adelphi

REPORT

Rebuilding Ukraine

Principles for a green post-war reconstruction

Iryna Holovko, Constanze Haug

Suggested citation: Holovko, I., Haug, C. 2023: Rebuilding Ukraine. Principles of a green post-war reconstruction. Berlin: adelphi consult GmbH

Publisher: adelphi consult GmbH
Alt-Moabit 91
10559 Berlin
+49 (030) 8900068-0
office@adelphi.de
www.adelphi.de

Authors: Iryna Holovko, Constanze Haug

Photo credits: Ruslan Lytvyn - shutterstock.com

The authors would like to gratefully acknowledge contributions to this work from Annica Cochu, Maia Hall, Bianca Pelletti, Anastasia Steinlein (adelphi), Martin Schön-Chanishvili (dena), Anna Ackermann (Ecoaction), Oldag Caspar (Germanwatch), and Artur Runge-Metzger.

Status: January 2023

adelphi

adelphi is the leading independent think-and-do tank in Europe for climate, environment and development. We are some 300 strategists, thought leaders and practitioners working at the local and global levels to find solutions to the most urgent political, economic and social challenges of our time. As a policy consultancy, we support a just transition towards carbon neutrality and sustainable, liveable societies. Our work is grounded in transdisciplinary research, evidence-based consulting and stakeholder dialogues. With these tools we shape policy agendas, facilitate political communication, inform policy processes and support decision-makers.

Since 2001, we have successfully completed more than 1,000 projects worldwide for numerous international clients and partner organisations in the fields of **energy, climate, resources, finance, diplomacy and business**.

Sustainability is the basis of our internal and external conduct. We are **committed to a future fit for grandchildren**, reduce our CO2 emissions where we can and offset those that are currently unavoidable. We purchase 100 per cent green electricity, consistently rely on environmentally friendly and socially responsible procurement and use ethical financial services. Through our project work, we contribute to increasing positive environmental performance. The responsibilities and processes of our corporate environmental protection are certified according to the EMAS seal of approval, the highest European certification for a systematic environmental management system.

Iryna Holovko

Advisor

holovko@adelphi.de

www.adelphi.de

Executive summary

Ukraine is currently fighting an existential war, suffering immense human and economic losses. While it might seem premature to plan post-war rebuilding efforts and place additional demands for said rebuild to be green, strong arguments exist for already doing so now. Reconstruction is already starting in those regions Ukraine has liberated. Making the rebuilding green would allow Ukraine to reach its core social, economic, and geopolitical objectives, ensuring energy independence from Russian fossil fuels, speeding up and easing integration with the European Union (EU), and reaping social and environmental co-benefits of a green rebuild while unlocking new economic opportunities.

Both the Ukrainian government and its international partners have acknowledged the urgency and importance of a green reconstruction of Ukraine, outlining the need for the reconstruction plan to be synchronized with the European green agenda and aligned with the Paris Agreement. Yet, due to many trade-offs and a need to overcome heavy past dependencies, greening of the rebuild will not happen easily and will require thorough planning and implementation. To make green reconstruction of Ukraine a reality, the reconstruction plan **must be aligned with the European Green Deal (EGD) objectives**, to clearly define the direction of development and avoid measures and investments that may impede the transition. The principles of **domestic ownership and inclusiveness** should be observed, aiming to build a joint understanding between donors, the Ukrainian government, and society. **Accountability and good governance** and **a high degree of coordination** between those involved must be provided to ensure alignment of efforts and sufficient scrutiny to minimize corruption risks. Finally, **climate considerations** should be included into all reconstruction investments. **Dedicated funding for climate-positive projects** should be made available to compensate for the upfront premium of low-carbon solutions.

A vision for the green post-war reconstruction of Ukraine must be realized across all key areas of the economy, from urban and regional development, to energy, industry, transport, and agriculture. This will mean first focusing on energy efficiency improvements in housing infrastructure, fostering climate resilience of cities, prioritizing the development of local renewable energy sources, avoiding any new investments in the coal sector, centering agricultural support around smaller to medium farmers and sustainable agricultural practices, and pursuing socially just transformations in coal regions.

Our recommendations on the next steps for Ukraine's partners – including, among others, the EU, its member states and organizations, and the US – are as follows:

1. Work together with the Ukrainian government **on the practical alignment of Ukraine's post-war reconstruction plan with the objectives of the EGD**.
2. Agree with the Ukrainian government on a **list of structural reforms** and implementation timelines (anti-corruption and rule-of-law reforms included) that are essential for a green and transparent reconstruction.
3. Set up a **transparent and inclusive governance structure** for the recovery process, providing for public participation and scrutiny.
4. Strengthen the coordination of reconstruction efforts between Ukraine's partners and donors by advising the Ukrainian government **to appoint one agency to act as a central coordination point** for both international partners and Ukrainian authorities.
5. Work on the **further operationalization of the term "green reconstruction"**, including the development of a set of indicators, in the spirit of the EU Green Taxonomy, to provide clear guidance on investments to all parties involved in the reconstruction effort.

Contents

1. Setting the scene for Ukraine's green post-war rebuilding

Ukraine is currently fighting an existential war for its sovereignty and national survival. It may thus seem premature to discuss post-war rebuilding, and to pile on additional demands for such rebuilding to be green. However, there are several reasons for doing so, and for doing so now.

First, and despite the many hardships Ukrainians are suffering, the war is evolving in Ukraine's favor. This has entailed the liberation of significant territories where rebuilding can start and is starting. This means the time for planning reconstruction is now, with the first steps already been made at Ukraine Recovery Conferences in Lugano and in the process that followed.

Secondly, there are several reasons why that rebuilding should be as green as possible. The first is the need to reduce Ukraine's dependence on Russia and its fossil fuels. The second relates to Ukraine's ambitions of joining the European Union as soon as possible, which incentivize an alignment with ambitious EU climate policies for the sake of facilitating closer integration and of reducing the time and / or the eventual challenges of fitting into a regulatory environment that imposes ambitious green objectives. The third relates to the opportunities that a green rebuilding offers – tapping into the employment, health, and social benefits of a green rebuilding while unlocking new markets and integrating into the supply chains of the future (See Box 1).

Rather than representing fanciful dreaming, the objective of green rebuilding is at the very core of the social, economic and geopolitical objectives that Ukraine is pursuing. That does not mean, however, that realizing these objectives will come naturally and by default. Because there are trade-offs especially with respect to the speed of reconstruction and challenges with overcoming past dependencies, it will require judicious planning and implementation. Throughout the planning process, it will be essential to ensure alignment with the Paris Agreement and mainstreaming environmental and climate considerations into all decisions, standards and regulations (Beckmann et al. 2022).

The idea of green reconstruction has been gaining momentum and finds its reflection in ongoing reconstruction planning process. In July 2022, Ukraine presented its Recovery Plan, the government's vision for the country's recovery, to the Ukraine Recovery Conference in Lugano. The document identifies synchronization with the EGD as one of two strategic development vectors (National Recovery Council of Ukraine 2022). This resonates with an earlier communication from the European Commission stipulating the need for Ukraine reconstruction plans to align with the European green agenda (European Commission 2022). Transparency and sustainability, alongside alignment with the Paris Agreement, feature among the guiding principles for Ukraine's reconstruction formulated in Lugano (Ukraine Recovery Conference 2022) illustrating the shared understanding of the importance of these principles among a wide circle of involved parties.

The next crucial step is now to further define the priorities and goals of Ukraine's reconstruction, ensuring that the principles of transparency and sustainability are operationalized and fully incorporated into future planning. Efforts to this end should not and do not undermine the importance of immediate relief measures needed to support Ukrainian people and to provide the government with essential means to run the country at times of war.

This paper aims to contribute to the process of Ukraine's reconstruction planning by formulating a set of principles, both overarching and sectoral, as a first step towards the operationalization of a green post-war reconstruction of Ukraine. It further provides recommendations for Ukraine's international partners to help shape Ukraine's green recovery.

Box 1. Why Ukraine's reconstruction needs to be green

- ✓ **Foster Ukraine's European integration.** The EGD sets the goal to reach net-zero GHG by 2050 – a momentous challenge not only for the EU's current members, but also for countries aspiring to join. For Ukraine, it is imperative to use the opportunities provided by the reconstruction program and associated funding to help it embark on such an ambitious decarbonization pathway. Early and sustained effort toward decarbonization would accelerate the EU integration process and help avoid serious obstacles for further development, such as facing a carbon price of likely 100 EUR/ton or higher post-EU accession and EU carbon border adjustment (CBAM) fees already from 2026.
- ✓ **Strengthen Ukraine's energy security, severing its dependence on Russian fuels.** Ukraine has historically been heavily reliant on fossil fuels imported from Russia. It is now facing an urgent need to reconfigure its energy supply system. Under the new realities—high global energy price volatility and the EU's carbon pricing regulations—the development of vast but largely untapped local renewable energy sources must become a pillar of the country's renewed energy security concept.
- ✓ **Seize the opportunity for technological modernization and benefit from new markets for low-carbon materials and products**. As rebuilding manufacturing and energy generation capacities requires significant investments, it is imperative to channel these into highly efficient and future-proof systems. With the financial support to be made available to Ukraine for post-war reconstruction, this is a unique and long overdue opportunity to advance the technological modernization of Ukraine's energy and industrial infrastructure. It is also a chance to realize the country's potential as an attractive partner for EU firms in developing new low-carbon supply chains given Ukraine's proximity, and availability of natural and human capital.
- ✓ **Tap into the macroeconomic and social co-benefits of a green transition.** Investing in green infrastructure has the potential to increase the energy and resource efficiency of Ukrainian industries and public services, save or reinvest fossil-fuel subsidy costs, create a new and future-proof employment base, lower the health risks associated with fossil fuel-based industry (heavy air pollution caused by coal-fired power plants, among others*), help create more livable cities,** and restore ecosystems and landscapes***. These improvements, while often underrepresented in the economic calculus, will over time generate huge macroeconomic benefits and cost savings.
- ✓ **Avoid stranded public/private investment**. The need for reconstruction is great. No euro can be wasted on infrastructure that will become unviable before the end of its life cycle. Pre-war Ukraine was among the countries most exposed to risks related to a low-carbon transition, with its economy heavily reliant on high-emissions manufacturing and fossil fuel-based power****. Reconstruction efforts must avoid reproducing these risks.

* (CEE Bankwatch/Ecoaction 2020)

** (Bachra et al. 2020)

*** (Karlsson et al. 2020)

**** Ukraine belonged to the country group with the highest spending in percentage of GDP on physical assets for energy and land-use systems projected under a scenario to achieve Net Zero by 2050. "Fossil fuel-based economies would also have substantial spend on physical assets as a share of their GDP: above 15% in the Middle East and North Africa, Russia, Ukraine…" (KcKinsey 2022).

2. Principles for a green and transparent reconstruction in Ukraine

The post-war reconstruction of Ukraine will not be an easy task and aiming to make it 'green' adds an additional layer of complexity. Much will depend on political will to overcome past fossil fuel dependencies, the availability of knowledge and practical know-how on planning and designing low-carbon solutions, access to sufficient funds, and their transparent and efficient use. The three pillars of the reconstruction process—planning, international cooperation, and financing—should be based on the following principles to operationalize the concept of a green and transparent reconstruction.

2.1 Planning the reconstruction

Ukraine's reconstruction must begin as soon as this becomes possible (in fact, it has already begun in liberated areas such as Kyiv and Chernihiv regions). Ensuring that green agenda priorities and opportunities are factored into reconstruction efforts across the country requires clear strategic guidance and a well-coordinated process on different governance levels. Setting strategic direction and respective targets for the national reconstruction plan are thus critical. Domestic understanding of the benefits of a green reconstruction is a crucial prerequisite for this to be sufficiently reflected in the plan. Finally, the governance structure of the reconstruction program should facilitate efficient and effective implementation from the outset.

▪ Setting objectives aligned with the European Green Deal

The post-war reconstruction plan should be aligned as much as possible with the principles and objectives of the EGD to clearly define the direction of development and avoid measures and investments which may impede the transition. Ukraine's existing obligations and the significant efforts made to date in aligning its legislation and regulations with the EU acquis in the areas of energy and environment should serve as a basis for integrating the green perspective into the post-war reconstruction process (Box 2). The EU should work with Ukraine on further mainstreaming green elements across all areas of the plan and ensuring green objectives are incorporated into the early reconstruction stages rather than being pushed back to after 2030. This will be crucial for laying the foundation for Ukraine to fully benefit from the opportunities of the EGD, to accelerate the country's prospects of EU accession and for avoiding stranded assets.

▪ Fostering domestic ownership and inclusiveness

The green agenda in post-war reconstruction must rely on domestic ownership. Ukraine and the EU must strive for a joint understanding on the need for a green reconstruction and establish joint priorities on this basis. The process must be inclusive and transparent, involving sectoral decision makers, businesses, regional and municipal authorities in affected regions, and civil society organizations. The latter, especially Ukrainian environmental NGOs, are already active in promoting the need for a green reconstruction (Ecoaction 2022) and can play an important role in promoting domestic buy-in. It would be essential to provide for a well-functioning communication channel for getting views and needs of local municipalities and incorporate them into the overall plan – this would be the best way to build up ownership at the level where the plans are eventually implemented.

Box 2. Ukraine's pre-war progress in climate and energy

Ukraine has been engaged in extensive cooperation with the EU, its member states, and various international organizations in the areas of climate and energy transition for more than a decade. Before the outbreak of the war the country was making slow but steady progress.

Ukraine assumed its first international climate commitments by ratifying the Kyoto Protocol to the UNFCCC in 2004. First binding obligations in energy and environment areas Ukraine assumed after acceding the **Energy Community Treaty (ECT)** in 2011. The ECT was established by the EU and its neighbors to create an integrated pan-European energy market. Ukraine committed to adopting and implementing the EU energy and environmental acquis within a given timeframe, including obligations to implement EU directives on Environmental Impact Assessment, on carbon emissions trading, renewables, energy efficiency and industrial emissions.

EU-Ukraine cooperation greatly intensified with the signing of the **EU-Ukraine Association Agreement (AA)** in 2014, which also strengthened incentives and support for EU acquis implementation in the EGD-related areas. Over the years, Ukraine has received extensive financial, technical, and capacity-building assistance under the ECT and AA frameworks and under bilateral cooperation agreements, enabling the country to make progress in many areas. Though not without flaws, Ukraine has unbundled energy utilities, launched competitive gas and electricity markets, set goals, and developed action plans for renewables development and energy efficiency enhancements in buildings, introduced the European practice of environmental impact assessment, and set up legal basis for a GHG emission monitoring, reporting and verification (MRV) system.

With the announcement of the EGD in 2019, cooperation further intensified, fostering new international partnerships on low-carbon industry, just transition in coal regions, and climate policy development. The Ukrainian government had expressed its readiness to "become an integral contributor" to the EGD (Government of Ukraine 2020). In 2020, the **EU-Ukraine high-level dialogue on EGD and Ukraine's green transition** was established to coordinate work in the EGD areas, including on climate governance, green finances, an Energy Efficiency Fund, and green hydrogen. In this period, Ukraine adopted its second Nationally Determined Contribution (NDC) to the Paris Agreement, for the first time committing to absolute GHG emission reduction from the current level. Work on the development of the NDC was supported financially by the EBRD and the Swedish government, highlighting the important role of cooperation with EU and international institutions.

Meanwhile, Ukraine has progressed with the development of climate policy instruments, launching in 2021 the EU-compatible MRV, starting work on carbon emission trading system (ETS) and improving carbon taxation. With the support from international partners from both sides of Atlantic, including via **World Banks' Partnership for Market Readiness (PMR),** GIZ and USAID's Energy Security Project, Ukraine has been gradually moving towards more efficient and greener economy in line with the EU and global decarbonization trends.

▪ Ensuring accountability and good governance

To make reconstruction efforts efficient and effective and to reassure international partners that resources are well spent, Ukraine will need to ensure transparency in expenditure and bolster anti-corruption and rule-of-law reforms. **Fostering robust procurement practices and providing for stringent monitoring and public scrutiny** of the use of funds, including adequate mechanisms for complaints and whistleblowing, will be central tasks in channelling reconstruction support. Civil society should be granted a strong voice in the governance of the reconstruction program, for example by setting binding rules for public participation in the spirit of the European Code of Conduct on Partnership.

2.2 Ensuring effective international cooperation

Many international partners of Ukraine have committed to supporting the county's reconstruction. Ensuring close coordination between Ukraine's partners is essential to driving forward the green reconstruction. The provision of extensive support in areas such as technology, innovation, and education will also be critical.

▪ Achieving a high degree of donor coordination

A green reconstruction of Ukraine becomes more likely, effective, and efficient when support matches identified needs, and when activities conducted by the country's international partners are maximally aligned. The EU should **work in concert with other international partners, first and foremost the United States and other G7 countries**, to ensure that green reconstruction is a priority. On the Ukrainian side, given the complexity of the reconstruction challenge and the multitude of international actors and funding sources, it is advisable that **one ministry or agency is assigned as the central coordination point** for both international partners and Ukrainian authorities. This will also enable the necessary build-up of competent staff to oversee and cross-coordinate on reconstruction efforts with a high degree of professionalism and integrity.

▪ Fostering technology, research, education, and innovation cooperation

Through the post-war reconstruction process, Ukraine should emerge as a renewed modern state, with modernized industry and robust public infrastructure that cements its competitive position in a decarbonizing global economy. To make this a reality, support for the development of the country's educational, technological, and innovation potential is critical. Actions needed include **mainstreaming green and low-carbon economy topics** in university curricula, professional education, promoting cooperation among universities and advanced researchers as well as industry-science dialogue. This can be done by building on and expanding the "green" focus of existing cooperation avenues such as Horizon Europe and the Erasmus + programs.

2.3 Securing financing and ensuring effective disbursement

Ukraine's reconstruction will require a significant amount of capital from both public and private sources. Aligning disbursement of this funding with climate and sustainability criteria is a key prerequisite to ensuring that reconstruction is as green as possible. There are several ways to green reconstruction finance:

Mainstreaming climate considerations into all reconstruction investments

Coordinated international effort is required to ensure that investments avoid lock-in effects and are optimized for climate impact, following emerging global best practices:

- **"Do no significant harm":** In line with the EU's "do no significant harm" (DNSH) principle enshrined in the EU Taxonomy for Sustainable Activities, all investments should be screened for unwanted negative side effects and provisions should be taken to avoid financing investments that (significantly) harm climate-related goals.
- **Ensuring minimum standards and maximizing positive side effects:** All tender processes for projects with international funding should include energy efficiency requirements, building codes, etc. as mandatory requirements. Investments should also undergo a screening process for identifying co-benefits and options to make them more climate-friendly. Positive climate performance could also be rewarded financially, e.g., through preferential interest rates.

Providing (and prioritizing) funding to green projects

Dedicated funding for driving a green transition ensures that there is a visible and separate financing opportunity for projects with a decidedly green outlook. Donors could provide green financing windows addressed at specific types of investments or require Ukrainian recipients to use **a pre-defined share of overall spending to support environmental and climate objectives.** However, considering the priority given to meeting the basic needs of the Ukrainian people, it is important to carefully consider what percentage of funding to funnel towards dedicated green projects. Provisions should be made as to how to use unspent green financing and clear guidance must be put in place to define what is considered green.

Mobilizing private capital flows to support a green reconstruction

Given the scale of destruction, financing will also need to extend beyond public money and effectively incentivize additional private sector resources. Blended finance approaches (e.g. targeted and transparent guarantees) provide added security and reduce cost for commercial investors to invest in fragile contexts like a post-war Ukraine and help public resources reach further. Financing for Ukraine should seek to effectively couple investments with supporting technical assistance, training, and other non-financial support for added impact. Regional best-practice instruments like the European Fund for Southeast Europe (EFSE) can provide a blueprint for designing these structures.

3. Sector-based principles for green reconstruction

The post-war green reconstruction of Ukraine must encompass all areas of the economy, from urban and regional development to energy, industry, transportation, and agriculture. The following principles highlight key priorities for greening the reconstruction efforts in key sectors.

Success will depend on Ukraine's ability to balance the short-term need for speed in rebuilding destroyed infrastructure and essential services with the long-term necessity to plan for sustainable reconstruction as the basis for the country's future economic development.

3.1 Rebuilding cities

As of September 2022, at least 74.1 million square meters (about 7.3% percent) of Ukraine's housing stock has been declared damaged or destroyed (KSE 2022b). Cities such as Kharkiv and Mariupol require major reconstruction and restoration of social and transport infrastructure. Some smaller cities will need to be completely rebuilt.

▪ Placing energy efficiency at the heart of housing construction

Rebuilding comfortable new housing for hundreds of thousands of Ukrainians is among the most urgent priorities of Ukraine's reconstruction agenda. While the speed and affordability of construction are very important, other challenges, such as heating provision and overall life-cycle costs, must be considered. **High energy efficiency standards should be applied to both new construction and in housing reconstruction programs**. Costs here need not be prohibitive– studies show that even near-zero energy buildings imply a mark-up ranging from between 3-38%, depending on the country (Bocian K. et al. 2022). The operation and maintenance costs of such buildings are lower, meaning residents will save every year on utility bills and reduce the country's overall energy needs – a crucial consideration in a context where cheap fossils fuels are no longer available.

▪ Prioritizing public transport infrastructure and smart mobility

Reliable low-carbon, electric public transport and bicycle infrastructure should be central to urban reconstruction planning. Road reconstruction plans should have **bicycles and public transport lanes** included, providing means of transport that are relatively quick as well as sustainable and accessible.

▪ Fostering climate resilience in urban spaces

Reconstructing ruined cities is an opportunity to improve city planning and reflect state-of-the-art planning, including with respect to climate change adaptation. Cooperation with European cities outside of Ukraine should be facilitated under the Covenant of Mayors and other fora to foster knowledge sharing and capacity building on green city planning. Ukrainian communities would also benefit from increased integration in ongoing EU processes, such as the New European Bauhaus initiative to rebuild cities and towns sustainably and inclusively. Climate resilience measures need not be expensive nor complex. Adapted city sewage systems and more green areas can be relatively easy to plan and implement as part of the reconstruction effort.

3.2 Energy infrastructure

Damage to Ukraine's major energy infrastructure increased significantly as a result of massive Russian attacks across the country in autumn 2022. Much will need to be repaired or replaced, including damaged thermal power plants and boiler houses, parts of high-voltage and distributional power grids, and numerous renewables capacities (especially solar)[1].

▪ Prioritizing local renewable energy solution in electricity and heating

In the electricity sector, priority should be given to renewable energy sources (primarily wind and solar) as these are cheapest, fastest, and most future-proof options. Ukraine's reconstructed power network should be ready for the more decentralized and dynamic electricity sector of the future. This primarily entails upgraded transmission and distribution systems to eliminate bottlenecks and the uptake of higher shares of renewables.

Investments into new coal power generating capacities should not be supported, in order to prevent carbon lock-ins and future stranded assets. With most coal mines depleted or lost in the first phase of the war in 2014-2015, Ukraine became a coal importer (in 2019, nearly 50% of coal burned domestically was imported). This new dependency should not be reinforced by adding further coal capacity – not to mention its climate impact.

Dedicated policies and financial instruments should be introduced on national and local levels to incentivize deployment of renewables. This will allow Ukraine to decrease demand for natural gas and support local businesses and job creation (e.g., in biomass, biogas, and rooftop solar project development).

Investing in new nuclear electricity should be considered with caution due to safety and security risks (exposed by the ongoing war), high costs, and the plants' limited flexibility.

In the heating sector, priority should lie with replacing ruined combined heat and power (CHP) plants and municipal boilers with systems that function on sustainably sourced biomass, heat pumps, solar collectors, and others.

▪ Stimulating necessary structural reforms *in addition* to financing projects

The post-war reconstruction program for the energy sector should strongly incentivize the finalization of power and gas market reforms, bringing them in line with EU rules according to Ukraine's existing obligations. This will reduce barriers for foreign investments into electricity and district heating and facilitate Ukraine's full-fledged participation in European energy markets. The latter is of strategic importance for Ukraine's energy security, given the country's pivot to the EU as its key partner in electricity and gas markets after the severing of ties with Russia and Belarus.

3.3 Heavy industry and manufacturing

Ukraine lost numerous industrial facilities, especially in the east, including two large steel power plants in Mariupol, which represented 19% of country's total pre-war iron and steel production. Decisions on reconstruction and rebuilding should reflect the following:

- **Avoiding a rebuild with high-carbon 20th century technologies**

Some present-day industrial technologies may still seem economically attractive for investment as part of the reconstruction (e.g., conventional iron and steel production). However, they imply a very high risk of stranded assets given huge upfront investment costs and long amortization periods. Old production technologies are often energy- and carbon-intensive and will likely be uncompetitive in just 5-10 years under the EU's new climate policies, either through high national carbon prices or obligations under the EU's carbon border adjustment mechanism (CBAM). These technologies can also be harmful to the local environment (water, air) and people's health. For the same reasons, transfers of second-hand unsustainable technologies should also be avoided.

- **Integrating Ukraine into new low-carbon product value chains and markets**

Ukraine must preserve its role as EU partner in creating new low-carbon product chains as part of the EGD strategy. The EU-Ukraine Partnership of Raw Material and Batteries was signed in 2021, and work had commenced on fostering cooperation on green hydrogen. These but also new industrial partnerships with Ukrainian companies in these areas will contribute to the country's economic recovery by attracting green investments and creating new jobs.

3.4 Transport systems

Transport infrastructure is heavily affected by the ongoing war. Over 25,000 kilometers of road, hundreds of bridges and railway stations, and 19 airports have been damaged or destroyed (KSE 2022a). The reconstruction of these systems should leverage the opportunity to build climate-compatible mobility and connectivity.

- **Prioritizing the rehabilitation and expansion of railway infrastructure**

Railway is the most energy-efficient and sustainable mode of transportation, both for passengers and freight. The reconstruction program should thus prioritize the restoration of ruined railway routes and aim to expand railway connectivity in the affected regions and between Ukraine and the EU. This is important for decreasing demand for gasoline and diesel, 75% of which used to stem from Russia and Belarus. For the same reason, and to support a modal shift, the construction of new and expansion of existing highways should be avoided. Airport reconstruction should be prioritized in strategically important transportation hubs and be aligned with the prospect of reduced air transport in the coming decades.

3.5 Agriculture

The damage caused to Ukraine's agricultural sector, including to farmland, crops, machinery, and storage facilities amounts to USD 6.6 billion to date (KSE/Ministry of Agrarian Policy 2022). Recovery of the agricultural sector should go hand-in-hand with supporting affected rural communities – the least protected segment of the Ukrainian population in this war.

▪ Prioritizing support to private small and medium farmers

Small and medium size farms and husbandries are the workplace for 80% of all agricultural workers in Ukraine, providing 50% of all labor-intensive food production (Saha et al. 2022). They will have much fewer resources to support the recovery of their farms compared to large industrial agricultural firms, which can more easily access international financing. Supporting schemes for private farmers are therefore essential for rebuilding the hundreds of damaged villages all over the country, helping millions to get back their jobs and livelihoods and ensuring the country's food security.

▪ Promoting sustainable agriculture solutions

Financial assistance to agricultural small and medium enterprises should be linked to knowledge sharing programs on sustainable agriculture, including organic farming, and on alignment with the EU's rules and regulations. This will help reduce the environmental footprint of food production and help them access a new customer base in the EU. Investments into local energy production using agricultural waste and byproducts (biogas from livestock waste, biomass plants on plant residues) should be another important focus of support, as this contributes to decreasing pressure on the environment and climate, but also to strengthening the country's energy security.

3.6 Regional development

The rural areas of Donbass, the largest of the two coal-mining regions of Ukraine, have been depressed for decades and are now further devastated by the war. The war, however, has sparked the beginning of a transformation processes in the parts of Donbass under Ukrainian control, as most state-owned mines were destroyed, occupied, or have become unprofitable. This transformation should be further supported.

▪ Supporting rather than postponing the transformation of coal regions

While most state-owned coal mines in Donbass were already unprofitable before the war, investments in their rehabilitation are extremely unlikely to see returns. Instead, they would likely result in stranded assets and in conserving the region's dangerous status quo as a depressed and disregarded region. Going ahead with the economic transformation of deprived areas as part of the post-war reconstruction will provide them with new long-term development perspectives, while technical and financial support would contribute to the realization of these prospects. Such a forward-looking approach will be essential for the region's stabilization. With the Just Transition Fund, the EU offers a possible blueprint for the regional transformation of coal regions. How this might be adapted to the Ukrainian context should be discussed in the reconstruction dialogue process.

4. Recommendations on next steps

Ukrainian partners, including the EU, its members states and organizations, the US and others are advised to take the following steps:

1. Work together with the Ukrainian government **on the practical alignment of Ukraine's post-war reconstruction plan with the objectives of the EGD**. The key priorities and respective targets need to be set jointly with Ukrainian counterparts.
2. Agree with the Ukrainian government on a **list of structural reforms** and implementation timelines (anti-corruption and rule-of-law reforms included) that are essential for a green and transparent reconstruction.
3. Set up a **transparent and inclusive governance structure** for the recovery process, providing for public participation and scrutiny.
4. Strengthen the coordination of reconstruction efforts between Ukraine's partners and donors by advising the Ukrainian government **to appoint one ministry or agency to act as a central coordination point** for both international partners and Ukrainian authorities.
5. Work on the **further operationalization of the term "green reconstruction"**, including the development of a set of indicators, in the spirit of the EU Green Taxonomy, to provide clear guidance on investments to all parties involved in the reconstruction effort.

5. Bibliography

Bachra et al. 2020: The co-benefit of climate action. Accelerating city-level ambition: CDP.

Beckmann, Andreas; Irene Lucius and Theodota Nantsou 2022: Ukraine: a systainable economic recovery for people and nature: WWF/BCG.

Bocian K. et al. 2022: Green Reconstruction. Post-war green recovery of Ukraine: WiseEuropa.

CEE Bankwatch/Ecoaction 2020: The impacts of Ukraine's energy sector on air quality. briefing: CEE Bankwatch/Ecoaction.

Ecoaction 2022: Green Reconstruction of Ukraine: Position of Civil Society. Retrieved 14 Dec 2022, from https://en.ecoaction.org.ua/green-reconstruction-ukraine.html.

European Commission 2022: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Ukraine Relief and Reconstruction". COM (2022) 233 final.

Karlsson, Mikael; Eva Alfredsson and Nils Westling 2020: Climate policy co-benefits: a review. In: Climate Policy 20:3, pp 292–316.

KcKinsey 2022: The economic transformation: What would change in the net-zero transition. Special Report.

KSE 2022a: Assessment of damages in Ukraine due to Russia's military aggression as of September 1, 2022. Kyiv: Kyiv School of Economics.

KSE 2022b: The total amount of damage caused to Ukraine's infrastructure is more than $127 billion. Retrieved 28 Nov 2022, from https://kse.ua/about-the-school/news/the-total-amount-of-damage-caused-to-ukraine-s-infrastructure-is-more-than-127-billion-kse-institute-s-report-as-of-september-2022/.

KSE/Ministry of Agrarian Policy 2022: Direct losses in Ukrainian agriculture due to the war with Russia reached $ 6.6 billion. Retrieved 14 Dec 2022, from https://kse.ua/about-the-school/news/research-of-kse-institute-and-the-ministry-of-agrarian-policy-direct-losses-in-ukrainian-agriculture-due-to-the-war-with-russia-reached-6-6-billion/.

National Recovery Council of Ukraine 2022: Ukraine's Recovery Plan.

Saha et al. 2022: Putting the green reconstruction of Ukraine into action. Requirements for programme design and policy: Berlin Economics.

Ukraine Recovery Conference 2022: Lugano Conference Outcome Document.