk of ignoring the ecological obligations which were adopted in the frames of the EU-UA Association agreement, for instance cancellation of the strategic environmental assessment (SEA) of the restoration programmes of regions of the territorial communities.



The faster the pace of Ukrainian-European integration is, the more thoroughly and extensively the Ukrainian energy industry, as well as the other sectors of the economy should be transformed towards climate neutrality.

Considering all the above-mentioned risks, Ukraine faces large-scale and important tasks: restoration of the critical infrastructure, ensuring ecological and energy security, further implementation of the EU legislation, the fight against climate change and adaptation to it, etc. The faster the pace of Ukrainian-European integration is, the more thoroughly and extensively the Ukrainian energy industry, as well as the other sectors of the economy should be transformed towards climate neutrality. It has been suggested to create the International Agency for the Reconstruction of Ukraine, through which experts in various fields will be engaged in the modernisation and restoration of the country. Similar functions were performed

by the Economic Cooperation Administration (ECA) which administered the Marshall Plan for Europe after World War II. This Agency should engage experts from the Ukrainian civil society (that were not enough represented before the war, despite the requirements of many international donors), the EU, G7 and other countries which are eager to support Ukraine in post-war reconstruction.

An important event in terms of defining further international support for Ukraine took place on July 4-5th in Lugano (Switzerland). The Ukraine recovery forum was an opportunity to share Ukraine's Recovery Plan, and engage international partners to develop the best possible response to the enormous challenges lying ahead. During the conference, the process of rebuilding Ukraine in a sustainable manner was aligned with the 2030 Agenda for sustainable development and the Paris Agreement, integrating social, economic and environmental dimensions including green ones. A week before the conference, the Swiss Federal Council approved a bilateral climate protection agreement with Ukraine. The agreement establishes the legal framework for Switzerland to implement climate protection projects in Ukraine. These projects will aim at reducing CO2 emissions while also contributing to environmentally sustainable reconstruction in Ukraine. According to the signed agreement and conference highlights, Ukraine is foreseen as becoming a platform for the symbiosis of solutions, and for developing the best technologies available in the world today in the field of energy, with the support of the world community and distinguished experts.

Some important steps were implemented by the Ukrainian government before the conference. On April 21st, 2022, the National Council for the Recovery of Ukraine from the Consequences of the War was established (with the financial support of the Swiss Agency for Development and Cooperation).

Ukrainian government officials, with their European partners, are working on the big plan for the post-war reconstruction of Ukraine. No doubt this plan should be in line with the most recent trends of EU and Global Climate policy, especially now that Ukraine has become a candidate for EU membership, and the ethics of the restoration will concern the possibility of maintaining morality in environmental aspects.

It is very important for Ukraine, as a candidate for EU membership, to develop the infrastructure and energy measures within the framework of the EU's environmental protection requirements, in particular the Green Deal, REPowerEU plan, and possibly to get support from the Recovery and Resilience Fund (RRF), which is aimed at supporting the energy and infrastructure projects and reforms. The Recovery and Resilience Facility (RRF) is at the heart of the REPowerEU Plan, supporting coordinated planning and financing of cross-border and national infrastructure, as well as energy projects and reforms. The EU's External Energy Strategy is considered as a green transformation that will strengthen economic growth, security, and climate action for Europe and its partners. It is stated in the document that the EU, together with Ukraine, will continue to ensure the security of supplying and functioning the energy sector, while paving the way for the future electricity and renewable hydrogen trade, as well as rebuilding the energy system under the REPowerUkraine initiative¹⁰. Despite the expectation of Eurosceptics, who predicted the EU would reveal fewer ambitions, the EU Green Deal targets are based on attempts to end the EU's dependence on Russian fossil fuels, while REPowerEU has shown strong adherence to the

previously declared road map. Moreover, the Commission proposed to increase the headline 2030 target for renewables from 40% to 45% under the Fit for 55 packages. According to recent IPCC reports, there is still a window of opportunity to avoid the worst impacts of the climate crisis, but it is closing fast. It is a now or never moment for the EU to prove its climate leadership at the global level and get on the right energy transition track. REPowerEU relies on the EU Solar Strategy, Solar Rooftop and Heat Pumps Initiatives, Biomethane Action Plan, and acts on the definition and production of renewable hydrogen, etc. Renewables already constitute a cheaper investment compared to that into the existing gas-fired power. Prioritisation of these sectors can drastically decrease greenhouse gas emissions, to empower the effective adaptation to climate change, and avoid dependence on Russian fossil fuels.



In the context of the EU's strategy of transition to climate neutral development, it is important that a significant part of the exported electricity should come from renewable sources

These EU decisions have received responses not only at the level of governments but at the level of civil society all over the world. On June 2nd-3rd, the governments of Sweden and Kenya hosted a large-scale Stockholm+50 meeting conference for civil society activists, government officials and stakeholders from all over the world to mark the anniversary of the first UN conference on the environment, and, in particular, to

10 Andersson, Jan and Petryk Igor. Flexibility to future-proof the Ukrainian power system Solving the Ukrainian Green-Coal paradox. Wärtsilä Energy, 2018
[\[https://www.wartsila.com/docs/default-source/power-plants-documents/downloads/white-papers/europe/wartsila-flexibility-to-future-proof-the-ukrainian-power-system.pdf\]](https://www.wartsila.com/docs/default-source/power-plants-documents/downloads/white-papers/europe/wartsila-flexibility-to-future-proof-the-ukrainian-power-system.pdf)

contribute to the acceleration of the fair energy transition. During the event, the Fossil Fuel Non-Proliferation Treaty was announced, as a part of the campaign for the global and equitable phase-out of oil, gas and coal. The document will offer world governments a mechanism to work together to accelerate the transition to carbon-free renewable energy. The document will also regulate the cessation of the search for the new deposits and the extraction of new reserves of fossil fuels. The other goals include gradually abandoning the expansion and crediting of fossil fuel production, expanding access to RES, and other low-carbon solutions.

At the same time, when the world declares encouraging ambitious energy and climate targets, and stimulating the use of RES and energy efficiency, some controversial decisions have appeared. This concerns the decision taken on July 6th, 2022 by the EU Commission to recognise investments in fossil gas as “green” and environmentally friendly, and to include gas and nuclear projects into the EU investment taxonomy. While earlier gas, in particular Russian gas, was considered in Europe as a bridge fuel for the energy transition, now it is obvious that the “green” label for gas will primarily promote the construction of gas-powered plants in the EU. The decision to replace one fossil fuel with another is strategically neither sustainable nor profitable. Scientists, environmental activists and even a large part of the investment management industry^{11,12} say that including fossil gas in the “green”

taxonomy is deeply controversial, and will only create uncertainty for investors about what is truly sustainable; at the same time classifying fossil gas as a sustainable energy source would mean that Europe being able to meet its decarbonisation and zero emissions targets, stated in the EU Green Deal.

This decision might mean decreasing the amount of EU investments in Ukrainian RES, because Ukraine’s energy security is not able to rely on the expansion of the gas infrastructure, which by its very nature is critically vulnerable to military attacks, such as missile strikes, artillery or aerial bombardments. Up to today, according to the government’s assessment, Russian troops have destroyed more than 300 boiler houses, and significantly damaged the Kremenchuk, Chernihiv, Okhtyrka, Luhansk, and Severodonets’k thermal power plants. It is obvious that priority investments in post-war reconstruction should be aimed at the decentralised and sustainable production of electricity from renewable energy sources, as well as strengthening the national and local energy supply infrastructure, and deployment of battery storage. Ukraine will need huge financial support to implement the Clean Energy Package for the creation of an open and sustainable energy system¹³. Ukraine has a significant potential for investments; moreover, energy can become one of the drivers of the recovery of the Ukrainian economy. Electricity exports from Ukraine could replace 17% of the Russian natural gas consumed by the European Union

11 Ainger, John. EU Lawmakers Remove Last Hurdle to Label Gas, Nuclear as Green. Bloomberg, 2022 [https://www.bloomberg.com/news/articles/2022-07-06/eu-lawmakers-remove-last-hurdle-for-gas-nuclear-as-green?leadSource=verify%20wall]

12 Eviston, Henry. European Parliament to pull the trigger on the inclusion of fossil gas and nuclear power in EU Taxonomy, WWF [2022 https://www.wwf.eu/?7016216/European-Parliament-to-pull-the-trigger-on-the-inclusion-of-fossil-gas-and-nuclear-power-in-EU-Taxonomy]

13 Braun, Stuart. Will war fast-track the energy transition? Deutsche Welle, 2022 [https://www.dw.com/en/will-war-fast-track-the-energy-transition/a-61021440]

countries. In the context of the EU's strategy of transition to climate neutral development, it is important that a significant part of the exported electricity should come from renewable sources. The Finnish company Wärtsilä has calculated scenarios for Ukraine's electricity development till 2050, and has shown that it is more profitable to build new renewable energy power plants. The scenario providing the cheapest electricity assumes a share of RES of 83% by 2050¹⁴. At the same time, today, under conditions of electricity surplus, individual producers are forced to reduce electricity production. Most system restrictions to reduce generation are received by the owners of solar power plants. Such modes of operation significantly reduce the productivity of solar stations and jeopardise their economic profitability. According to calculations, the amount of system restrictions of only the SPSs is 573 GW/h, or approximately 30% of the potential generation. Instead of restrictions and underproduction, "green" energy can be exported to the EU countries in the future, reducing the financial burden and payments of the "green" tariff for system restrictions. The electricity surplus Ukraine currently has will allow individual countries to quickly abandon Russian gas. It should be pointed out here that the European Commission called in July for EU countries to reduce demand for natural gas by 15% over the foreseeable future, in an attempt to boost winter stocks of gas. Member states were also asked to give Brussels the power to introduce compulsory energy rationing, which would allow for a prioritisation of supplies, in case Russia cut off gas to Europe entirely¹⁵.

To help the EU meet this challenge and support the Ukrainian energy sector, two main steps have already been taken by the Ukrainian government: on March, 16th 2022, Ukraine joined the unified continental European electricity system ENTSO-E, and completed an emergency synchronisation of its power grids with the ENTSO-E; on June 30th 2022, Ukraine started selling electricity to Romania and in July to Slovakia. Currently, Ukraine has the following interconnections with the ENTSO-E countries:

- Hungary – 650 MW / 450 MW (export/import capacity)
- Slovakia – 600 MW / 600 MW (export/import capacity)
- Romania – 400 MW / 400 MW (export/import capacity)
- Poland – 210 MW / 0 MW (export/import capacity)

The energy sector in Ukraine is on the brink of major change. These changes are being made to provide energy transition and a favourable investment climate for RES enlargement in the after-war period. However, there are challenges that need to be addressed, to make this transition to a market-based energy system as smooth as possible. For further Ukrainian RES development, the government should:

- reduce the duration of the project approval procedures for wind and solar power plants;
- justify the "green" tariff. The present feed-in-tariff scheme for renewables is very lucrative for investors, but in the long run this will become expensive for the state;

14 Bonifacio, Rogerio, Pini, Giancarlo and Boeck Sebastian. Global Climate Context of the Ukraine War. June 2022 [https://reliefweb.int/report/ukraine/global-climate-context-ukraine-war-june-2022]

15 Connolly, Kate. Germany tables new crisis measures after Russian gas supply only partly restored. The Guardian. 2022 [https://www.theguardian.com/business/2022/jul/21/]

- decrease restrictions for energy providers and ensure maximum utilisation of electricity produced through RES;
- meet requirements for more power system reserves or back-up power, to add more flexibility to the RES;
- expand opportunities for RES owners to export electricity to the EU;
- implement a system of issuing guarantees of electricity produced from renewable sources and ensuring their recognition by the European Union and the Energy Community;
- provide support for reforms for the future full integration of the energy market of Ukraine with the EU.

Ukraine's energy transition should be based on an increase in wind and solar energy, and an increase in hydropower production from 13% of the energy balance to almost 30%. Ukraine's energy strategy also envisages a significant expansion of biomass and biofuel production. According to analysts, Ukraine can generate 6-8 billion cubic meters of biomethane by 2050. Biomethane retains the advantages of being a natural gas and it can be used for heat and electricity generation, in industry and in transport. At the same time, it is carbon neutral.

In order to ensure the development of RES, all new infrastructure in cities, rural areas and their communities must facilitate the transition from fossil fuels to renewable sources. This transition must take into account social, economic and environmental factors. It is necessary to find a balance between the "old" and "new", "smart", "green" cities. When rebuilding destroyed settlements, planning the city's infrastructure should be based on the local energy sources (waste heat, wind turbines, thermal power plants, biomass, etc.). It is important to diversify generation sources as much as possible

and reduce the distance from the place of energy generation to the consumers. One of the ways to achieve energy safety is to create self-sufficient energy communities. In case Russia decides to stop energy supply on a large scale, the provision of a huge number of microgrids would be needed. It is also important to make a shift from electricity production in a few big power plants to a system of small local energy sources that ensure supplies when energy is consumed as close to its source as possible, even on the level of individual residential buildings, e.g. the case of prosumers (individuals who both produce and also consume). Increasing the share of renewable energy sources in the city's energy balance, as well as energy saving measures, will make it possible to increase the energy independence of communities, and accelerate the achievement of national climate goals. Backup sources, such as batteries, can offer long-lasting protection in case of power outages, and ensure the continuous operation of crucial equipment.

 ***A bold climate and energy policy will allow Ukraine to break free from its fossil fuel shackles, while protecting its people from pollution and providing energy security***

When combined with the renewable energy source, the delivery point can stockpile green energy and save it for later use. To cover the most severe social aspects, reconstruction should prioritise the latest technologies in energy efficiency, and design in urban planning. In case some of the adaptation measures are included in planning infrastructure rehabilitation, this will not require significant investment and will allow consideration of the inevitable

consequences of climate change. A bold climate and energy policy will allow Ukraine to break free from its fossil fuel shackles, while protecting its people from pollution and providing energy security.

The principle of the Sendai Framework Programme for disaster risk reduction, “rebuilding better than it was”, should be the basis of the post-war reconstruction of Ukraine. It is this principle that most fully reflects the idea of sustainable development. It should serve as the main value and methodological guideline in the development of the Programme for the Reconstruction of Ukraine, and the corresponding action plan.

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