

The Russian War Against Ukraine: a Case Study in Climate, Conflict, and Green Recovery¹

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Abstract

The Russian war against Ukraine, having brought monumental social, economic, and environmental devastation, serves as a compelling case study demonstrating the broader implications of climate crises, underscoring the complex interplay between fossil fuel dependency and geopolitical tensions, and illustrating that the fight for climate justice and the fight for peace are deeply interconnected.

Meanwhile, Ukraine has the potential to leverage post-war reconstruction as an unprecedented opportunity for comprehensive decarbonisation and ecological recovery. Examining the limitations of the international climate change regime and exploring controversial aspects of fossil fuel production, this paper highlights the hidden climate costs of war, and investigates the concept of 'climate change as a battle' and how it can frame the global discourse on climate security and climate justice. It argues that addressing climate change is akin to fighting a war, requiring mobilisation of resources, political will, and international solidarity. In this context, Ukraine's experience offers valuable lessons for the global community as it navigates the complex challenges of post-conflict recovery while simultaneously addressing the urgent need for climate action. With the right assistance, Ukraine could emerge as a front-runner in the global energy transition, inspiring other nations to pursue ambitious climate action even in the face of adversity.

Keywords: Russian War against Ukraine; climate crises; climate security; climate justice; international climate change regime; green recovery reconstruction; war emissions accountability; decarbonisation, equitable transition; energy transition.

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Війна Росії проти України: тематичне дослідження з питань клімату, конфлікту та зеленого відновлення

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Анотація

Війна Росії проти України, що призвела до масштабних соціальних, економічних та екологічних руйнувань, є переконливим прикладом, який демонструє широкі наслідки кліматичних криз, підкреслює складний взаємозв'язок між залежністю від викопного палива й геополітичною напруженістю, а також засвідчує нерозривний зв'язок між боротьбою за кліматичну справедливість і прагненням миру. Водночас Україна має потенціал використати післявоєнну відбудову як безпрецедентну можливість для комплексної декарбонізації та екологічного відновлення. Через аналіз обмежень міжнародного режиму боротьби зі зміною клімату та дослідження суперечливих аспектів видобутку викопного палива, стаття розкриває приховані кліматичні наслідки війни й досліджує концепцію «зміни клімату як битви» та її вплив на формування глобального дискурсу про кліматичну безпеку й справедливість. У дослідженні обґрунтовано, що протидія зміні клімату подібна до ведення війни і потребує мобілізації ресурсів, політичної волі та міжнародної солідарності. Досвід України пропонує важливі уроки для світової спільноти, яка долає складні виклики постконфліктного відновлення і водночас відповідає на нагальну потребу в кліматичних діях. За належної підтримки Україна може стати лідером у глобальному енергетичному переході, надихаючи інші країни на амбітні кліматичні дії навіть за несприятливих умов.

Ключові слова: війна Росії проти України; кліматична криза; кліматична безпека; кліматична справедливість; міжнародний режим зміни клімату; зелене відновлення; повоєнне відновлення; відповідальність за викиди; декарбонізація; справедливий перехід; енергетичний перехід.

Introduction

The most up-to-date scholarship, published in January 2024, confirms long-standing concerns—we are not on track to meet the goal of the Paris Agreement, and thus on the path to expecting a 2 degrees Celsius increase in global temperature by 2050 (Diffenbaugh & Barnes 2023). Having reached a critical tipping point, it is imperative to recognise that the climate crisis does not exist in isolation but is deeply intertwined with issues of security, justice, and development. The 2022 Russian full-scale invasion, following the illegal occupation of Ukrainian territories and annexation of Crimea, has not only

pushed Ukraine to the brink of collapse, inflicting severe damage on its economy, population, and environment but has also highlighted the urgent need for a paradigm shift in addressing climate action amid geopolitical tensions, economic instability, and social upheaval.

The war has severely degraded Ukraine's energy sector and caused widespread environmental destruction, amounting to what can be described as an ecocide¹. The destruction and disruption of Ukraine's agricultural sector, a major contributor to the global food supply², have highlighted the cascading effects of conflict on food security. As a country with substantial oil³, gas⁴, and critical material reserves⁵, Ukraine finds itself at the centre of a geopolitical struggle with far-reaching implications for global energy security and climate stability. In the face of these immense challenges, the question arises whether Ukraine can seize this opportunity to devise a recovery plan that prioritises decarbonisation and ecological restoration.

By delving into the shortcomings of existing international climate governance frameworks and the intensified climate–security nexus laid bare by the Russian war against Ukraine, this paper aims to contribute to the ongoing dialogue on how to effectively address the climate crisis in the face of multiple, interconnected global challenges. It also explores the potential for Ukraine's post-war reconstruction to prioritise green and sustainable development, in line with the country's stated goal of becoming a leader in the green transition.

Examining the lessons learned from Ukraine's experience and exploring innovative strategies for aligning post-conflict recovery with ambitious climate action, this paper seeks to contribute to the growing body of knowledge on how to build resilience and foster sustainable development in the face of complex global challenges.

¹ According to the Independent Expert Panel, ecocide is 'unlawful or wanton acts committed with knowledge that there is a substantial likelihood of severe and either widespread or long-term damage to the environment being caused by those acts' (Stop Ecocide Foundation 2021).

² Ukraine is the world's largest exporter of sunflower oil (50 per cent of world exports), the third largest one of barley (18 per cent), the fourth largest one of maize (16 per cent) and the fifth largest one of wheat (12 per cent). In 2021, Ukraine exported cereals worth almost \$12 billion (about €11.5 billion) (Food and Agriculture Organization of the United Nations 2021).

³ According to the BP Statistical Review of World Energy 2021, Ukraine had proven oil reserves of 0.4 billion barrels as of the end of 2020. The country's oil and gas sector had been a key focus of its energy strategy before the Russian invasion, with efforts to increase domestic production and reduce reliance on imports (see BP 2021).

⁴ This is mainly in the Black Sea/Azov–Kuban basin, which is gas-prone and includes natural gas fields offshore in the Azov sea and onshore in Crimea (see Pirani 2018).

⁵ Ukraine has the largest reserves of titanium ore in Europe (5.9 million tonnes); the second-largest reserves of manganese ore in the world (2.3 billion tonnes); significant reserves of iron ore (6.5 billion tonnes), as well as kaolin and other mineral resources (see US Geological Survey 2022).

The (un)hidden costs of the Russian war

The Russian war against Ukraine has resulted in devastating human suffering, severe destruction, environmental devastation, and climate damage. Ukraine's GDP plummeted by 29.1 per cent in 2022, while the inflation rate soared to 25 per cent (Harmash 2023). The poverty rate in Ukraine skyrocketed from 5.5 per cent of the population to 24.2 per cent in 2022, pushing 7.1 million people into poverty and erasing fifteen years of progress (World Bank 2023). Even though in 2023, economic growth exceeded expectations, reaching 5.7 per cent of the annual real GDP growth rate, the pre-war level can be reached only in 2030, in the most optimistic scenarios¹. As of January 2024, over 10,378 civilians were killed and 19,632 injured, 3.7 million were internally displaced, and 6.5 million Ukrainian refugees were registered abroad (Statista 2024).

The war-fighting has so far inflicted over \$56.4 billion in environmental damage as the result of indiscriminate attacks on industrial facilities, the degradation of landscapes, forest fires, and chemical pollution of air, water, and soil, alongside the destruction of at least 30 per cent of protected areas and landmine contamination of 30 per cent of the territory of Ukraine (CEOBS 2023). The devastating environmental impact of the destruction of the Nova Kakhovka dam in June 2023—the worst environmental disaster in Ukraine since Chernobyl—affected 620 square kilometres of territory and impacted 100,000 residents and is estimated to exceed \$5 billion in losses and reconstruction needs. Collectively, these realities rise to the definition of ecocide, which, according to Article 441 of the Criminal Code of Ukraine, is defined as ‘mass destruction of flora and fauna, poisoning of air or water resources, and also any other actions that may cause an environmental disaster’. Given that environmental crime is currently the fourth most prevalent criminal activity globally, the ecological destruction caused by warfare heightens the risk of a collapse in both ecosystems and societies (Vettorazzi 2022) and calls for recognition of ecocide as a crime within the Rome Statute of the International Criminal Court².

The scale of destruction escalates with each passing day, with the estimated cost of recovery and reconstruction exceeding \$486 billion³. The latest targeted strikes on the energy infrastructure in March and April 2024 damaged 85 per cent of thermal power plants and 50 per cent of hydroelectric power plants. This

¹ Baseline scenarios developed by National Bank of Ukraine and the International Monetary Fund make a key assumption that the war will wind down at the end of 2024 (see EGOB 2024).

² Ukraine has been actively advocating for the recognition of ecocide as an international crime, which would provide a legal framework to make belligerents liable under international law for extensive environmental destruction during armed conflicts (see Higgins 2023, Ramirez 2023).

³ The sum was estimated as of 31 December 2023 (World Bank Group *et al.* 2024).

resulted in the loss of approximately 9.2 GW of generating capacity¹, creating a substantial deficit in the power system and leading to cuts in electricity, heating, and water supply for two million people (*Economichna Pravda* 2024). Total emissions linked to Russia's war on Ukraine are estimated to have already amounted to 175 million tonnes of CO₂ equivalent as of September 2023, inflicting \$9.6 billion in global climate damages (de Klerk *et al.* 2024). Consideration of emissions underscores the international scope of the damage and the responsibilities of the international community. The damage is not localised, and neither should be the legal framework used to seek redress.

Meanwhile, the impact of Russian aggression extends beyond Ukraine, having had an adverse global impact. The OECD's November 2022 report referred to the war in Ukraine as a 'massive and historic energy shock' to the markets (OECD 2022), leading to a surge in energy and food prices² and one of the main factors in slowing down global economic growth³ with the greatest impact on Europe's economy. Despite relative stabilisation of the relative markets in 2023 (IMF 2023), the far-reaching consequences are still evident as demonstrated by the persistent inflationary pressures and the ongoing challenges in the global supply chain⁴. Moreover, the long-term impact of the fading peace dividend, including increased European defence spending that could surpass the €807 billion NextGenerationEU pandemic stimulus and the potential €100 billion or more contribution to rebuilding Ukraine, may prove more significant than most governments have acknowledged (IMF 2022).

Amidst these challenges, one can see potential opportunities for positive change. The war in Ukraine has brought energy security to the forefront of policymakers' agendas, creating a foundation for accelerating the shift towards green energy. This is exemplified by the launch of the REPowerEU plan, which aimed to rapidly reduce dependence on Russian fossil fuels and fast-track the clean energy transition (European Commission 2022). By placing emphasis on energy efficiency, renewable energy, and the diversification of energy sources, the

¹ This is equivalent to power for seven million households and \$1 billion in material damage.

² Energy prices soared for 60 per cent between January and September 2022, with natural gas and coal prices rising by 340 per cent and 150 per cent, respectively (World Bank 2022); combined with food export restrictions from Russia and Ukraine, this caused a 60–100 per cent increase in food prices from 2021 to 2023, potentially leading to undernourishment for 600 million people and up to 1 million additional annual deaths by 2030 if the war is sustained (see Alexander *et al.* 2023).

³ Global economic growth slowed to just 3.1 per cent in 2022 and is projected to be 0.3 per cent in 2024. Additionally, global debt reached a record \$305 trillion in 2022, equivalent to 348 per cent of global GDP (see Institute of International Finance 2023).

⁴ The war has exacerbated pre-existing supply chain issues, causing delays and shortages in various industries, from automotive to electronics, with 90 per cent of US manufacturers experiencing supply chain disruptions due to the conflict in Ukraine (see National Association of Manufacturers 2022).

REPowerEU plan aligns with the objectives of the European Green Deal and represents a significant step towards a more sustainable and secure energy future. Evidence of the progress is seen in the record declines in coal, gas, and emissions recorded in April 2024, with fossil fuels falling by 19 per cent to their lowest level; currently less than one-third of the EU's total electricity generation. Concurrently, renewables, driven by wind and solar, have risen to a record 44 per cent share, surpassing 40 per cent for the first time and achieving their largest-ever annual capacity additions (Ember 2024).

However, one may view this as hypocritical, given the EU's continued consumption of Russian liquified natural gas (LNG)¹ and oil via third parties. Despite sanctions imposed on Russia², the EU has imported 5.16 million tonnes of oil products valued at €3.1 billion from three Turkish ports with no refining hubs: Ceyhan, Marmara Ereğlisi, and Mersin. Notably, 86 per cent of these ports' oil product imports, in value terms, originated from Russia. The EU's legislative loopholes and insufficient enforcement mechanisms have enabled the continued importation of oil products originating from Russia, especially through countries that have not imposed sanctions on Russian exports³.

Additionally, the Russian full-scale invasion of Ukraine has accelerated deglobalisation⁴, which may hinder collaborative efforts to address global issues, such as climate change. The renewed focus on energy self-sufficiency may tempt countries to postpone energy transition efforts, potentially locking in new sources of carbon pollution. Despite optimistic evidence that the war-driven energy crises have boosted clean energy investment (IEA 2023)⁵, the Global North has also witnessed significant fossil fuel expansion plans. For instance, Canada

¹ Russian LNG is currently not subject to sanctions in the EU; the 14th EU sanctions package against Russia, slated to include measures against Russia's LNG sector, is expected to be introduced in late June 2024 (Humpert 2024).

² The EU/G7 ban on Russian crude and the introduction of the price cap policy was implemented in December 2022; the ban on oil products and associated price caps came into force in February 2023 (Council of the European Union 2024).

³ A prime example of this legal loophole occurred in May 2023, when the Toros Ceyhan oil terminal at the port of Ceyhan received 26,923 tonnes of gasoil from Novorossiysk, only to ship a similar volume to the MOH Corinth refinery in Greece ten days later.

⁴ A 2022 report by the World Economic Forum identified geopolitical instability as a major risk to the global economy, citing the war in Ukraine as a key contributor (see World Economic Forum 2022). Meanwhile, political economists, dating back to Montesquieu, have argued that deglobalisation can exacerbate this risk, as countries that engage in direct trade are less likely to go to war; even indirect trade through common partners and networks can help maintain peace (see Oneal & Russett 1999).

⁵ According to International Energy Agency's *World Energy Investment 2023* report, more than \$1.7 trillion is going to clean energy, including renewable power, nuclear, grids, storage, low-emission fuels, efficiency improvements and end-use renewables, and electrification (IEA 2023).

approved a \$23.05 billion expansion project for the Trans Mountain pipeline to triple the flow of crude oil (Government of Canada 2022), while the UAE's state oil company, ADNOC, announced plans to expand its oil production capacity from four to five million barrels a day by 2027 (ADNOC 2022). Similarly, Australia approved the opening of new coal mines, such as the Carmichael mine in Queensland, despite global efforts to phase out coal power (Slezak 2023). In Brazil, the government passed legislation to encourage oil and gas exploration in the Amazon rainforest, prioritising energy self-sufficiency over preserving one of the world's most important carbon sinks (Londoco & Casado 2022). Thus, while the immediate impact of the invasion on global energy markets has been significant, its long-term consequences for the fight against climate change could be even more profound. In the scenario of uncertain prolongation of the war in Ukraine, combined with other conflicts across the globe, the world risks becoming increasingly fragmented and less equipped to confront the existential threat of climate change.

A salient illustration of this fragmentation and its detrimental effects can be seen in the Arctic, where Russia's invasion of Ukraine has disrupted international cooperation and weaponised one of the world's regions most vulnerable to the impacts of climate change¹. In particular, the exclusion of Russia from international fora resulted in the absence of data from the Russian stations, which has created a blind spot in monitoring the global implications of thawing permafrost² and reduced the ability to design effective mitigation strategies and decreased the effectiveness of existing programmes aimed at addressing the climate crisis in the Arctic (Lopez-Blanco *et al.* 2023).

Guns, greenhouse gases, and geopolitics: the climate dimension of the Russian invasion

The war in Ukraine starkly illustrates that the fight for climate justice³ and the fight for peace are deeply interconnected (United Nations 2021). Beyond the inevitable diversion of critical resources needed to tackle climate crises, as discussed above, the ongoing war in Ukraine has underscored that the

¹ This disruption of scientific collaboration comes at a critical time when the Arctic is warming four times faster than the global average, leading to the thawing of permafrost, sea ice loss, and other far-reaching consequences (see AMAP 2021).

² Thermo frost is a phenomenon that has been called a 'ticking time bomb below our feet' due to the vast stores of CO₂ and methane held in the soil (Lopez-Blanco *et al.* 2023).

³ The pursuit of climate justice in the context of the war (a concept that acknowledges the disproportionate impact of climate change on marginalised and vulnerable communities and seeks to address these inequities by considering the social, economic, and political factors that contribute to climate change and its consequences (Schlosberg 2007), would involve holding those responsible for the environmental damage accountable, providing support and resources for affected communities to adapt and rebuild, and promoting a more equitable and sustainable path forward (see Klinsky 2015).

relationship between climate change and conflict is even more complex and multifaceted.

While scholars have long recognised that war is both intensive and far-reaching among human activities causing ecological change (Machlis & Hanson 2008), the ongoing conflict in Ukraine has highlighted the complexities of modern warfare and its impact on the environment and climate. For example, increased militarisation¹, military activity², and massive destruction of infrastructure, as well as changes in energy production³ have fuelled a substantial increase in greenhouse gas emissions. According to the estimates mentioned above, the total emissions linked to Russia's war on Ukraine have already reached a staggering 175 million tonnes of CO₂ equivalent⁴.

The hidden and overt costs of the conflict on energy resources, such as the diversion of resources from clean energy projects to military spending⁵ and the role of artificial intelligence (AI) and its energy demands in modern warfare should be evaluated and included in the assessment of the war's climate dimension (Smith 2023). The use of AI in military applications, such as drone technology and data analysis, may contribute to increased energy consumption and GHG emissions (Nguyen 2023). Meanwhile, internal displacement patterns, demographic shifts, and the negative effects of reduced industrial or economic activity in some sectors must be taken into account when assessing the war's

¹ Since the beginning of the full-scale invasion, Ukraine has been significantly expanding its defence industrial capacity by growing its domestic defence industrial base, establishing collaborations with European countries, and engaging in joint ventures with the US and other global companies for co-production of defence equipment (see Stepanenko *et al.* 2024).

² This includes the use of land, marine, and aviation fuels, as well as urban and landscape fires and fires resulting from damaged energy infrastructure.

³ Some examples are the increased use of domestic generators, the transfer of used equipment from decommissioned coal power plants in European countries to Ukraine as a quick, cost-effective solution for the critical 2024/2025 winter season, as well as the replacement of electric trams and trolleybuses with diesel alternatives to provide mobility during periods of energy shortages.

⁴ This was as of February 2024. Notably, over two years of war, the major contributors to emissions have shifted from predicted post-war reconstruction emissions (associated with extensive damage to civilian infrastructure) to a combination of active warfare, landscape fires, and damage to energy infrastructure (see de Klerk *et al.* 2024). Therefore, it is crucial to develop international legal frameworks that hold aggressor states accountable for greenhouse gas emissions resulting from their warfare. One potential approach is the formulation of a liability mechanism under the UNFCCC (United Nations Framework Convention on Climate Change) regime to formally assess and attribute responsibility.

⁵ In 2024, eighteen NATO countries are projected to meet the 2 per cent of GDP defence spending target, with European NATO allies collectively investing \$380 billion, equivalent to 2 per cent of their combined GDP. Russia's military expenditure reached 3.9 per cent of its GDP in 2023 and is anticipated to increase further (see *The Telegraph* 2024). Global military spending totalled \$2.4 trillion in 2023, a 6.8 per cent rise in real terms from 2022, marking the sharpest annual increase since 2009 (see Stockholm International Peace Research Institute 2024).

carbon footprint, although these factors are challenging to calculate accurately. While looking ahead, it is anticipated that one of the largest sources of emissions for Ukraine will be the carbon cost of post-war reconstruction¹.

This mass expansion of emissions, however, is not an inevitable consequence of fighting a modern war. Despite the derision often expressed by so-called military realists towards low-carbon warfare, there are undeniable benefits in terms of logistics, supply, and heat signature reduction through decreased reliance on fossil fuels. Ukraine has been at the forefront of this approach, employing tactics such as cyber hacking, drone warfare, and even deploying agile ‘electric cavalry’ motorbikes, which offer battlefield advantages over traditional combat transportation due to their silent motors and lack of odour.

Russian tactics, predicated on sheer mass of materiel, have developed in exactly the opposite fashion, becoming more wasteful and environmentally destructive as the war has progressed (for example, the ad-hoc development of ‘turtle tanks’ means that Russian armour is heavier and slower, requiring more fuel, and thus more emissions, to manoeuvre). The costly Russian approach to warfighting, in both lives and material, calls into sharp relief the need for a higher moral imperative for minimising the environmental impact of war and reducing damage to civilian infrastructure. Considering the importance of cutting emissions in the pursuit of a just world for future generations, a compelling case can be made for holding the aggressor accountable for the forced CO₂ emissions of the defending nation by requiring them to finance net-zero sustainable reconstruction efforts (Ramirez 2022).

Another dimension of the Russia–Ukraine war is the role of fossil fuels in financing the conflict and its resource-driven nature. This aspect has significant implications for both the geopolitical landscape and the global climate crisis, as the reliance on and competition for fossil fuel resources not only fuels military aggression but also perpetuates the climate emergency. A growing body of evidence suggests that the Russian war of aggression against Ukraine, building upon the 2014 illegal occupation of Ukrainian territories and annexation of Crimea was, to an extent, enabled and is financially supported by the fossil fuel industry (RazomWeStand 2023), which for the past three decades, actively engaged in disseminating misinformation, promoting denial, and subverting the established scientific consensus regarding the imperative to phase out fossil fuels and expedite climate action. A staggering \$7 trillion was spent globally on fossil

¹ The process of the reconstruction of buildings and other infrastructure requires significant amounts of concrete and steel, which results in a high carbon footprint, which is estimated to generate a total of 56.0 million metric tonnes of carbon dioxide equivalent (tCO₂e) emissions (see de Klerk *et al.* 2024).

fuel subsidies in 2022 (Libby 2023), with a substantial portion directly benefiting fossil fuel advocates. Fuelled by these subsidies, Russia has earned over €596 billion in revenues from fossil fuel exports since the onset of the full-scale war in Ukraine (Russia Fossil Tracker 2024), giving it the ability to channel these funds towards militarisation and weapon production.

While governments do possess the means and financial resources to swiftly reduce demand for fossil fuels and expedite the transition to sustainable energy, they fail to do so. This is exemplified by Belgium, which allocated approximately €350 million for humanitarian assistance to Ukraine while simultaneously investing billions in Russian liquefied natural gas (LNG). The EU spent over €8 billion on Russian LNG in 2023, with Belgium becoming the largest buyer, even as it facilitated LNG exports to China and India through ongoing transshipments in the port of Zeebrugge (*Financial Times* 2023).

Meanwhile, Russia's large-scale liquefied LNG projects, referred to as 'carbon bombs' due to their potential to release over 1 billion metric tonnes of carbon dioxide emissions each¹, are directly contributing to the global climate crisis and leading to climate damage and economic losses.

Additionally, it is argued that Russia's war against Ukraine is partially motivated by a desire to control critical metals and minerals². As the world transitions away from fossil fuels, these materials are crucial for modern technologies, including clean energy solutions, advanced electronics, and military applications, making them highly valuable in the global market and essential for economic and strategic advantages, leading to a growing concern about the potential for 'resource wars'³.

A significant yet still overlooked issue is the omission of military and conflict-related emissions within the UNFCCC (United Nations Framework Convention on Climate Change) process⁴ as well as climate accountability of the aggressor

¹ According to some estimates, the annual cost of climate-related damages could reach \$38 trillion globally by 2029 (see Swiss Re Institute 2021). Meanwhile, the EU's climate-related economic losses have already exceeded €650 billion (see European Environment Agency 2022).

² These are largely concentrated in the Russian-controlled Luhansk and Donetsk regions. At least \$12.4 trillion worth of Ukraine's energy deposits, metals, and minerals are now under Russian control. In addition, 63 per cent of the country's coal deposits, 11 per cent of its oil deposits, 20 per cent of its natural gas deposits, 42 per cent of its metals and 33 per cent of its deposits of rare earth and other critical minerals, including lithium, have been seized (see SecDev Group 2022).

³ According to the recent study by Shahzad *et al.* (2022), the Russian war against Ukraine has led to a rapid deviation in the critical metals markets, resulting in prices that are consistently higher than projected, posing a substantial threat to global energy security and the energy transition.

⁴ Currently, there are no binding reporting and emissions reduction requirements for defence forces under international climate agreements, resulting in minimal reliable and complete data on military carbon footprints.

state for climate damages. The very goals of Russia's war were in direct opposition to international climate priorities. The burden of environmental protection cannot be expected to fall equally on the aggressor and on the aggressed. Therefore, there is an urgent need to develop international legal frameworks that hold aggressor states accountable for greenhouse gas emissions resulting from their warfare. One potential approach is the formulation of a liability mechanism under the UNFCCC regime to formally assess and attribute responsibility.

The effort to refine and expand responsibility and culpability, with regards to environmental destruction in wartime has ramped up in recent years. Notably, COP28 was the first time in the history of climate negotiations to put the nexus of war, security, and the climate crisis on the agenda with a special themed day on 'Relief, Recovery, and Peace' (UNFCCC 2023a). This was followed by the adoption of the Declaration on Climate, Relief, Recovery and Peace, which acknowledges the need for 'bolder collective action to build climate resilience' while focusing on countries and communities affected by fragility or conflicts. It stresses that financial resources, capacity, partnerships, data, and information access must be scaled up urgently in these areas, and recognises that support must be tailored to the specific needs of people in conflict-affected settings (UNFCCC 2023b).

However, the Declaration falls short of addressing the root causes of the climate–conflict nexus and fails to provide concrete measures to tackle the issue. It neither addresses the role of powerful nations and corporations in perpetuating the climate crisis and exacerbating conflicts through their reliance on fossil fuels and exploitation of resources in fragile states nor considers the possibility of suspension of aggressor states like Russia from the UNFCCC process¹. The consequences of the latter are evident in Russia's stance at the COP28 negotiations, where it insisted on reducing emissions without addressing the phase-out of fossil fuels and advocated for the use of 'transitional fuels' like natural gas as viable options for emission reductions (Lo 2023). Another striking example is the Arctic, which has long been a target for resource exploitation, particularly oil and gas reserves². With retreating sea ice due to climate change (Lanteigne 2019), these reserves have become increasingly accessible, sparking concerns about a potential race for Arctic dominance, which over the coming years is predicted to spark a race for Arctic dominance that Russia is hellbent on winning (Wilkerson 2023). Russia, currently holding over 53 per cent of

¹ Neither UNFCCC nor the Paris Agreement contains provisions allowing parties to expel Russia, suspend its membership, or prohibit its representatives from participating in meetings (for more, see Legal Response International 2022).

² The Arctic is estimated to hold 412 billion barrels of oil and gas, about 22 per cent of the world's undiscovered reserves, making it a highly coveted region.

the Arctic Ocean coastline, is predicted to be a major contender in this race (Wilkerson 2023).

While the ongoing war in Ukraine underscores intricate connections between fossil fuel dependency, geopolitical tensions, and the fight against climate change, it is worth mentioning the metaphor of 'climate change as war or a battle' that has gained significant traction in political and academic discourse in recent years. From Joe Biden's rhetoric on the campaign trail (Biden 2020; Wolff 2020) and Emmanuel Macron's statement at the 2021 Leaders Summit on Climate¹ to Michael Mann's book *The New Climate War* (Mann 2021), the idea that decarbonisation should be viewed through a war-like lens has become increasingly widespread. The 2005 European Union Memo 'Winning the Battle Against Global Climate Change' (European Commission 2005) emphasises the need for radical resource investment and often incorporates notions of sacrifice and loss. Therefore, the war metaphor used in climate discourse implies an urgent mobilisation of resources, similar to wartime efforts, to address the climate crisis.

While this idea underscores the severity and immediacy of the climate challenge, it is also highly debatable. A substantial body of scholarship has emerged, questioning the assumptions and implications of this framing. One of the primary critiques levelled against the war metaphor is that it tends to elide attention to the justice and equity issues that, some argue, lie at the root of the climate crisis (Asplund 2011; Hulme 2009; Thomas & Warner 2019). Moreover, the war metaphor often foregrounds a trenchantly nationalistic lens, casting climate change as a threat to be defended against rather than a shared global challenge requiring collective action and solidarity (Thomas & Warner 2019).

By framing the issue of climate crises in terms of national security and competition, the war metaphor may undermine the sense of shared responsibility and global interdependence that is crucial for tackling a problem of this magnitude. In this sense, the international support of Ukraine's war efforts gives us some examples to consider regarding the organisation of global climate responses, although not without suffering from some of the shortcomings of nation-focused efforts, as opposed to truly international ones.

The war in Ukraine has brought to the fore the devastating human and environmental costs of armed conflict, underscoring the need for a more nuanced and holistic approach to global challenges. By recognising the complexities and interconnections between issues like climate change and conflicts, we can develop more sophisticated and comprehensive strategies that prioritise justice, equity, and shared responsibility in the pursuit of sustainable solutions.

¹ The fight is the same; it is a fight for the planet' (Macron 2021; see Farand 2021).

From the ashes of war as a climate leader: building back better and greener Ukraine?

In July 2022, during a head-of-states conference in Lugano, Switzerland, the government of Ukraine presented the initial version of its ten-year national recovery plan, outlining proposed recovery pathways for major sectors at an estimated cost of \$750 billion (Government of Ukraine 2022). This highlighted that green, inclusive, low-carbon, and sustainable post-war reconstruction for Ukraine is feasible, while underscoring the urgent need for international financial support¹.

In the aftermath of Russia's devastating actions against Ukraine's centralised power grid and coal power plants during the winter of 2022–3, Ukrainian communities were actively engaged in developing innovative energy systems utilising solar, wind, and energy storage technologies. These enabled hospitals, water pumping stations, and other critical facilities in Ukraine to operate resiliently and become less vulnerable to disruption from rocket attacks (Kinstler 2022; Shankleman 2023; Troianovski 2023; Ukrainian Energy Ministry 2023). This substantiates that prioritising a renewables-oriented reconstruction can ensure enhanced energy security² while offering the additional advantage of accelerating long-term net-zero transition efforts.

Meanwhile, the green transition in Ukraine is not just a national concern but a significant component of the global climate agenda. At COP28 Ukraine reaffirmed its deep commitment to achieving net zero, phasing out coal by 2035 and supporting the global ambition to triple renewable energy capacity and double the rate of energy efficiency improvements. The Ukrainian government presented scenarios and plans for decarbonisation of its energy system based on decentralised renewables (Dennehy 2023), the case of €450 million of private financing attracted for the development of wind energy, and Ukraine's ambition to emerge as a 'green energy hub' of Europe.

While clarity regarding Ukraine's commitment is paramount, the most significant challenge is that Ukraine must rebuild quickly. The foremost question is whether this can be executed in a 'green' manner aligned with climate goals and net-

¹ However, the recovery plan contains a major loophole risking amplified emissions and climate vulnerabilities—the allocation of \$29 billion for expanded gas production and offshore extraction. Unless integrated with equitable and sustainable transition mechanisms, these fossil fuel investments could strand assets, increase carbon intensity, and expose Ukraine to heightened climate impacts in the medium to long term (for more, see Zagoruichyk *et al.* 2023).

² Decentralised, locally generated renewable energy will enhance the resilience of Ukraine's energy system in the long term and prove helpful in maintaining critical infrastructure. A small but indispensable portion of electricity generated from solar can help maintain water and heating systems during the winter season (see Troianovski 2023, Ukrainian Energy Ministry 2023).

zero targets. The pressing priority is to swiftly reconstruct the energy sector's infrastructure and assets, along with a significant portion of industrial assets, ushering in a transformative phase unparalleled in the experience of the majority of other nations¹.

Under the UNFCCC regime, Ukraine as an Annex I country², is mandated to take accelerated action to expedite efforts beyond those of developing countries, ensuring emissions balance for neutrality by the early stages of the second half of this century. However, Ukraine's per capita GDP, particularly post-war, is likely to place it lower than many lower-middle-income and even lower-income countries classified as developing nations globally. This circumstance restricts Ukraine's access to specific instruments outlined by the convention and the Paris Agreement, such as the Green Climate Fund, Least Developed Country Fund, and the Special Climate Change Fund—resources currently unavailable to Ukraine. This highlights the constraints of the current international climate framework, which is based on a paradigm from three decades ago and no longer aligns with the contemporary need for global decarbonisation and the unique national circumstances in countries like Ukraine, particularly amid the challenges of the war. While there is mounting pressure for a recalibration of this framework, the process is gradual. In the interim, the focus should shift towards exploring regional or national instruments.

On the other hand, the Paris Agreement assumes a pivotal role, potentially exerting a more significant influence in steering Ukraine towards a trajectory where reconstruction prioritises green, sustainable, and low-emission practices.

In essence, Ukraine's commitment to climate action amid the war can illustrate that, even in challenging circumstances, sustainable practices can be integral to recovery and development. It underscores the idea that prioritising climate action is not only an environmental imperative but also a pathway to building a more resilient, prosperous, and sustainable future for nations emerging from conflict.

The prospects for Ukraine's green reconstruction efforts are closely tied to its potential EU membership following the candidate status granted in June 2022 (Council of the European Union 2022). Accession to the EU would open up

¹ To address the critical energy needs for winter 2024–5, Ukraine is likely to rely on gas-to-power technologies, requiring a significant increase in domestically produced Ukrainian gas. Additionally, as a quick-deploy solution, Ukraine is considering the installation of several hundred megawatts of diesel generators. While necessary for immediate energy security, these measures pose a significant risk of technological lock-in effects, whereby these interim fossil fuel-based infrastructures could persist long beyond their intended lifespan.

² The list of 'Annex I countries' includes members of the Organisation for Economic Co-operation and Development (OECD) as well as economies in transition (EIT), Ukraine in particular (see UNFCCC 1992).

new avenues for financial assistance, technical expertise, and policy coordination to support Ukraine's sustainable recovery in line with European Green Deal objectives. However, the timeline and outcome of Ukraine's EU integration process remain uncertain, contingent on the evolution of the war and the country's ability to implement necessary reforms amidst ongoing challenges.

Russia's invasion of Ukraine has underscored deep links between Europe's green transition plans and geopolitical security. What was once climate policy has become vital to the defence strategy. Thus, green transition and sustainable reconstruction for Ukraine are not merely a prerequisite for EU membership or a condition to fulfil international climate obligations. This is a matter of national, regional, and global security strategies. Achieving a climate-compatible recovery will prove foundational for Ukraine's and the EU's future resilience and prosperity by driving the renewable transformation of infrastructure and industries.

While using Ukraine as a model for decarbonisation efforts may seem unusual given the ongoing war, there is a broader logic to this argument, as Ukraine's case demonstrates the complex interplay between climate change and security in conflict-affected regions. Ukraine is not merely choosing to transition; it is being forced to accelerate its energy transformation as a matter of national survival. To replace damaged thermal power plants and support compromised hydroelectric facilities, Ukraine aims to rapidly deploy a diverse mix of technologies. This includes expanding wind and solar capacity, installing

1.5 gigawatts of biofuel and gas peaking installations for grid balancing, and adding 1 GW of battery storage. Crucially, Ukraine is compelled to compress its original energy transition timeline from 2032 to just two or three years – a pace driven by necessity rather than choice. This forced acceleration, while challenging, positions Ukraine to potentially become a role model, demonstrating that decoupling economic growth from carbon emissions is possible even in the most extreme circumstances. If successful, Ukraine could emerge as a front-runner in the global energy transition.

However, little can be achieved without international financial and institutional support. For this purpose, for instance, the €50 billion Ukraine Facility Programme¹ must be leveraged to guarantee sustainable and just green transition in all economic sectors by catalysing equitable decarbonisation, resilient infrastructure, and robust environmental safeguards. Prioritising climate-aligned

¹ On 1 February, the European Council supported the revision of the European Union's budget, which will provide €50 billion in macro-financial support to Ukraine, to be implemented under the Ukraine Facility programme over the period of 2024–7 (European Council 2023).

investments will help secure Ukraine's self-sufficiency, prosperity, and political sovereignty over the long term.

On the level of the UNFCCC regime, climate damage caused by the Russian aggression¹, could be claimed as a breach of the global climate commitment tied to the United Nations Framework Convention on Climate Change.

Integrating quantified climatic harm into the registry of losses under the Warsaw International Mechanism for Loss and Damage would enable economic valuation and claiming of wartime losses and damages. Concretely, the expenses associated with Russia's invasion-attributable excess emissions could be documented and claimed based on global cost estimates. Constructing formal attribution and liability systems through UNFCCC processes or loss/damage registries will help discourage environmentally destructive warfare while promoting climate accountability. Additionally, the new collective quantified goal for climate funding for 2024, discussed at COP28 (UNFCCC 2023a, 2023b), must address the requirements for both rapid recoveries during the war and long-term post-war reconstruction, supporting post-conflict regions and aiding these nations in rebuilding destroyed assets and infrastructure in alignment with the Build Back Better principles.

A debatable potential solution to the funding challenge is the possibility of using frozen Russian assets to finance Ukraine's post-war reconstruction. As of early 2024, Western countries have frozen an estimated \$300 billion in Russian Central Bank assets as part of the sanctions imposed in response to the war.

Redirecting these assets towards Ukraine's reconstruction efforts could provide a significant source of funding for green infrastructure projects, such as renewable energy installations, energy-efficient buildings, and sustainable transportation systems. However, the legal and diplomatic complexities surrounding the use of frozen assets (Chatham House 2024) require international consensus and the establishment of a clear legal framework to ensure the legitimacy and transparency of the asset transfer².

Conclusions

The Russian war against Ukraine has brought to the fore the devastating human, environmental, and climate costs of armed conflict, serving as a stark reminder of the interconnectedness between climate security and global stability. Despite

¹ This represents \$32 billion for 24 months of the war (as of February 2024); see de Klerk *et al.* (2024).

² Meanwhile, the G7 leaders have agreed to provide a \$50 billion loan to Ukraine, backed by profits earned on roughly \$260 billion in frozen Russian central bank assets, to support the country's military, economic, humanitarian, and reconstruction needs. The loan is expected to be disbursed before the end of 2024, with the US government primarily guaranteeing the funds, while the possibility of burden-sharing among G7 nations arises in case of a default (see *The Business Times* 2024).

the increasing recognition of the climate crisis as an existential threat, the implementation of climate commitments remains inadequate, with fossil fuel interests hindering progress toward net-zero emissions.

By framing Ukraine's recovery in terms of global climate justice and leveraging geopolitical shifts, EU accession endeavours, and international cooperation, a comprehensive strategy that addresses both Ukraine's immediate needs and the broader imperatives of sustainable development and climate resilience can be developed. Ultimately, building back a better and greener Ukraine is not just a matter of environmental responsibility but a critical component of national, regional, and global security strategies.

Ukraine's commitment to achieving net-zero emissions and prioritising green, inclusive, low-carbon, and sustainable post-war reconstruction demonstrates that decoupling economic growth from carbon emissions is possible even in the most extreme circumstances. With the right international financial and institutional support, Ukraine has the potential to emerge as a front-runner in the global energy transition, inspiring other nations to pursue ambitious climate action in the face of adversity.

However, the success of these efforts will depend on the ability of the international community to navigate the complex web of economic interests, geopolitical tensions, and competing priorities. As the world watches the unfolding of events in Ukraine, it is crucial to recognise that the choices made in the coming months and years will have far-reaching implications not only for the country itself but for the global fight against climate change and the pursuit of a more just and sustainable future.

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