



Private Sector Opportunities for a Green and Resilient Reconstruction in Ukraine

Sector Assessments

December 2023

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Abbreviations and Acronyms

BOO	Build-own-operate
BOT	Build-operate-transfer
CAP	Common Agricultural Policy
CAPEX	Capital expenditure
CAR	Capital adequacy ratio
CHP	Combined heat and power
CPSD	Country Private Sector Diagnostic
CSA	Climate smart agriculture
DAM	Day-ahead market
DFS	Digital financial services
DPS	Deferred payment structure
DSO	Distribution system operator
EBITDA	Earnings before interest, taxes, depreciation, and amortization
EC	European Commission
ECA	Europe and Central Asia
EdTech	Educational technology
ENTSO-E	European Network of Transmission System Operators for Electricity
ESG	Environmental, social, and corporate governance
EU	European Union
EV	Electric vehicle
FC	Fintech company
FDI	Foreign direct investment
FIT	Feed-in-tariff
FOB	Free-onboard
GB	Guaranteed Buyer
GHG	Greenhouse gas
GoU	Government of Ukraine
GRE	Municipal government-related entity
ICT	Information and communication technologies
IDM	Intra-day market
IDP	Internally displaced person

IFI	International financial institution
IMF	International Monetary Fund
IPARD	Instrument for Pre-Accession Assistance for Rural Development)
IT	Information technology
M&A	Mergers and acquisitions
MAPF	Ministry of Agricultural Policy and Food
MoES	Ministry of Education and Science of Ukraine
NBFI	Nonbank financial institution
NBFS	Non-bank financial sector
NBU	The National Bank of Ukraine (NBU)
NEURC	National Energy and Utilities Regulatory Commission
NPL	Non-performing loan
NSSMC	National Securities and Stock Market Commission
OTT	Over-the-top
PFI	Private finance initiative
PFI	Private finance initiative
PPA	Power purchase agreement
PPP	Public-private partnership
PSA	Production sharing agreement
PSHPP	Pumped storage hydropower plant
PSO	Public service obligation
PV	Photovoltaic
RAB	Regulatory asset base
RDNA	Ukraine Rapid Damage and Needs Assessment
RDNA2	Second Ukraine Rapid Damage and Needs Assessment
RES	Renewable energy source
RIDO	Regional Irrigation and Drainage Organization
ROL	Rehabilitate-operate-lease
ROM	Rehabilitate-operate-maintain
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SAWR	Water Operations Division of the State Agency of Water Resources
SAWR	State Agency of Water Resources
SDG	Sustainable Development Goal

SME	Small and medium-sized enterprise
SOB	State-owned bank
SOE	State-owned enterprise
SPS	Sanitary and phytosanitary
TFP	Total factor productivity
TPP	Thermal power plant
TSO	Transmission system operator
USAID	United States Agency for International Development
UZ	JSC Ukrzaliznytsya
VAT	Value-added tax
WACC	Weighted average cost of capital
WBG	World Bank Group
WSS	Water supply and sanitation
WUO	Water User Organization

CHAPTER 1

Introduction and Country Context

This report is the second volume in a series of two volumes covering the private sector opportunities for a green and resilient reconstruction in Ukraine. This volume provides detailed assessments of the private sector opportunities that underline and validate the key messages and findings presented in the first volume. This series follows the Second Ukraine Rapid Damage and Needs Assessment (RDNA2) that estimated the damages, losses, and needs in Ukraine as of February 24, 2023, one year after the start of Russia's invasion of Ukraine and uses the same sector classification (World Bank et al. 2023). For sectors in which the private sector cannot fully finance the needs identified in the RDNA2, this series identifies other private sector opportunities.

Mobilizing private financing to support Ukraine's reconstruction is distinct from compensation for damages, and the reported projections are subject to various caveats. Compensation for damages caused by Russia's invasion of Ukraine is important but is not discussed in this report. While the Government of Ukraine (GoU) could provide the necessary environment to facilitate private sector development, the actual private sector financing response also requires other conditions that are beyond the scope of this report, including conducive macroeconomic developments as well as external guarantees for security and governance.

Russia's invasion of Ukraine has triggered a massive social, humanitarian, economic, and

energy crisis. By May-June 2023, the invasion had forced nearly one-third of Ukraine's population to flee their homes, including 6.3 million refugees (estimated in June 2023¹) and 5.1 million internally displaced persons (IDPs) (estimated in May 2023) (UNHCR 2023; IOM 2023).² As of February 24, 2023, the RDNA2 (World Bank et al. 2023) estimated the direct damages from the invasion at \$134.7 billion³ and the economic losses at \$289.1 billion, resulting in estimated reconstruction needs of \$411 billion.⁴ Ukraine's economy contracted by 29.1 percent in 2022 (World Bank 2023a; World Bank Open Data 1998–2022). According to preliminary estimates by the World Bank in April 2023, the headcount poverty rate increased from 5.5 percent in 2021 to 24.1 percent in 2022, indicating that the invasion had pushed an additional 7.1 million people below the poverty line, reversing 15 years of progress on poverty reduction (World Bank 2023b).⁵

Sound economic policies and large-scale external support have helped stabilize the Ukrainian economy. The Ukrainian government has implemented emergency measures, including administrative foreign-exchange and capital controls, the suspension of regulatory and supervisory enforcement actions, the postponement of audits of banks' financial statements, and forbearance with respect to restructured loans. The authorities also pegged the exchange rate to the US dollar on the first day of the invasion, providing a nominal

¹ The number shows the current number of refugees registered globally and does not include those who were refugees before the date. Accessed on June 19, 2023.

² Only the current number of IDPs is shown, not including returnees.

³ All dollar amounts are US dollars unless otherwise indicated.

⁴ Damages since February 24 2023, including the destruction of the Kakhovka dam on June 6, 2023, are not included in these estimates.

⁵ Data are based on the global poverty line of \$6.85 per person per day at 2017 purchasing power parity (World Bank Ukraine Macro Poverty Outlook April 2023).

anchor for the economy. The National Bank of Ukraine (NBU) has devalued the currency once since the invasion, by 25 percent in July 2022 (NBU 2022c). The Ukrainian government has adjusted its fiscal policy to reduce nonessential expenditures while protecting spending on critical social needs and increasing defense spending. An increase in public expenditures was partly accommodated by private sector financial savings. Grants equivalent to 9.8 percent of GDP helped keep the fiscal deficit relatively contained at 16.7 percent of GDP in 2022. The government partly financed the deficit from external sources, but monetary financing equivalent to 7.8 percent of GDP contributed to inflation. The International Monetary Fund (IMF) approved a new four-year arrangement for Ukraine under the Extended Fund Facility of 11.6 billion special drawing rights (SDR, the international reserve asset of the IMF), equivalent to about \$15.6 billion.⁶ The program, the GoU agreed with the IMF in March 2023, envisaged no monetary financing for 2023 (Interfax 2023). Instead, the program expected external sources to almost finance the projected fiscal deficit of 20.4 percent of GDP fully. It projects end-of-year inflation to fall from 26.6 percent in 2022 to 20 percent in 2023, before reaching 5 percent in 2027. Long-term growth is projected to stabilize at 4 percent under the baseline scenario and 5 percent under an upside scenario. Moreover, private investment was expected to recover and the current account was projected to turn to a deficit of 4.4 percent in 2023, which would widen to 6.7 percent in 2025, before narrowing thereafter. Foreign direct investment (FDI) inflows are projected to reach 2.4 percent

of GDP in 2025 and rise to 4.8 percent in 2027, fully financing the current-account deficit (IMF 2023a). This report follows the macroeconomic projections agreed by the GoU with the IMF in March 2023.

Russia's invasion has transformed the Ukrainian economy. The severing of financial and commercial ties with Russia and the simultaneous pivot to European and transatlantic markets represent a lasting westward shift in the economic center of gravity.⁷ Meanwhile, internal and external displacement has altered Ukraine's population patterns in ways that will persist long after the invasion. In parallel, the European Union (EU) accession process⁸ is driving sweeping reforms to economic governance, competition policy, and public sector transparency, and EU accession offers access to vast financial resources, including the Green Deal and other programs designed to catalyze the transition to low-carbon growth. The alignment of Ukrainian legislation with the EU acquis chapters is still in its early stages, but the ongoing process is anchoring the private sector's expectations for the future of the legal framework (Figure 1.1 and Figure 1.2). Implementation of the EU acquis will open opportunities to the private sector, increasing its role over time. Russia's invasion will likely have a lasting impact on Ukraine's political economy and increase social cohesion and reframe the relationship between citizens and the state.

If Ukraine succeeds in mobilizing sufficient private capital and management skills, it could be well positioned for a strong post-invasion

⁶ IMF 2023, Ukraine IMF Country Report 23/132

⁷ This process began following Russia's actions with respect to Crimea in 2014 but accelerated dramatically after the invasion in February 2022. The change in the direction of trade also had an impact on the composition of exports, as exports to Russia and Belarus are more complex than exports to the European Union and other developed markets.

⁸ The political criteria for EU accession include specific demands to implement the rule of law. The European Commission in its Communication COM(2022)407 in June 2022 identified, in particular, the following steps Ukraine needs to take to start formal negotiations: (i) enact and implement legislation on a selection procedure for judges (in line with Venice Commission); (ii) finalize the procedures to establish the High Qualification Commission of Judges of Ukraine; (iii) further strengthen the fight against corruption, in particular at high level; (iv) ensure that anti-money laundering legislation is in compliance with the standards of the Financial Action Task Force; and (v) implement the Anti-Oligarch law in a legally sound manner, considering the forthcoming opinion of the Venice Commission on the relevant legislation. Two more conditions relate to securing the independence of media and the rights of minorities. (EU-LEX 2022).

Figure 1.1 Alignment of Ukrainian Laws with the EU Acquis Chapters, 2023

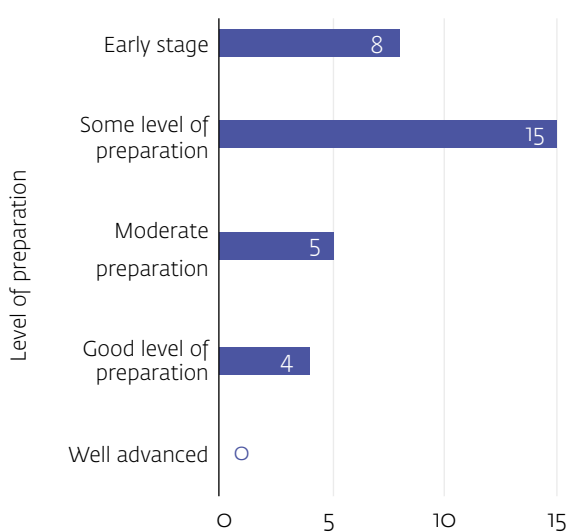


Figure 1.2 Progress toward Achieving the Preconditions for EU Candidacy, 2023



Source: EC 2023d; New Europe Centre 2023.

Note: Note: The graph represents the level to which Ukraine prepared 33 EU policies (EU acquis) to become an EU member. The graph assesses Ukraine's implementation of seven EU pre-conditions for Ukraine's membership. The graph reflects the absence of a Venice Commission opinion on the implementation of the Anti-Oligarch law and the EU's changing position on how Ukraine should deal with its oligarchs.

recovery. The public sector has limited budgetary and institutional capacity to expand public investment, and a private sector-led recovery would likely yield a more efficient allocation of productive resources and sustainable growth. The IMF program envisages that the private sector will finance three-quarters of the investment necessary for Ukraine's reconstruction. While this estimate is consistent with historical data, mobilizing such a vast amount of funding in a post-invasion environment would require extensive and sustained improvements in the investment climate. The government has demonstrated a credible commitment to strengthening business environment, and the IMF projects that private investment will reach 20 percent of GDP in 2027 under the baseline scenario, either of which would represent a massive increase over the 10 percent registered in 2021 (IMF 2023c).⁹

Meanwhile, the IMF projects that public investment will rise from just under 4 percent of GDP in 2021 to about 5 percent in 2027. In this context, a successful reconstruction effort would hinge on maximal mobilization of private capital and optimal resource allocation.¹⁰

The objective of this report is to explore the potential for private capital mobilization and the private sector role in Ukraine's green and resilient recovery by adapting the World Bank Group (WBG) cascade approach to the Ukrainian context. The cascade approach is the method by which the WBG operationalizes the concept of maximizing finance for development.¹¹ To maximize the impact of scarce public resources, the cascade approach seeks to mobilize commercial finance, enabled by upstream reforms where necessary. Where risks remain high, the

⁹ These projections were revised in the first review of the IMF program (IMF 2023c). This report refers to the original program unless otherwise indicated.

¹⁰ Efficient private resource allocation requires strengthening competition, reducing uncertainty, lowering transaction costs, and increasing the efficiency of factor markets.

¹¹ This report uses the phrase "mobilizing private financing for development" and refrains from using the word "maximizing," which may not be consistent with post-invasion macroeconomic conditions.

priority is to apply guarantees and risk-sharing instruments. Public resources are tapped only when sectoral reforms and risk-mitigation measures cannot make market solutions feasible (WBG 2017). Applying the cascade approach to Ukraine requires understanding the state's role in the economy, government and/or market failures, and different modalities of private financing available to support the recovery. The EU accession process offers unique opportunities to mitigate country risk, which is projected to remain high even after the invasion ends.¹²

The expected outcomes of the report are to contribute to: (i) attracting private sector interest in investing in Ukraine to support the post-invasion reconstruction effort, and (ii) encouraging the Ukrainian government to continue implementing reforms that would help unlock private financing while strengthening economic development and increasing integration with international markets. It is intended to support the GoU's efforts in developing the Ukraine Plan—the government's plan for developing the economy in the next four years—to access funds from the EU-established Ukraine Facility. The report assesses private investment potential in all sectors included in the RDNA2. It estimates first-order approximations of the potential to: (i) attract private investors' attention and (ii) promote reforms. In some sectors such as agriculture, transport, and energy and extractives, the report assesses opportunities for private investment beyond

RDNA2 needs, extending to Ukraine's goals for economic growth through a green transition of the domestic economy and faster integration into European and global value chains.

Private Sector Investment Projections¹³

Following IMF macroeconomic projections (IMF 2023a) and considering the needs identified in the RDNA2, this report quantifies the role of the private sector in meeting the country's needs. The report uses the same time frame as the RDNA2 (2023–2033) and follows the same sectoral classification. The report divides the economy into commercial sectors such as agriculture and telecommunications, infrastructure sectors such as transportation and logistics, and social sectors such as housing and education. It also discusses banking and pensions, as reforms in these areas could help mobilize additional domestic private resources. When banking and pensions are included, Ukraine may be able to mobilize 15.3 percent of GDP in domestic private financing for a green and resilient reconstruction by 2027 (IMF 2023a).¹⁴

The analysis presented in the sector-specific chapters is subject to important caveats.¹⁵ First, the private financing opportunities reflect numerous assumptions and are merely indicative of the possible impact of alternative policies. While the specified reforms and interventions would be necessary to create these opportunities,

¹² Ukraine's crisis will take time to resolve due to:

- a Supply shocks: Destruction of productive assets in certain industries and regions, which has reduced the productive potential of the private sector. The recovery will likely be slow in the absence of measures that help the private sector invest in regaining its potential.
- b Demand shocks: Reduction in consumer demand (due to emigration, loss of income sources, etc.) and access to international markets (e.g., port blockade). As public and private sector investment resumes, domestic demand should recover. Attracting external demand will require both reforms that accelerate EU integration as well as investment in logistics infrastructure.
- c Liquidity constraints: Increased liquidity constraints and limited access to finance (which was already modest before the invasion) for the private sector as a result of both supply and demand shocks.

¹³ The caveats presented in this section reiterate those presented in IFC's October 2023 Synthesis Report.

¹⁴ The IMF projects a private investment-to-GDP ratio of 20.1 percent and an FDI-to-GDP ratio of 4.8 percent in 2027 (IMF 2023a). Assuming projected FDI fully contributes to gross fixed capital formation, domestic resources will contribute 15.3 percent of GDP to private investment in 2027 under the baseline projection. The IMF report published in June 2023 (2023c) revised the private investment-to-GDP ratio down from 20.1 to 15.9 percent, while FDI was revised up from 4.8 to 5.0 percent of GDP, suggesting that only 10.9 percent of domestic resource mobilization would finance private investment. The revisions left the projected growth rate unchanged, implying more efficient investment and a lower incremental capital output ratio. The revised scenario makes financing external to firms, including bank lending, even more important than the baseline because this type of financing contributes disproportionately to productivity and growth (Rajan and Zingales 1998).

¹⁵ Further information on the projections is included in the sector assessment chapters.

they would not be sufficient to mobilize the amount of private financing estimated in the report. Under any scenario, multiple factors outside the scope of the analysis would influence investment decisions. Economic growth, sound macroeconomic management, governance reforms, and conducive trade and investment policies as well as risk mitigation instruments delivered by international development partners will be crucial to attract private financing from both domestic and foreign sources. Second, estimates are based on information available as of May 31, 2023. Given the rapidly evolving context of the invasion and the uncertainty regarding the ultimate extent of related damages and losses, the analysis will require subsequent updates to remain accurate.

The sector-specific projections assess whether private investment can effectively address the needs outlined in the RDNA2. Private financing requires: (i) private ownership or management of public or formerly public assets; and (ii) cost recovery for investors. Even without reforms, these conditions are largely met in the agriculture, commerce, industry, tourism, and banking sectors. There are, however, subsectors such as engineering and machine-building that are profitable but cannot attract private investment due to the dominant market position of state-owned enterprises (SOEs). Moreover, price controls inhibit investment in sectors that are already largely private such as renewable energy. The housing sector is a special case: as private reconstruction financing is expected to originate mostly from households, projections for this sector are based on household investment in housing as a share of GDP.

Reforms and interventions are projected to increase the share of private financing to address the needs outlined in the RDNA2 as well as to increase private investment opportunities beyond the scope of the RDNA2. These reforms and interventions include:

- a. *Increasing the opportunities for the private sector to manage or utilize state assets.* These are sector-specific measures, ranging from port and airport concessions to the mobilization of private capital and the eventual privatization of SOEs such as the electricity distribution system operators, the Kharkiv combined heat and power (CHP) plant and Centerenergo.
- b. *Implementing an adjustment of controlled prices.* For example, revising maximum and minimum price caps on the different wholesale market segments to ensure free price formation by the end of 2023 would increase EU electricity market integration, demand reduction, investment and energy security.
- c. *Accelerating public investment.* For example, public investment in irrigation and the demining of land can expand the scope for private agricultural investment.
- d. *Enhancing public sector capacity to address regulatory issues.* State capacity is required to prepare assets for public-private partnerships (PPPs), enforce competition policy, and administer creditor rights. In most cases, the government is best suited to address crosscutting priorities for public goods, although the private sector could play a role in some critical areas such as land decontamination (Box 1.1). Public sector regulatory capacity is not a subject of this report.
- e. *Piloting projects to explore private investment opportunities in state-dominated sectors.* These sectors include water and sanitation, education, and health.

Sector-specific assumptions, reforms, and projections discussed in this report are summarized in IFC's Synthesis Report that was published in October 2023. Despite the

uncertainty generated by Russia's invasion and the limited availability of risk-mitigation instruments, the projections published in this report are designed to inform decision-making in both the public and private sector. The government is currently developing a medium-term plan (2024–2027) and a long-term strategy for the country's key economic sectors designed to anchor policy expectations as Ukraine's economy shifts toward European

and transatlantic markets. This report identifies reforms and interventions that could expand opportunities for private investment and growth in each of the identified sectors, supporting the government's planning process during a pivotal phase in Ukraine's economic development. While the reforms and projections aim to support this planning process, they are not sufficient to ensure the private financing of Ukraine's green and resilient reconstruction.

Box 1.1. Effect of Land Decontamination and Demining on Ukraine's Economic Performance

The RDNA2 reports that, as of February 24, 2023, Ukraine's National Mine Action Authority estimated that 25 percent of the national territory has been exposed to contamination from hazardous materials, including landmines and unexploded ordnances. Decontamination will be vital to the recovery of agriculture, transportation, and other economic activities in the affected areas. The RDNA2 reports that the cost of land decontamination is estimated at \$37.6 billion, or about 9 percent of all recovery needs, and the process will likely take decades to complete. The cost and difficulty of decontamination will increase the longer the invasion drags on, as will the amount of suffering and death inflicted on civilians in the meantime, which means that the final damage estimates may be much higher. Moreover, these estimates exclude the cost of removing sea mines from Ukrainian harbors and the harm done to commercial shipping, which has deep negative implications for agricultural producers that depend on the country's Black Sea ports.

Core decontamination activities will be carried out and financed primarily by the government, its development partners, and international actors specializing in demining and related issues, but there will be opportunities for the private sector. Private firms can conduct land and population surveys, provide public outreach and training, import the necessary supplies and equipment, and supply various forms of logistical support. Mechanical tillers, dozers, and other machines used in demining operations have civilian applications in agriculture, construction, and other sectors, which could eventually give rise to a secondary market for repurposed demining equipment. The government is in the process of reforming its trade rules to expand imports of the machinery and supplies required for decontamination.

CHAPTER 2

Cross-cutting Issues

This chapter examines how Russia’s invasion of Ukraine has affected preexisting cross-cutting constraints on private-sector development and identifies additional constraints created by the invasion. The World Bank and IFC’s 2021 Ukraine Country Private Sector Diagnostic (CPSD) analyzed the challenges facing Ukraine’s private sector prior to Russia’s invasion (IFC 2021a). The invasion has heightened political and security risks, resulted in insufficient private commercial financing, weakened the business enabling environment, and limited the role of public and concessional risk management, which will be critical to mobilize private financing for reconstruction.

To accelerate private financing, the Ukrainian government must successfully address longstanding issues. Under a business-as-usual, no reform scenario, pre-invasion constraints on private financing will continue to determine the amount of resources available for reconstruction.¹⁶ The public sector’s limited capacity has been a key constraint to private sector development, but it is evolving rapidly as Ukraine implements the reforms required for EU accession. Continued progress on EU accession, combined with the adoption of both publicly supported and market-based risk mitigation measures, will provide incentives for the private sector to contribute to financing Ukraine’s green and resilient reconstruction.

Especially important reforms relate to the implementation of policies in the areas of judiciary and fundamental rights (Chapter 23 of the *acquis*)

as well as justice, freedom, and security (Chapter 24 of the *acquis*). Specifically, compliance with the rule of law requirements requires “an independent and efficient judiciary”, “a solid legal framework and reliable institutions [...] to underpin a coherent policy of prevention and deterrence of corruption” (*acquis* Chapter 23) and “a strong and well-integrated administrative capacity within the law enforcement agencies and other relevant bodies” (*acquis* Chapter 24) (EC “Chapters of the *acquis*”).

2.1 Private Sector Resilience amid Economic Turbulence

Ukraine strives to improve economic efficiency despite Russia’s invasion. Changes in total factor productivity (TFP) can serve as a proxy for the economic impact of abnormal market conditions caused by Russia’s invasion of Ukraine. In 2022, TFP contributed about one-third of the 29 percent contraction in GDP.¹⁷ This steep decline reversed a positive 1.9 percent average annual contribution of TFP to GDP growth during 2016–2021. Renewed year-on-year economic growth in the second quarter of 2023 suggests that TFP could again positively contribute to economic growth. Meanwhile, the return of refugees and diaspora members may further boost productivity.¹⁸

Despite economic turbulence, private investment has continued during Russia’s invasion of Ukraine, setting the stage for a strong post-invasion recovery. Gross fixed capital formation contracted by 34 percent in 2022, with a

¹⁶ Assuming no changes in resource endowments and territory.

¹⁷ Conference Board data report that TFP contributed 10.2 percentage points to the 2022 economic contraction.

¹⁸ Some studies found that migrants returning to the Western Balkans after the Yugoslav Wars of 1991–2001 were more likely to start a business than their counterparts (Bahar, et al. 2019).

disproportionate drop in public investment.¹⁹ The share of gross fixed capital formation in GDP fell from 14.8 percent in 2021 to 11.6 percent in 2022. Private investment has been resilient, boosted by public-sector demand. Public procurement of goods, services, and capital equipment accounted for 20 percent of GDP in 2022, offering opportunities for the private sector.²⁰ An end to the invasion would likely trigger an expansion of investment that goes beyond the government's available fiscal resources, including investment by private firms and SOEs, as well as resources managed by development partners. Private investment is projected to accelerate after the end of the invasion, supported by rebounding TFP growth, public investment, and a growing labor force (IMF 2023a).

During the reconstruction, the private sector's focus will be on rebuilding assets that offer a healthy return to investors. Construction firms, including cement producers, will benefit from a boost in demand for housing and infrastructure.²¹ Working capital for agriculture will contribute to the normalization of production and exports. The ongoing digitalization of the economy will benefit the information and communications technology (ICT) sector, with benefits spilling over to other sectors. Transportation companies will expand, and the energy sector offers investment opportunities to increase energy security and exports. Ukraine's score on the Organisation for Economic Co-operation and Development (OECD) Business Confidence Index improved from 37.5 in January to 51.5 in April 2023,

confirming the positive short-term business outlook.²²

Ukraine's post-invasion reconstruction offers the opportunity to build back better and greener. Prior to the invasion, Ukraine had made progress in decarbonizing energy and industry comparable to that of its neighbors (Figure 2.1). Still, the country remains vulnerable to the impact of climate change in terms of increasing temperatures and extreme weather events (Figure 2.2). Reconstruction will offer an opportunity to invest in climate-change mitigation and adaptation, bolstering Ukraine's resilience to future shocks. Recognizing the importance of building back better, public and private development partners are prioritizing a green and resilient reconstruction. In parallel, the EU accession process is expected to raise environmental, social, and corporate governance (ESG) standards and strengthen the enforcement of legislation.²³

Attracting the medium- and long-term investment necessary for a green and resilient recovery will require sustained policy reforms. Prior to Russia's invasion, the state maintained an exceptionally large role in the economy, and monopolies dominated some sectors. Many key firms in the financial, energy, transport, and industrial sectors were controlled by vested interests (Box 2.1). In the absence of major domestic policy changes, private financing will concentrate in sectors that have accumulated resources during the invasion. A more broad-based distribution

¹⁹ The share of public investment in GDP fell by 27 percent, while the share of private investment (including by SOEs) fell by 19 percent. (State Statistics Services of Ukraine. 2023a).

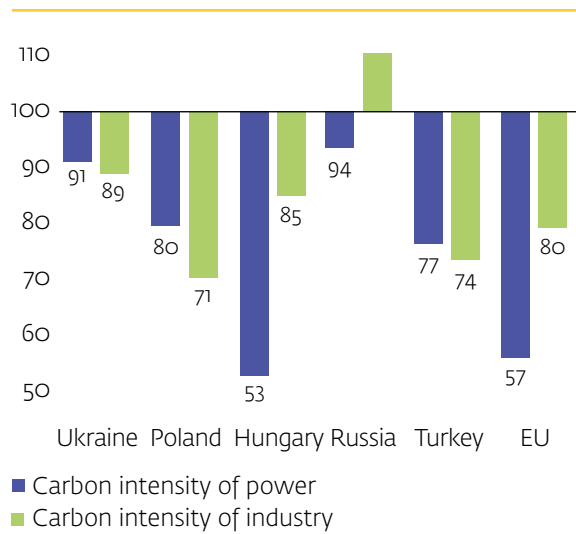
²⁰ The IMF estimates that fiscal expenditure accounted for 70 percent of GDP in 2022. Public sector wages, social benefits, and interest payments account for 47 percent of GDP, offering limited opportunities for private sector participation.

²¹ The construction sector is covered in the chapter on housing, and building materials are included in the chapter on industry and commerce.

²² In 2020, 11 percent of Ukraine's imports came from Russia, 5.8 percent from Belarus, and 13.3 percent from China. Imports from Russia were valued at \$5.69 billion. .

²³ Ukraine was 85th out of 141 countries in the Global Competitiveness Ranking in 2019. Improved ESG disclosure to bring transparency to the public and financial sectors is important for investment attractiveness, stakeholder trust, and share prices (World Economic Forum 2020). In 2020, 32 percent of companies in Ukraine published corporate social responsibility-related information, an improvement from 21.7 percent in 2017 (CSR Development Center).

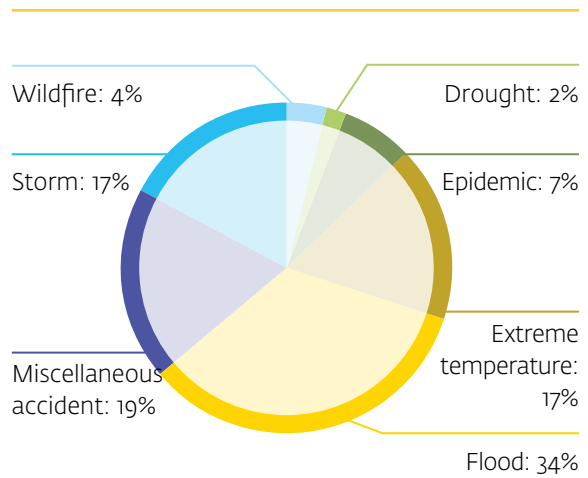
Figure 2.1 Ukraine has made far less progress than most of its peers in decarbonizing energy and industry



Source: IEA.

of the benefits of the recovery will require policy reforms. The government has continued to make progress in key areas since Russia’s invasion, and in some areas its efforts have been accelerated by Ukraine’s EU accession status.²⁴ The WBG cascade approach offers a framework for prioritizing reforms that may trigger private investments that contribute to a competitive business environment (Section 2.2). Private sector strategies will vary by sector and depend on the available financing sources and risk mitigation instruments (Section 2.3).

Figure 2.2 Floods, storms, and extreme temperatures account for most natural disasters in Ukraine over the last 20 years



The private sector is also expected to engage with local governments and municipalities, as these will be at the forefront of Ukraine’s reconstruction. The decentralization reforms adopted and implemented since 2015 have greatly strengthened the role of local governments in planning, financing, and investment decisions to improve local accountability and service delivery. The GoU is committed to engaging local governments in developing place-based reconstruction strategies and plans. Private sector financing and management capacity is expected to contribute to the implementation of these strategies and plans, with oversight from subnational and national authorities.

²⁴ For example, as of September 2023, Ukraine will be a signatory to the European Court of Justice.

Box 2.1. Updating the Constraints on Private-Sector Growth Identified in the CPSD

1. Lack of Competition and Large State Presence in the Economy

In July 2021, just a few months prior to Russia's invasion, the first stage of Ukraine's land-reform program took effect, as the authorities lifted the ban on domestic transactions involving small land plots owned by individuals. The reform reestablished an agricultural land market, empowering farmers and local communities, while attracting more private investment into agriculture (see Chapter 3). The option to collateralize land should further improve access to finance (see Chapter 15).

The invasion required the state to increase its role in the economy, but the government is committed to fostering robust private-sector competition, especially during the recovery. As the shock of the invasion caused GDP to contract while emergency spending needs sharply increased, fiscal expenditures rose from 40.3 percent of GDP in 2021 to 69.9 percent in 2022 (IMF 2023a). Meanwhile, Ukraine's central bank assumed control of the subsidiaries of two Russian banks,²⁵ and the authorities commandeered domestic firms that it deemed vital to national defense.²⁶ The government announced that these are temporary measures demanded by the invasion and that they will be reversed once the invasion ends (Zakon Rada 2022b).²⁷

Reforms to improve the governance of SOEs started prior to Russia's invasion and have continued apace, though much remains to be done. Since 2014, reforms have been implemented to augment the power of the Antimonopoly Committee of Ukraine, to reform loss-making SOEs, and to facilitate properly regulated privatization where appropriate (OECD 2021c). As part of the SOE reforms launched in December 2019, the government adopted a protocol to improve corporate governance among the ten most economically important SOEs, with five more SOEs added in 2020 (OECD 2021).

2. New Anti-Corruption Institutions

The government has created a well-designed framework of anticorruption and law-enforcement agencies, but these institutions will need time to become fully effective. Newly-created bodies include the National Agency for Corruption Prevention, the National Anticorruption Bureau of Ukraine, an independent police force responsible for detecting and investigating high-level corruption, and the Special Anti-Corruption Prosecution Office. The High Anticorruption Court has already started to process selected cases. The government has also established an Agency for Recovery and Management of Assets, which is responsible for managing illegally obtained assets, including the proceeds of corruption (EC 2022). In June 2022, the legislature adopted the National Anticorruption Strategy, demonstrating the government's continued commitment to curb corruption despite the ongoing invasion. (OECD 2022). The momentum of reform must be sustained while the newly established institutions mature, as it will take time to attract financing for post-invasion reconstruction.

²⁵ Two Russian banks, Prominvestbank and MR Bank (Ukrainian subsidiary of Sberbank Rossii), were nationalized by the decision of the National Security and Defense Council of Ukraine on May 11, 2022 (Zakon Rada 2022). A draft law to nationalize Sense Bank (formerly Alfa Bank, owned by two Russian oligarchs) failed to be approved by the Verkhovna Rada on May 2, 2023 (Forbes 2023).

²⁶ A number of companies controlled by oligarchs (Boguslaev, Kolomoyskyi, Zhevago, and the Russian citizen Grygoryshyn) were put under government control in October 2022: Motor Sich (aircraft engines and gas turbines), Zaporizhtransformator (transformators, reactors), AvtoKRAZ (heavy duty trucks), Ukrnafta (oil and gas extraction), and Ukratnafta (oil production, gas stations) (Focus 2022).

²⁷ The head of the National Security and Defense Council of Ukraine, Oleksii Danylov, noted that the assets may be returned to the owners or reimbursed after the end of the war (Ukrinform 2022).

3. Limited Access to Finance

Access to finance has remained broadly unchanged since the CPSD. Ukraine's small, bank-dominated financial sector constrains economic growth and distorts competition. Bank lending to the private sector totaled 20.9 percent of GDP in 2020, well below the average of 55.5 percent for lower-middle-income countries in Europe and Central Asia (World Bank 2023 c). The lack of access to credit weakens competition, as companies that are part of a conglomerate access financing through intercompany borrowing, which is not an option for small and medium enterprises (see Chapter 15). Addressing the constraints faced by Ukraine's financial sector will be crucial to enable a healthy flow of finance to support a green and resilient recovery.

4. Inadequate Infrastructure and Energy Market Distortions

Infrastructure constraints have become more binding since the start of the invasion. Damage to infrastructure accounted for 39 percent of all invasion-related damage, as well as 24.5 percent of losses and 38 percent of reconstruction needs.

2.2 Applying the World Bank's Cascade Approach to Ukraine

Commercial Financing

The cascade approach maximizes overall financial flows by prioritizing commercial financing where it is most viable and directing scarce public finance where it is most needed. Prior to Russia's invasion, investment by private firms and SOEs was concentrated in the industry and commerce sector (32 percent) and the energy sector (22 percent), followed by the housing (16 percent), agriculture (12 percent), transport (8 percent), and ICT (5 percent) sectors.²⁸ Some of these sectors are characterized by significant market competition, including retail, information technology, housing, and certain agricultural subsectors. By contrast, oligopolistic competition characterizes the metals sector. The CPSD highlights that private commercial project financing requires a predictable, consistent, and transparent regulatory framework, and the sectoral analyses in this report reinforce this message. For example, the slow and costly enforcement of creditor rights limits access to finance (see Chapter 15).

While fully implementing sector-specific regulations will take time, Ukraine's reconstruction needs are urgent. In this context, the authorities should encourage private investment in commercial projects while strengthening regulatory institutions. Private firms in oligopolistic sectors—such as the steel industry—may feel threatened by regulatory changes that disrupt the status quo. Addressing the uncertainty caused by the reform process will be vital to unlock private investment while increasing competition and transparency.

Creating an Enabling Environment for the Private Sector

Reducing the state's role in the economy will be crucial to support a private sector-led recovery. Several sectors that are currently subject to heavy state intervention could sustain a much greater degree of private-sector activity. In sectors that remain dominated by SOEs, the private sector could increase its participation through management contracts, PPPs, or even full-scale privatization.²⁹ Engaging private firms in managing and/or financing SOE operations can be a first step toward deeper reforms,³⁰

²⁸ Average of 2018 and 2019, the latest available data (State Statistics Services 2023d).

²⁹ Commercial financing already dominates industry, commerce, agriculture, tourism, and some transport and energy subsectors.

³⁰ Community involvement at an early stage can contribute to public support for proposed changes in policy and public investment.

and the existing regulatory framework for establishing PPPs and privatizing SOEs and state assets has already been applied in various sectors (Figure 2.3).³¹ The privatization process stopped for seven months before restarting in September 2022. By the end of 2022, 182 auctions had been held, and four state assets had been sold (State Property Fund of Ukraine 2022).³²

Reforms to the budget and tax code adopted in 2014–2020 paved the way for commercial borrowing by voluntary associations, local communities, and subnational governments. SOEs can also borrow from commercial sources, subject to approval by the Ministry of Finance and in accordance with oversight rules.³³ The EU accession process offers guidance on further reforms that can bolster confidence among private investors and encourage them to offer financing to associations, subnational authorities, and SOEs. Short-term financing and management contracts should be consistent with the long-term goal of allocating resources on a competitive basis.

Public and Concessional Resources for Risk-Mitigation Instruments and Credit Enhancements

Risks are expected to decline after the invasion ends, but risk-management tools will remain crucial to the reconstruction. Mitigating country risk will be especially critical. Country

risk is a composite index of commercial risks, execution risks, and other risks considered by foreign investors. The government may consider mitigating country and commercial risks while leaving execution risks to the private sector (see Section 2.3). Country risk is important for all investors, but particularly foreign investors that compare investing in Ukraine to investing in other countries. To mitigate country risk, Ukraine needs a properly functioning system of internal control in the private and public sectors.³⁴

The fiscal cost of publicly financed risk mitigation instruments must be weighed against the public benefits they generate.³⁵ These public benefits include physical and social infrastructure built with the support of state guarantees or other risk-mitigation tools. The fiscal cost-effectiveness of these measures should be evaluated continually as risks moderate. As demand for investment guarantees is projected to exceed supply, the authorities should be judicious in their allocation of guarantees. Using guarantees for projects that would be feasible without a guarantee may limit the resources available for projects that require guarantees.

Availability payments may be necessary to attract private investment in sectors that serve social policy objectives.³⁶ These payments can be used to mitigate the risk of unpredictable demand while requiring private investors

³¹ The GoU has asked IFC to provide advice on how to leverage the private sector for reconstruction in infrastructure sectors and establish financial structures that crowd in private capital by leveraging donor funding. IFC's Strategic Advisor team, working in coordination with the World Bank Infrastructure Practice Group, has offered advice on the revisions to the PPP legislation.

³² The State Property Fund of Ukraine did not hold privatization auctions between February 24 and September 19, 2022. After that, 182 auctions were held, with four small (but no large) assets being sold in 2022. Ukraine received over 1.7 billion hryvnia (nearly \$48 million) from the privatization of state property in 2022, which is approximately one-third of 2021 revenue.

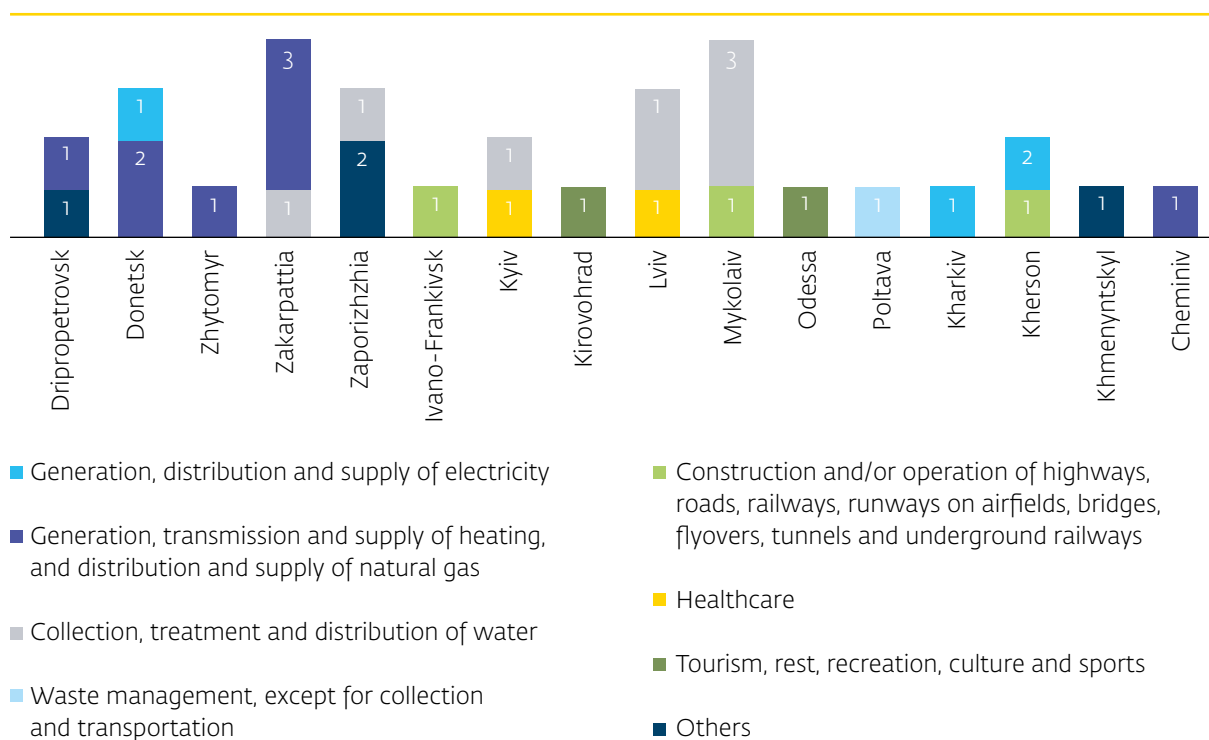
³³ Ukrainian SOEs generally do not access commercial financing and instead rely on capital injections from the state, borrowing from State-owned banks, bond issuance, and state guaranteed debt from international finance institutions.

³⁴ This issue is being considered in draft Law No. 5593-d on Amendments to Certain Legislative Acts of Ukraine on Improving of Corporate Governance of Legal Entities, the Shareholder (Founder, Participant) of Which is the State.

³⁵ Risk management tools will remain important during the post-invasion period, and the deeper sector analysis that is planned during a second phase will discuss this, depending on the relevant security issues later this year. The second phase will include a review of instruments to insure against security risks used by Israel and Spain.

³⁶ Availability payments are payments from the public sector to private partner based on the attainment of specified performance targets and availability of contracted infrastructure.

Figure 2.3 PPP Agreements by Sector and Region at the Start of Russia's Invasion of Ukraine



Source: CMS Law Tax Future (2022).

to meet the needs of low-income groups. The 2022 budget law included a provision allowing availability payments to be offered on a multiyear commitment, which should provide greater predictability to private investors.³⁷ In addition, a deferred payment structure (DPS) implicitly covers availability payments through development partner guarantees (Box 2.2). However, pure public goods will need to be provided by the public sector. Drawing on public resources and the assistance of development partners can help prevent short-term needs from overwhelming the available resources after the invasion ends.

2.3 Private Sector Strategies and Risk Mitigation

Private financing will follow risk-adjusted profit expectations. In 2021, the balance of payments recorded a net FDI income outflow of \$19.8 billion, while international investment liabilities were estimated at \$185.3 billion. Ukraine's implicit interest rate³⁸ on its external debt was 4.1 percent, higher than that of Poland (1.7 percent), Romania (1.9 percent), and Türkiye (3.4 percent). At the time, the rate of return was partially a function of the perceived risk of investing in Ukraine and the absence of instruments to manage these risks through financial markets (see Chapter 15). Amid Russia's ongoing invasion, risks will remain high but are mitigated by the EU accession process, the 4-year

³⁷ On February 15, 2022, the Verkhovna Rada adopted Bill No.5090 on Making Amendments to the Budget Code of Ukraine on the Settlement of Budgetary Relations During the Implementation of Agreements that Regulate PPP, Including Concession Agreements. The bill allows the government to make contributions to PPP projects, including water supply and sanitation projects, primarily in the form of periodic payments (up to 30 percent of municipal budgets' general fund). Prior to this bill, the government could not assume long-term liabilities under PPPs because of the principle of three-year budget planning. (Verkhovna Rada, Bill No.2035-IX).

³⁸ The implicit interest rate is defined as interest payments on foreign debt as reported in balance of payments data and the stock of foreign debt as reported in net international investment position data. data.imf.org.

Box 2.2 International Private Financing for Public Investment Using DPSs

DPSs can attract private contractors and mobilize financing for public investment projects where risk allocation is challenging for private sector debt and equity. In emerging markets jurisdictions, DPS programs have been used to finance highly complex projects, including multibillion-dollar expansions of metro systems and roads in Latin America and the Caribbean.

Under DPS programs, granting authorities accept bids from the private sector for the construction, operation and maintenance of public infrastructure projects, and private contractors perform discrete tasks (based on milestones) in exchange for a stream of long-term deferred payment rights granted by the government. As each phase of the project is completed, contractors sell these payment rights to generate liquidity for the next phase, and the process repeats itself until the project is complete. Such future payment streams, which can come 10-15 years after the completion of the project, are either authorized directly by the government or through a trust backed by the government. When structured in a bankable manner, these government-backed payment obligations can be bundled and sold to institutional investors in a customary securitization transaction.

In Ukraine, the infrastructure concession would need to be structured on a DPS basis, and the government would need to commit to multi-year payments backed by payment support from development partners. At the start of the project, the foreign partners would need to pay the bulk of the obligations to the certificate holders. However, over time, as Ukraine's sovereign creditworthiness improves and its payment capacity is restored, the government could assume a larger share of the payment obligations under terms agreed upon in advance and embedded in the language of the trust documentation. Consequently, implementing DPSs in Ukraine would require especially close collaboration between the government, financial markets, and the international community.

IMF program, and the continued engagement of international partners.

Private Financing

Prior to Russia's invasion, intracompany resources financed the largest share of total investment, followed by public investment. Intracompany financing accounted for about two-thirds of total investment, or 10 percent of GDP, while public investment amounted to just over 3 percent of GDP.³⁹ The large share of intracompany financing reflected the underdevelopment of the domestic financial market. In the absence of widely available external financing, firms that were part of a conglomerate relied on intracompany

financing, which may have provided them with an advantage that distorted competition in sectors where credit constraints were particularly binding. For example, firms in the commercial and industry sectors financed 37 percent of investment with their own resources, significantly exceeding those sectors' 28 percent share in total investment. Firms also disproportionately relied on their own resources in the energy, extractives, and telecommunications sectors (Figure 2.4).

The other key sources of private financing were financial markets (including banks), foreign investment, and household savings. During 2018-2019, financial markets financed some 6.8 percent of total investment, while foreign investors financed

³⁹ Some intercompany financing is included in FDI in balance of payments data.

3.8 percent. In principle, these investments should have been allocated on a competitive basis. In practice, however, the allocation of bank credit was influenced by the government's Affordable Loans 5-7-9 program, which subsidizes credit for small- and medium-sized firms (see Chapter 15). Moreover, non-performing loans (NPLs) represented 30 percent of total bank lending prior to the invasion, suggesting that noncommercial criteria may have been used to allocate bank credit. Foreign financing was dominated by large energy sector transactions in 2019. Household savings, which amounted to 0.9 percent of GDP during 2018-2019, were almost exclusively used for housing construction.⁴⁰

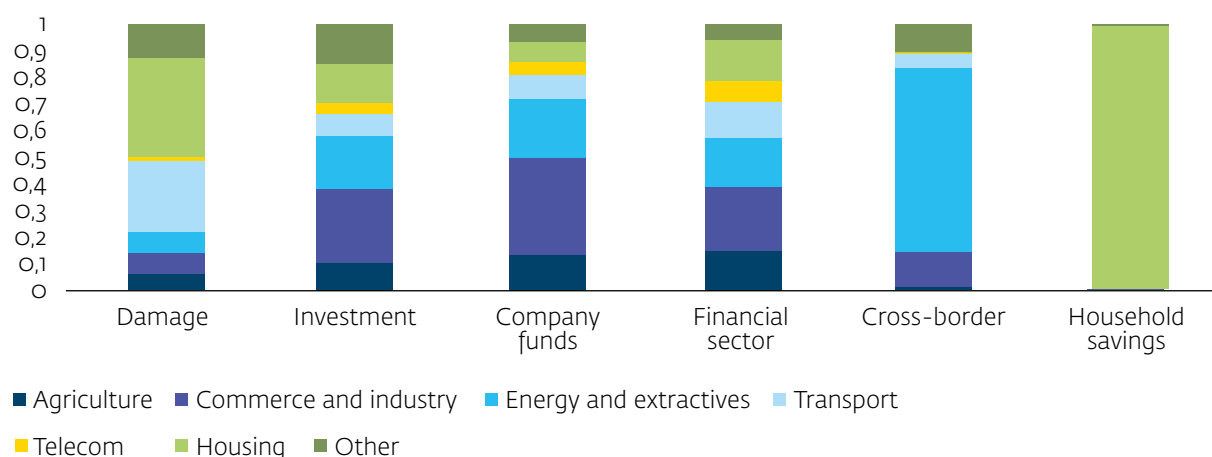
During the invasion, households and firms sharply reduced investment in fixed assets, increasing financial savings during 2022. In addition to accumulating net bank deposits of \$7 billion, households also accrued foreign savings. At the same time, an estimated 7.1 million people fell into poverty, suggesting an increasingly uneven distribution of assets and income. Ukraine's corporate sector accumulated savings, which it partially transferred into increased foreign-asset holdings. The corporate sector's stock of trade

credit increased by the equivalent of \$11 billion. This capital outflow exacerbated external imbalances. As in the case of household savings, the distribution of assets among corporates was highly uneven, as the balance sheets of many corporates deteriorated, while those of a few improved. In addition to financial assets accumulated during the invasion, post-invasion Ukraine may benefit from new sources of private financing as it deepens its integration into transatlantic and European value chains.

Strategies for Risk Mitigation

Private-sector strategies and instruments vary by sector. Standalone equity-financed investments, both by domestic and foreign investors, could follow the pattern observed among small and medium-sized enterprises (SMEs) in agriculture, services, and some manufacturing subsectors. For example, the ICT sector contracted by 15.4 percent in 2022, far less than the economy-wide average of 29.1 percent, resulting in its share of GDP increasing from 4.3 to 4.6 percent. Going forward, the sector will benefit from the digitalization of infrastructure and continued international demand.

Figure 2.4 Invasion Damage (2022-2023) and Pre-Invasion Investment Financing (2018-2019) by Sector



Source: World Bank et al. 2022; State Statistics Service of Ukraine. 2018 & 2019.

⁴⁰ The State Statistics Service of Ukraine provides data on household savings in the housing construction sector only. Data on how much household savings were invested in other sectors of the economy are not collected and not shown in this paper.

Integration into international value chains could accelerate as the authorities address key challenges highlighted in the CPSD. Value chains offer the opportunity for intercompany and supplier-debt finance, which has been important in agriculture but could benefit a wider range of sectors. Since Russia's actions with respect to Crimea in 2014, the direction of trade has shifted from Russia towards the EU. However, previous exports to Russia were relatively complex, while current exports to the EU include less complex, more labor-intensive products. Increasing the sophistication of exports will be a key challenge, and the CPSD lists three obstacles that inhibit the ability of Ukrainian firms to integrate into sophisticated European value chains: trade facilitation barriers, a limited range of efficiency-seeking FDI inflows, and constrained domestic links. These obstacles can be addressed by: (i) improving institutional quality and strengthening the rule of law; (ii) enhancing the investment climate, building entrepreneurial capacity, and upskilling the labor force; (iii) continuing to align domestic economic and trade policies with EU standards; and (iv) addressing infrastructure bottlenecks. The government is already addressing these obstacles despite the ongoing invasion.

Private-sector engagement with SOEs and government agencies that manage state assets could play a major role in mobilizing private financing for Ukraine's reconstruction. SOEs continue to own or manage a significant share of public assets. Some of the SOEs in the energy and transport sectors already issued bonds on private capital markets prior to the invasion (see Chapters 7 and 8). A published strategy defining how the role of SOEs and state-owned banks (SOBs) will evolve over time could help improve their credit ratings and deepen private sector interest in engaging with these companies.

SOEs could also promote market development, and SOBs could, for example, establish local asset markets in collaboration with international financial institutions (IFIs). Local asset markets are important for financial risk management and could help attract international capital flows. Management contracts for SOE assets could improve investor confidence, which in turn could increase their creditworthiness over time and eventually lead to the use of PPP contracts. Private firms have an interest in building relationships with SOEs, as these ties can position them to participate in future PPPs or win competitively tendered contracts, including DPS programs (Box 2.2).⁴¹

Private investors will have to navigate multiple risks during Russia's invasion and even in a post-invasion environment, and a variety of instruments can help mitigate these risks. Country risk is important for foreign investors, which may seek support from the Multilateral Investment Guarantee Agency and contractual assurance that they have access to international arbitration. Macroeconomic risk is particularly important for the financial sector, as traditional hedging instruments are not available in Ukraine. In contrast to exports, domestic demand and supply are difficult to project, which elevates commercial risk. Availability payments can mitigate commercial risk, but external guarantees may be important in mitigate the risks of large-scale projects. Execution risk may be particularly important for projects that require significant investment in construction, such as those in the infrastructure, housing, health, and education sectors.

While risk mitigation instruments can be classified as predominantly public or private (Table 2.1), the invasion has blurred these distinctions. A combination of risk-mitigation

⁴¹ Draft Law No. 5593-d on Amendments to Certain Legislative Acts of Ukraine on Improving of Corporate Governance of Legal Entities, the Shareholder (Founder, Participant) of Which is the State is scheduled for discussion in the Verkhovna Rada in October 2023. It aims to bring the SOE corporate governance framework in line with the Organization for Economic Cooperation and Development (OECD) Guidelines on Corporate Governance of SOEs.

instruments is currently being used to support FDI, including the mobilization and/or management of resources by development finance institutions. The urgent need to support private financing during the invasion has required the government to direct public

resources to address risks that are traditionally managed by the private sector. As this report focuses on private-sector opportunities for a green and resilient reconstruction, it does not include an in-depth analysis of risk instruments used during the invasion.

Table 2.1 Risks and Risk-Mitigation Instruments

Risk	Definition	Mitigation	Public or Private
Invasion-related risk	Damage and disruptions caused by the invasion	Strategic use of public resources	Public
Political and country risk	Adverse changes in policy design or implementation, including reform slippages	Contractual provisions and insurance mechanisms, such as those provided by MIGA, as well as appeals to the European Court of Justice	Public and/or private
Macroeconomic risk	High or unpredictable inflation rates, sudden exchange-rate adjustments or other forms of macroeconomic instability	Market-based hedging instruments and indexation of tariffs	Private
Commercial risk	Misalignment of projected and actual revenues and/or costs	Minimum traffic or offtake guarantees and availability payments	Private
Execution and fiduciary risks	Risks that are technically under managerial control, including the failure to implement projects as planned	Contract provisions and staged payments	Private

Source: IFC estimates.

PART I: COMMERCIAL SECTORS

CHAPTER 3 Agriculture

3.1 Sector Overview

Agriculture is one of the most important sectors in Ukraine's economy. In the decade prior to Russia's invasion, the agriculture sector was growing steadily at an average annual rate of 4 percent. Agricultural output contributed 11 percent to the country's GDP (14–16 percent when processing of agricultural products is included), and the sector employed about 17 percent of the labor force (RDNA2 and State Statistic Service of Ukraine 2023a and 2023b). FDI inflows to the agriculture, food, and beverages processing industry averaged 0.6 percent of GDP in the seven years leading up to Russia's invasion, while total inflows averaged 2.6 percent.⁴² Agricultural products are Ukraine's most important exports, representing an average of 38.6 percent of total merchandise exports in the decade leading up to Russia's invasion. Agricultural exports peaked at 49.1 percent of merchandise exports in 2020.⁴³ In July 2021, the first stage of Ukraine's land reforms became effective, removing the ban on domestic transactions involving small land plots for individuals.⁴⁴ The reforms introduced a land market aimed at empowering farmers and local communities while attracting more private investment in agriculture. By September 2022, over 12,000 land contracts had been signed, covering an area of almost 280,000 hectares (Ministry of Agrarian Policy and Food of Ukraine 2022). While this represents only a small fraction of the country's 5 million hectares

of agricultural land, it highlights the importance of prioritizing land reform and continuing the reform program once hostilities cease.

Ukraine is one of the world's largest food producers and exporters, and it is a strategic supplier for many countries that depend on food imports. Ukraine is among the top 10 global producers and exporters of grains and oilseeds, oil and meal, and livestock products. In the 2021-2022 marketing year, Ukraine ranked first in sunflower exports, second in sunflower oil exports, and fourth in barley exports worldwide. Ukrainian food products reach about 400 million people outside of Ukraine, and just 50 countries do not import agricultural products from Ukraine. Prior to Russia's invasion, Ukraine was the origin of 13 percent of global grain exports and 50 percent of the world's sunflower oil production (EU4Business, et al. 2022).

3.2 Strategic Challenge

Oblasts (regions) where hostilities have ceased or are ongoing are leading producers of certain agricultural goods and livestock. Kharkiv, Luhansk, Donetsk, Zaporizhzhia, and Kherson were the most affected regions in the country during the time this report was prepared. During the 2021-2022 marketing year, these regions produced 35 percent of the country's sheep and goats, 32 percent of wheat, 29 percent of sunflower, 26 percent of barley, 25 percent of vegetables, 23 percent of honey, 20 percent of pigs, and 16 percent of

⁴² Sectors considered are agriculture, forestry and fishing, and manufacturing of food products, beverages, and tobacco products, in line with the central bank's inward direct investment dataset. Based on FDI data from the NBU and GDP data from the World Bank's World Development Indicators.

⁴³ In 2022, agricultural products represented 57.2 percent of Ukraine's goods exports, a historically high share. Based on trade data from the NBU for the years 2011 to 2022.

⁴⁴ The first stage of the reform allows individuals to directly own up to 100 hectares of agricultural land. The next stage of the reform will start in January 2024 and will open access to the land market for legal entities.

eggs. For its part, Kyiv produced 24 percent of the country's eggs, Chernihiv and Sumy produced 11 percent and 7 percent, respectively, of its corn, and Mykolaiv produced 12 percent of its barley. Estimates suggest that approximately 38 percent of agricultural production in regions impacted by hostilities has been affected (EU4 Business, et al. 2022).

Russia's invasion has significantly reduced the volume and value of Ukrainian agricultural production. Corn production has been especially affected, as invasion-related delays resulted in 6 percent of the corn crop remaining unharvested in February 2023. In 2022, the planting area for winter wheat declined by 25 percent, and many farmers switched to oilseed crops, which will likely reduce Ukraine's grain harvest and exports in 2023. Wheat and overall grain production in 2022 fell below the levels observed in 2020, a year marked by a severe drought and relatively low agricultural production in Ukraine (EU4Business, et al. 2022). Production volumes for major grains and oilseeds fell by an estimated 35 percent (about 37 million tons) in the 2022/2023 marketing year relative to the previous year.⁴⁵ Some of the reasons behind the drop in production include higher input (e.g., fertilizer)⁴⁶ prices and input-supply disruptions, which reduced crop yields; lower farmgate prices that discouraged the production and even harvesting of some outputs (e.g., corn); and a reduction in planting and harvesting areas due to the invasion. Land damage and contamination due to mines, unexploded ordnance, artillery fire, and the movement of heavy military equipment have also weighed on production.

Falling farmgate prices and diminished production have reduced the incomes of farming households. Ukrainian farmers registered an 80 percent fall in revenue in 2022, due largely to the 35 percent drop in production value and 45 percent drop in farmgate prices of major grains and oilseeds. Because Ukraine usually exports about 70 percent of the grains and oilseeds it produces, the farmgate prices of these commodities are determined by free-onboard export prices, as well as the cost of post-harvest, logistics, and freight—all of which increased drastically last year. Following Russia's invasion, global wheat prices increased significantly and did not return to pre-invasion levels until the second half of 2022. However, prices in Ukraine fell and remain below pre-invasion levels (Figure 3.1). High logistical costs have also put downward pressure on farmgate prices in Ukraine. For example, in 2022 Ukrainian farmers received \$156 per ton for wheat exported to Saudi Arabia, much less than farmers in Russia and Germany, who received \$252 and \$310 per ton, respectively (Striwe 2022). The average difference between farmgate and export prices for Ukrainian wheat exports increased from \$32 per ton in 2021 to \$147 per ton in 2022 (Figure 3.1). Due to low farmgate prices and other logistical difficulties, farmers are facing significant losses and liquidity constraints.

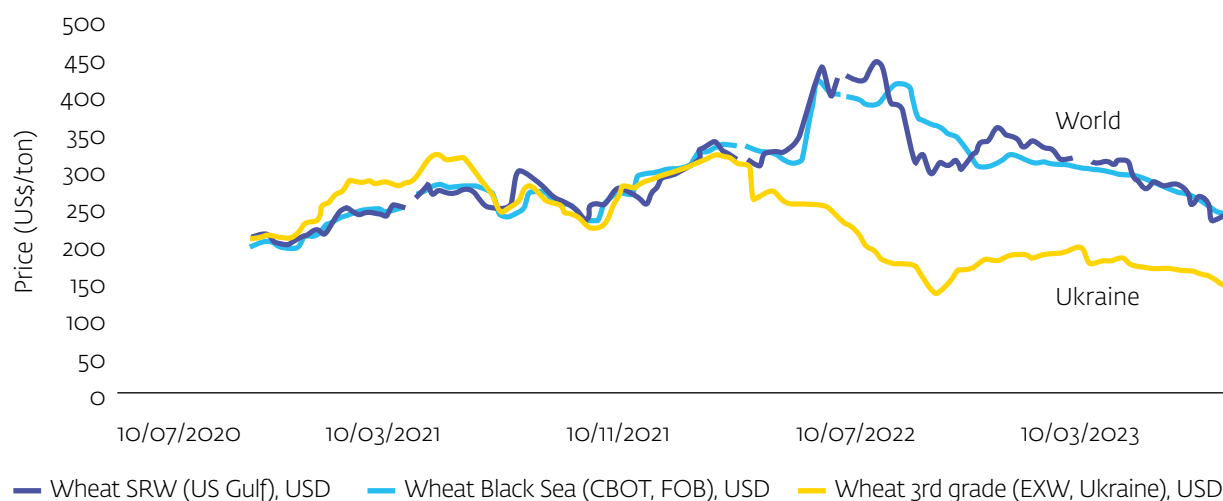
Logistical challenges and limited overland transport facilities undermine Ukraine's ability to export. Before the invasion, a significant share of goods was exported via ports, and about 86 percent of agricultural products were seaborne.⁴⁷ From late February to July 2022, all ports were blocked, except for the small Danube ports, which lack capacity to handle significant (i.e., pre-invasion) levels of exports. The problem was partly solved by the Black Sea Grain Initiative, which was signed in late July 2022 between the governments

⁴⁵ Refers to grains, legumes, and sunflower. Based on crops growing data from the State Statistics Service of Ukraine

⁴⁶ Prior to the invasion, Ukraine was about 50 percent self-sufficient in mineral fertilizers. Over the last year, however, the Ukrainian mineral fertilizer market has seen a significant decline in production and imports of all types of fertilizers. The consumption of fertilizer has also decreased, especially in frontline areas. Despite falling demand, the domestic price of various types of fertilizers (i.e., potash, carbamide, NPK 16:16:16, and ammonium nitrate) has soared. Higher domestic prices likely reflect high global prices, high production costs, limited access to raw materials, and logistics issues resulting from the invasion

⁴⁷ Based on data provided by the NBU. Agricultural products refer to HS-2 codes 01 to 23

Figure 3.1 Global and Ukrainian Wheat Prices (\$/ton)



Source: IFC elaboration based on data from APK-Inform.

of Ukraine and Russia but is no longer active.⁴⁸ Ukraine's ports are still operating well below their maximum capacity, and the ports of Mykolaiv, which are among the largest in the country, remain blocked. Another problem is congestion in the Black Sea, as Russia appears to be interfering in the inspection of vessels, further slowing the delivery of Ukrainian exports. However, starting in September 2023, Ukraine started to export again from ports in Odesa via a new route through the waters of Romania, Bulgaria, and Türkiye. Railway transportation has been increasing, but its growth is limited by various factors, including the low capacity of railway border crossings with European countries and the difference in gauge width between Ukraine and the EU. Assuming no delays on the grain corridor, the cost of exporting grain via alternative routes is approximately 4-5 times higher than via Black Sea ports. Greater costs in alternative forms of transportation have impacted the profitability of agriculture, as alternative transportation of bulk goods is not economical. Following a record harvest of 108.8 million tons of grain and oilseeds in the 2021-2022 marketing

year, Ukraine was expected to deliver a record volume of commodities to the global market, but instead logistical disruptions related to Russia's invasion sharply reduced Ukrainian exports. As a result, agricultural exports plunged by an estimated 15.6 percent in 2022 (NBU 2023a). More than 20 million tons of grain and oilseeds were blocked at the Black Sea and Azov Sea ports. Grain exports in the first months of the year were limited to 500,000 tons per month, down from 5 million tons prior to the invasion (EU4Business, et al. 2022). According to the Ministry of Agrarian Policy and Food, Ukraine has lost \$170 million per day due to blocked ports (EU4Business, et al. 2022). To prevent a food crisis, in early March 2022 the Cabinet of Ministers restricted exports of several key food products, including rye, oats, buckwheat, millet, and sugar, as well as live cattle, frozen beef, meat, and meat offal. However, restrictions on some products, including wheat and barley, have been lifted since June 2022. Between 2021 and January-November 2022, exports of select products to Europe increased, but exports to all other regions fell (Figure 3.2).⁴⁹ Lower production and export

⁴⁸ The deal allowed for Ukraine to export via three of its Black Sea ports, namely Odesa, Chornomorsk, and Pivdennyi. However, the deal ended in July 2023 as Russia suspended its participation. This deal was crucial for many food-insecure countries to continue receiving grain and foodstuff from Ukraine despite Russia's invasion.

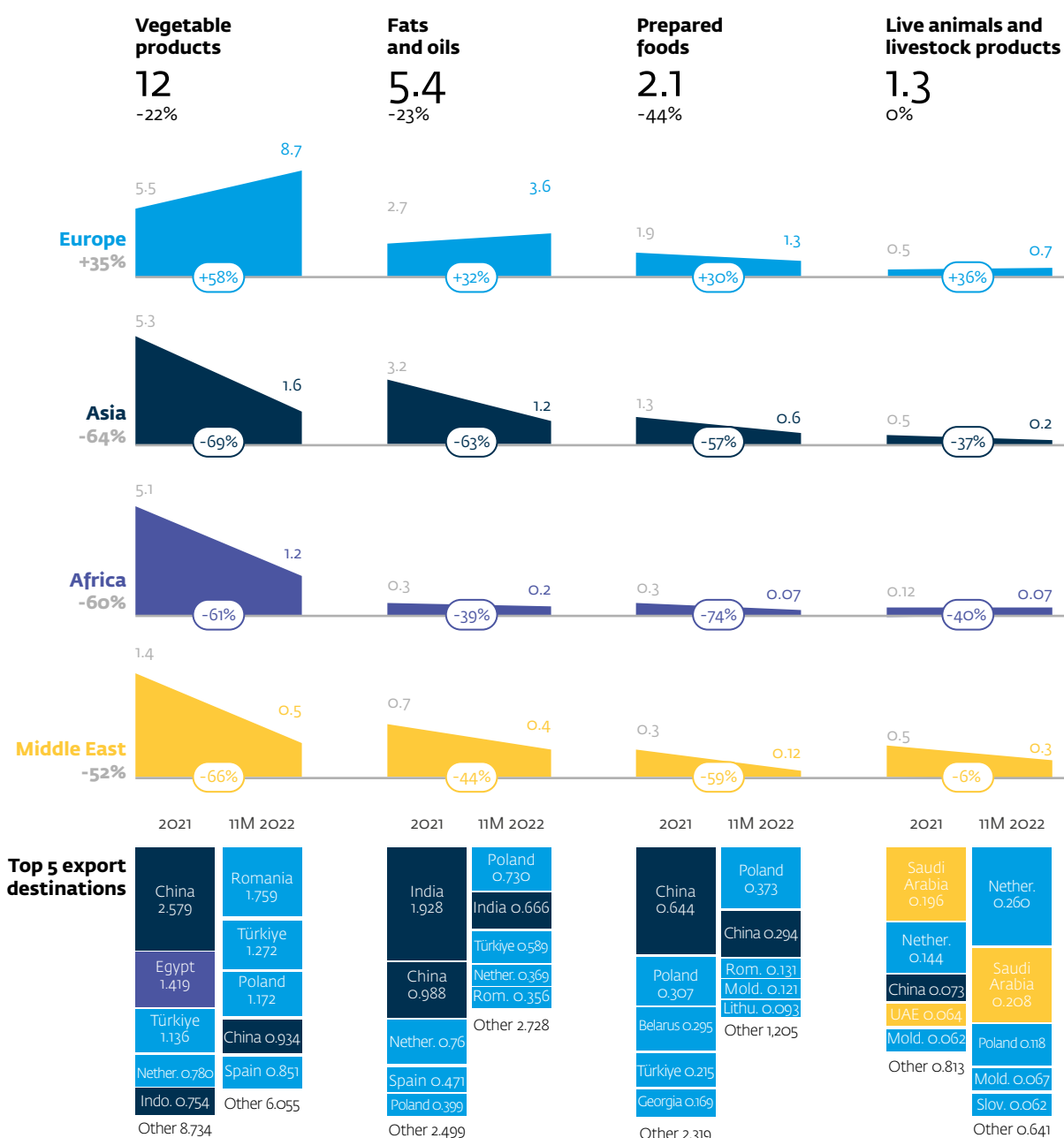
⁴⁹ While the EU canceled all duties and fees on Ukrainian agricultural products, this did not include agricultural commodities. However, the initiative bolstered Ukrainian exports to EU countries. This measure was introduced in May 2022 and is intended to expire in June 2024 (originally intended to expire in 2023).

volumes exacerbated the risk that the current crisis of food access could become a crisis of food availability in the coming years.⁵⁰

3.3 Obstacles to Private-Sector Participation

Despite its importance to the Ukrainian economy, the agriculture sector had considerable

Figure 3.2 Selected Ukrainian Agricultural Exports (\$, billions, 2021 and January–November 2022)



Source: EU4Business et al., 2022.

⁵⁰ About 349 million people across 79 countries were acutely food insecure in 2022, a situation that has been and is likely to be exacerbated by Russia's invasion of Ukraine. Russia and Ukraine are major growers and exporters of grain and oilseeds, accounting for 30 percent of global wheat exports, 20 percent of corn exports, and 80 percent of sunflower oil exports. More than 50 countries worldwide, including many developing countries in Africa and Asia, depend on Russia and Ukraine for 30 percent or more of their grain supplies. For example, Somalia and Benin imported 100 percent of their wheat from Russia and Ukraine in 2020, Egypt imported 82 percent, Türkiye imported 85 percent, and Sudan imported 75 percent

untapped potential even before the invasion. In 2014, the average value-added per hectare was just \$413 in Ukraine, far below the levels of Poland (\$1,142), Germany (\$1,507), and France (\$2,444) (IFC 2021a). Most of this gap was explained by differences in crop types, as Ukraine focused heavily on cereals with relatively low marginal value. However, even on a per crop basis, the Ukrainian agriculture sector underperformed its European comparators, and limited irrigation infrastructure made Ukraine's agricultural yields especially volatile. Before the invasion, a range of structural and policy constraints inhibited investment in the sector, including the absence of a regulated land market, distortive state support policies, inadequate access to finance, and limited uptake of global product standards (IFC 2021a). These constraints, especially those related with meeting production standards, will likely become more relevant as the country seeks accession to the EU.

Farmers and other private-sector stakeholders face a range of challenges, including difficulty accessing inputs, logistical challenges, changes in crop structure, and obstacles to carrying out technical operations. The shortage, disruption, and rise in the price of inputs will make it more difficult for farmers to acquire fuel, seeds, plant protection products, and fertilizers. An inability to deliver prepaid inputs from warehouses in temporarily not under governmental controlled territories or invasion-affected areas is expected to continue decreasing the availability of inputs for future seasons. The change of crop structure associated with the decreased profitability of some crops has also increased the cost of inputs and made it difficult to sell agricultural products. Furthermore, Russia's invasion has made it impossible to carry out technical operations, including applying fertilizer and plant protection products, in some parts of the country. During the 2022 spring sowing campaign, producers mitigated losses by having purchased most fertilizers, seeds, and plant

protection products in 2021. However, the 2023 crop season and subsequent seasons will likely entail significant losses for farmers, as the planting area for winter crops has decreased by 38 percent (EU4Business, et al. 2022).

Vegetable production has been severely affected by Russia's invasion. About 25 percent of vegetable production is concentrated in the temporarily not under governmental control southern and eastern regions. The Kherson oblast (region), part of which remained temporarily not under governmental control for a long period, has long been a leader in vegetable production. The invasion has shifted the geography of cultivation, reducing or ending production in the southern regions and increasing production in the western and central regions. Damage to energy infrastructure poses an especially significant challenge, as the storage and processing of vegetables and fruits requires a reliable and consistent source of energy (EU4Business, et al. 2022).

Ongoing hostilities have also created challenges at various stages of the livestock supply chain. Constant bombardment and shelling have resulted in harsh working conditions for farmers, and many animals have died or been released into the wild. Higher prices for veterinary drugs and lack of access to certain areas have also contributed to the loss of animals. Attacks have also made hay and silage preparation more difficult and have limited the flow of raw materials to processing plants located in combat zones and temporarily not under governmental control territories. Blackouts and stabilization power outages, resulting from damage to energy infrastructure, have disrupted key production processes. The intensely difficult operating environment has greatly reduced the productivity of the livestock and poultry industries (EU4Business, et al. 2022).

3.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

As of February 24, 2023, the invasion had caused \$8.72 billion in direct damage to the agriculture sector, with aggregate losses totaling \$31.50 billion (RDNA2). Direct damage from the invasion includes the partial or complete destruction of machinery and equipment, storage facilities, livestock, fisheries and aquaculture, and perennial crops, as well as stolen inputs and outputs. Damage to machinery and equipment represented 53 percent of total damages,⁵¹ followed by stolen inputs and outputs (23 percent) and damaged storage facilities (15 percent) (RDNA2). Invasion-related damages increased almost fourfold between June 2022 and February 2023 due to: (i) assets that had previously been partially damaged being fully destroyed in territories temporarily not under governmental control; (ii) the value of stolen inputs and outputs increasing; and (iii) farm surveys conducted by the Food and Agriculture Organization and the World Bank revealing that actual damage was greater than previously believed (RDNA2). Almost half (46 percent) of total losses resulted from falling farm gate prices for export-oriented commodities such as wheat, barley, corn, and sunflower seeds, while another 44 percent reflected diminished production of annual and perennial crops (RDNA2). Reduced livestock and fishery production accounted for 6 percent of total damages, while increased production costs were responsible for 3 percent.

Agriculture accounts for more than half of the state's Affordable Loans 5-7-9 Program loan portfolio. In 2022, the program was expanded to reach more farmers by setting the lending rate at 0 percent for the first six months and at 5 percent for the following six months. In 2022, 6.5

billion (\$194 million) hryvnia in public spending on this program mobilized 46.8 billion hryvnia (\$1.5 billion) in agricultural loans, of which just 25.8 billion hryvnia consisted of loans partially guaranteed by the government. The program provided loans to almost 7,000 agricultural producers, a large majority of which were farms of 1,000 hectares or less. Bank lending to firms in the agriculture sector also increased following Russia's invasion, with loans to firms in the agriculture, forestry, and fisheries sector growing by 44 percent in nominal terms, and loans to food producers increased by 13 percent (EU4Business, et al. 2022).⁵² Currently, agribusinesses are actively attracting financing to replenish working capital amid higher production costs and limited market access, though fewer are obtaining financing for investment projects.

The Instrument for Pre-Accession Assistance for Rural Development (IPARD) may become available to Ukraine after 2027 if the country follows the EU's recommendations for accession. Through IPARD, the EU provides financial and technical assistance to beneficiaries to make their agricultural sectors and rural areas more sustainable and align beneficiaries with the EU's Common Agricultural Policy (CAP). Ukraine is in the process of aligning its legal framework for agriculture and rural development with the EU acquis, but more work is needed. The country must establish the administrative structures required for CAP, including extending the registration of farms in the state agrarian registry, expanding the state farm-support fund into a compatible paying agency, and establishing reliable systems for managing EU funds. In addition, the authorities need to improve the integration and data quality of the Land Parcel Identification System. Similarly, Ukraine needs to develop the legal framework for a common market organization that

⁵¹ Estimates by the Kyiv School of Economics suggest that, as of January 2023, 11 percent of the machinery and equipment used before February 24, 2022, has been fully or partially damaged

⁵² The rise in loans is likely explained by the amendments made to the state budget in March 2022 in terms of the amount of state guarantees. Following the amendments, new guarantees were provided, and the list of banks participating in the state portfolio guarantee program was expanded.

addresses issues such as market interventions and school schemes.

Over the longer term, the transition to climate smart agriculture (CSA) presents a wide range of attractive financing opportunities both for the public and private sectors. Ukraine's agriculture sector has considerable potential to contribute to the decarbonization of global supply chains for soft commodities. A tailored climate policy framework, aligned with EU regulations (CAP, Green Deal, REPowerEU, etc.) can help support business-to-business decarbonization efforts and advance the country's long-term agricultural climate agenda. In tandem, the private sector could explore CSA technologies to increase the sector's competitiveness. In line with the findings of the CPSD, the CSA technologies with the highest returns are climate-smart fertilizer, no-till practices, and agritech/data tools (IFC 2021a). Agritech/data tools can also help build resilience to uncertainty, which will be critical in a post-invasion environment.⁵³ Despite the benefits of CSA, various barriers limit the uptake of key technologies and practices, especially among smaller enterprises. These barriers include lack of access to finance, limited knowledge, capacity, and skills, and inadequate irrigation, transport, and logistics infrastructure, and most of them have been exacerbated by Russia's invasion.⁵⁴ Invasion-related disruptions have also affected foreign equipment and solutions providers, which already faced high import tariffs. The land reform, if properly implemented, could alleviate some of these barriers by helping farmers unlock additional financial resources while incentivizing them to invest in assets they would legally own.

3.5 Risk and Risk Mitigation

Hostilities will continue to affect decisions related to crops for the duration of the invasion. Grain has long been a mainstay of the Ukrainian

agriculture sector, but the temporary closure of Ukraine's Black Sea ports and the threat of a renewed blockade have discouraged grain production. While export prices for wheat and other cereals have stabilized, costs continue to rise. Narrowing margins and uncertain access to vital transportation infrastructure have prompted farmers to shift from grains to oil producing plants such as sunflower, rapeseed, and soy. Vegetable oil offers an attractive alternative to grain production, but a sudden pivot from grains to oil plants could overwhelm local processing capacity, especially for rapeseed and soy. Moreover, most vegetable oils will ultimately need to be exported, leaving the subsector vulnerable to the same transportation disruptions that are depressing grain production. In September 2022, the Ukrainian and Polish governments signed a deal to create a pipeline—the first of its kind in the world—capable of transporting 2 million tons of Ukrainian vegetable oil per year into Poland for export via the Port of Gdansk.

Weak protection of land tenure could aggravate farmers' liquidity constraints and limit their access to capital expenditure (CAPEX) and working capital. For 20 years, the government imposed a moratorium on private land sales that prevented landowners from using their titles as collateral to secure loans while also discouraging investment in soil quality and supportive infrastructure. In 2021, the government lifted the moratorium for domestic transactions involving small plots, but creating an efficient land market requires continued liberalization of land sales and strengthening of institutions for land governance. Meanwhile, stronger protections of land rights could encourage investments in soil quality and enable landowners to borrow against equity. Measures to prevent the excessive concentration of land ownership will also be necessary to maintain competition while

⁵³ See the case of Kernel about leveraging technology to ensure business continuity during hostilities (Microsoft News 2022).

⁵⁴ The CPSD includes an in-depth discussion of these barriers.

Table 3.1. Agricultural Risks and Risk-Mitigation Instruments

Risk	Definition	Impact on the Sector	Mitigation Measures
Country	Change in legislation	Delays in implementing land reform	No sector specific measures available
Macroeconomic	Change in inflation, exchange rate	Volatile input prices and farmgate prices	Hedging instruments for agricultural commodities
Climate change	Adverse/extreme weather events	More frequent droughts	CSA technologies and practices; investments in expanding and modernizing the irrigation system
Commercial	Mismatch between projected and actual revenues or end costs	Uncertainty regarding future prices (e.g., at the time of harvest)	Contract agriculture agreements
Execution	A failure to fully implement programs and policies on schedule	Slow adoption of CSA technologies and practices	Agricultural extension services that provide information on best practices and demonstrate their effectiveness

Note: sector-specific measures only, cross-sector risks and risk mitigation is summarized in Table 2.1.

Source: IFC, WB elaboration.

leveraging economies of scale. As liquidity remains the biggest challenge in the agriculture sector, government programs must continue and be scaled up to help producers cope with the uncertainty caused by the hostilities.

Additional risks and sector-specific mitigation measures are presented in Table 3.1. Country-level risks include delays in implementing the land reform, which could jeopardize the creation of an efficient land market. Macroeconomic risks include higher inflation, exchange-rate depreciation, and price volatility, all of which directly affect farmers' incomes. If these risks materialize, they could also create mismatches between projected and actual revenues or end costs. Execution risks stem from interruptions in project implementation, which can result in delays and costs overruns. The agriculture sector is also highly vulnerable to the rising risks posed by climate change, including more frequent droughts that adversely affect crop productivity.

3.6 Financial Flows and Projections

Based on historical data, private funding appears sufficient to meet the agriculture sector's recovery and reconstruction needs, but

government-supported credit instruments will play a vital role in mobilizing private capital. The government must undertake efforts to support and unleash private financing. To attract enough private resources, especially capital investment, to support recovery and reconstruction efforts, public funds must crowd in private financing. The government must also provide essential public goods such as food safety, sanitary and phytosanitary (SPS) standards, and laboratories, certifications, and compliance verification, as well as other enabling factors such as agricultural research, agrometeorological information, and a range of physical and digital infrastructure.

The authorities must prioritize efforts to attract capital to the agriculture sector and avoid policies that reduce liquidity and distort market signals. Building on existing momentum and leveraging Ukraine's role in global food security, private financing could cover around 80 percent of the needs identified in the RDNA2. Estimates suggest that with reforms, private financing could increase by about 30 percent in 2023–2026 and by about 50 percent in 2027–2033 (Table 3.2). Under a reform scenario, private financing could exceed total reconstruction

needs. The conditions necessary to attract private financing include:

- Completion of agricultural land reforms, including the implementation of the arrangements slated for January 2024, capacity-building efforts targeting institutions responsible for land governance, and support for a more active land mortgage market.
- Completion of irrigation reforms to enable more private investment in water delivery and on-farm water management.
- Consistent access to the EU market and opening of new markets for agricultural products.
- Timely reimbursement of the export value-added tax (VAT) and other fiscal considerations.⁵⁵
- Enactment of legislation to digitalize and simplify issuance of crop receipts, which would attract more private financing for agriculture from banks and input suppliers while reducing the cost for carbon-sink verification, a pre-condition for attracting private climate finance.
- Public support for private investment through credit guarantees, interest-rate compensation, and matching grants; financing of public services required to support the sector;⁵⁶ adoption of CAS technologies in the context of EU accession; and mine clearance and recultivation of farmland.
- Upgrading of public administration and infrastructure needed to utilize future EU pre-accession funds (e.g., IPARD).

Table 3.2 Agricultural Sector Needs and Private Financing (\$, billions, 2023 prices, unless otherwise indicated)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	10.2	19.5	29.7
Private sector financing for reconstruction—Non-reform scenario	8.0	16.2	24.2
Addressing needs identified in RDNA2	8.0	16.2	24.2
Private sector financing as share of RDNA2 needs (%)	78.4	83.1	81.5
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario	10.4	24.2	34.6
Addressing needs identified in RDNA2	10.2	19.5	29.7
Private sector financing as share of RDNA2 needs (%)	100.0	100.0	100.0
Other investment opportunities identified	0.2	4.7	4.9

Source: RDNA2 and IFC, WB estimates.

Note: Both scenarios assume that the government will pay for select public goods, discussed in the text, to crowd in the private sector financing included in the table. Under the no reform scenario, contributions from the public sector are estimated at \$5.6 billion (\$2.23 billion in 2023-2026 and \$3.34 billion in 2027-2033). Under the reform and intervention scenario, contributions from the public sector rise to an estimated \$6.7 billion (\$2.7 billion in 2023-2026 and \$4 billion in 2027-2033).

⁵⁵ Other fiscal considerations include avoiding taxation on the export of agricultural commodities, either directly or indirectly (through non-return of export VAT), to support food processing, which requires other types of public support rather than taxation of agricultural commodities.

⁵⁶ Specifically, financing public services that are critical for transparent management of public support, access to markets, and food safety and health.

CHAPTER 4

Industry and Commerce

Industry and commerce are the largest sectors of the Ukrainian economy, representing about one-third of GDP in 2020. This chapter covers the country’s major industrial segments—the food and beverages industry, metal production, and engineering and machine building—along with wholesale and retail commerce. In 2021, these sectors accounted for 51.4 percent of revenues, 22.3 percent of national employment, 34.6 percent of commercial employment (3.147 million workers), 19 percent of capital investment, and 47 percent of goods exports ⁵⁷ (State Statistics Service of Ukraine 2023f).

Private investment opportunities in these sectors are estimated at \$18.1 billion, below the estimate presented in the RDNA2, as most damages to the engineering and machine building industries were incurred by SOEs. The analysis

also highlighted \$11.5 billion in additional opportunities in the food industry, but the presence or absence of reforms will greatly influence the extent to which the private sector can meet the identified needs.

4.1 Food and Beverages ⁵⁸

4.1.1 Strategic Challenge

Ukraine’s well-diversified food industry serves both domestic and export markets. In 2021, food and beverage production accounted for 3.8 percent of gross value-added, 3 percent of national employment, 3.9 percent of commercial employment (356,000 workers), 4 percent of capital investment, and 15.5 percent of goods exports. ⁵⁹ Food products are the country’s third largest export good after metals and grains,

Table 4.1 Industry and Commerce Needs and Private Financing (\$, billions, 2023 prices)

	RDNA2	Private sector opportunities			
		Non-reform scenario		Reform and intervention scenario	
		Addressing RDNA needs	Other opportunities	Addressing RDNA needs	Other opportunities
Total	23.2	17.8	0.0	18.1	11.5
Industry, Total	18.6	13.2	0.0	13.5	11.5
Food and beverages ^(a)	0.8	0.8	0.0	0.8	11.5
Base metals and metal products	12.0	12.0	0.0	12.0	0.0
Engineering and machine building ^(b)	4.4	0.4	0.0	0.7	0.0
Other industry	1.4	0.0	0.0	0.0	0.0
Commerce, Total	4.6	4.6	0.0	4.6	0.0

Note: (a) The reform scenario assumes meeting EU sanitary and phytosanitary (SPS) standards; trade facilitation to access EU markets and timely reimbursement of the export VAT and other fiscal considerations. (b) The reform scenario assumes that large non-military SOEs are privatized and new investors finance reconstruction.

Source: RDNA2 and IFC estimate.

⁵⁷ IFC calculation based on official statistics from the State Statistics Service of Ukraine.

⁵⁸ Unless specified otherwise in this chapter, the food industry refers to the food and beverages industry.

⁵⁹ IFC calculation based on official statistics from the State Statistics Service of Ukraine.

and most of its food exports are bound for EU countries, especially the Netherlands, Spain, Poland, Italy, and France, as well as India and China (ITC “Trade Map”). In 2022, revenue declined by 23 percent in US dollar terms, far less than the 49 percent drop experienced by other manufacturing subsectors. Food exports declined by 20 percent, also well below the average of 35 percent, and food surpassed grains to become the second-largest export good. In 2021, the food industry was responsible for 2 percent of Ukraine’s greenhouse gas (GHG) emissions (State Statistics Service of Ukraine “Statistics on emissions...”).

The food industry relies heavily on local agriculture. Most inputs are sourced domestically—including grains, fruits and vegetables, oilseeds, milk, meat, poultry, and eggs—though wine production and confectionary utilize imported inputs. Local production covers about 90 percent of domestic food demand. Prior to the invasion, about 33 percent of food products, mainly cooking oil and other oilseed products, were exported; exports of other food goods averaged 20 percent. Many foods are exported in unprocessed form.

Russia’s invasion damaged more than a dozen large and medium-sized food-processing enterprises. Organic Systems in Mykolaiv was destroyed, while other facilities survived partially intact. Some of the damaged facilities are again operating, including Sandora, Coca-Cola Beverages Ukraine, and Mondelez Ukraine.

Other damaged assets include several edible-oil extraction plants and vegetable- and fruit-growing facilities. As of April 2023, direct damages were estimated at \$468 million, including undepreciated fixed assets, unfinished capital investments, and inventories.

4.1.2 Sectoral Context

The food industry in Ukraine is mostly privately owned. Some assets, such as edible-oil factories and confectionary factories, belong to oligarchs. At edible-oil factories, total oligarch exposure is 35 percent. Confectionary production is the most oligarch-exposed segment of the food industry at 50 percent (CES Policy Paper). The presence of oligarchs in this segment is significant but not overwhelming. The presence of the state is limited to a dozen small factories, mostly bakeries. Distilleries are in the process of being privatized.

Foreign investment plays a significant role in the Ukrainian food industry. Since the industry was not the primary focus of oligarchs, and regulations did not limit competition, a substantial number of foreign investors entered the market. The largest foreign players include Cargill, Delta Willmar, Carlsberg, ABInBev Efes, Coca Cola, PepsiCo, Nestle, and Mondelez. The food industry accounts for about 25 percent of industrial FDI and 6 percent of total FDI in Ukraine (NBU, 2022).

The largest segment is edible oil, which accounts for 35 percent of sales and 70 percent of food exports. Ukraine is the largest supplier of sunflower oil on the global market, with a market share of 37 percent in 2021. The international success of the sunflower oil industry enabled it to grow much larger than other agri-food segments. Other segments are less export-oriented due to technical regulations and deliberate targeting of the domestic market.

4.1.3 Obstacles to Private-Sector Participation

Entry to the European food market is subject to a mix of technical, regulatory, and financial requirements. Regulations and market preferences also vary between individual EU countries. Due to the challenges involved, only Ukraine’s largest companies, including Chumak,

Milkiland, Nemiroff, Obolon, Roshen, and AVK, have managed to penetrate the EU market.

Ukrainian industries, particularly agriculture, often struggle due to a lack of high-value inputs as well as changes in internal and external market conditions that result in short planning horizons. Sectors that involve long-maturing crops and livestock, such as fruits, vegetables, and beef, are particularly vulnerable to uncertainty. As a result, businesses often opt for products with a shorter turnaround, such as grains and chickens. Annual crops can be changed each year, whereas perennial crops may require a lead time of 3-7 years. In addition, some perennial crops were damaged by the invasion, leading to a 23 percent decrease in grape production, *inter alia*. Little specialized equipment for the food industry is produced domestically. Instead, food companies typically purchase used equipment from Europe, a practice that has become increasingly costly due to the depreciation of the hryvnia and logistical challenges.

Adding to these difficulties, large retailers often take advantage of their market power to delay payments more than technically necessary. The retail market in Ukraine is dominated by large networks, with the biggest food retailer, ATB, also being the second largest by revenue. This dominance allows them to exert significant control over suppliers, resulting in late payments that can stretch to several months, negatively impacting producers' liquidity. While some large producers can negotiate better terms, most smaller firms are left to deal with these unfavorable conditions.

4.1.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

The depreciation of the hryvnia had a positive effect on Ukraine's food industry by making Ukrainian foods more competitive in international markets, while also diminishing the local competitiveness of imports. Ukraine primarily exports semi-processed food products that face stiff price competition. A 30 percent depreciation of the hryvnia against the US dollar bolstered exports, though they still declined in 2022 due to logistical constraints, an increase in temporarily not under government-controlled territories, and the destruction of assets. The decline in imports was even more pronounced, as a 45 percent increase in the exchange rate against the US dollar was compounded by job and income losses among the population.

Export-related logistical challenges have encouraged investment in domestic processing facilities. With 92 percent of raw agricultural products traditionally exported by sea—a mode of transport now limited by the invasion—many businesses, including Epicenter Agro, Terra, Kulinichi, and Yuriya, are considering investing in processing facilities.⁶⁰ This would enable the production of higher-value products per unit of weight/volume, reducing dependency on logistics. The same logistical issues also obstruct imports, potentially encouraging replacement with locally produced goods.

European agricultural commodity import requirements incentivize investment in domestic processing. Following an initiative from five member states, the EU recently limited imports of certain grains and oilseeds from Ukraine, but it did not ban imports of processed foods. These limitations create an additional incentive to invest in processing.

⁶⁰ According to companies' public statements.

The liberalization of alcohol production should further stimulate the growth of the food industry. In 2020, the government began privatizing state-owned distilleries, which had previously enjoyed exclusive production rights. In total, 39 distilleries have been sold, with auctions continuing despite the ongoing invasion. Another 26 auctions are planned for this year, which will conclude the industry's privatization. Additionally, the Verkhovna Rada (Parliament) recently reduced the administrative burden on small wine and spirits producers, further encouraging the sector's development.

4.1.5 Risk and Risk Mitigation

The food industry's recovery is closely tied to the outlook of the domestic agriculture sector, which currently faces significant challenges due to landmines and other forms of land contamination. In the nine regions where the invasion is ongoing, approximately 470,000 hectares of land are potentially mined. The RDNA2 estimates that demining will cost about \$37.6 billion in 2023–2033. In addition to immense funding requirements, the speed of demining is constrained by the availability of personnel and equipment. The Ministry of

Defense estimates that at least 5,000 personnel are required for the demining effort. Demining is ongoing, with some 170,000 hectares of arable land demined as of June 2023.

There is also an emerging risk that the EU will impose further trade restrictions, which could impact Ukrainian food imports. Initially, individual EU member states banned imports of processed food from Ukraine, but ultimately these bans were not adopted by the European Commission (EC). In the worst-case scenario, EU trade restrictions could trigger a deterioration in Ukraine-EU trade relations, especially as local producers come under increasing pressure.

4.1.6 Financial Flows and Projections

The private sector has the potential to finance the totality of the food and beverage industry's recovery and reconstruction needs outlined in the RDNA2, estimated at \$820 million over 2023–2033. Without reforms, average annual funding requirements are \$103 million for 2023–2026 and \$59 million for 2027–2033. With reforms and interventions, the private sector will be able to increase its annual financing commitments to \$857 million for

Table 4.2 Food and Beverage Sector Needs and Private Financing (\$, billions, in 2023 prices)

	2023–2026	2027–2033	2023–2033
RDNA2 needs	0.4	0.4	0.8
Private sector financing for reconstruction—Non-reform scenario	0.4	0.4	0.8
Addressing needs identified in RDNA2	0.4	0.4	0.8
Private sector financing as share of RDNA2 needs (%)	100.0	100.0	100.0
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario	5.1	7.3	12.3
Addressing needs identified in RDNA2	0.4	0.4	0.8
Private sector financing as share of RDNA2 needs (%)	100.0	100.0	100.0
Other investment opportunities identified	4.7	6.9	11.5

Note: The reform scenario assumes meeting EU SPS standards, trade facilitation to access EU markets, timely reimbursement of the export VAT, and other fiscal considerations.

Source: RDNA2 and IFC estimates.

2023–2026 and \$486 million for 2027–2033 (Table 4.2). The food and beverage industry is capable of mobilizing this level of financing. Despite the invasion, many enterprises are still profitable, with total net profits reaching \$700 million in 2022. Furthermore, several companies have explicitly expressed their willingness to invest, highlighting the industry’s resilience and potential for recovery.⁶¹

4.2 Base Metals and Metal Products

4.2.1 Strategic Challenge

For many years, base metal production was a leading industry in terms of value-added, profits, employment, and especially exports. In 2021, the base metals industry accounted for 2 percent of gross value-added, 1.3 percent of national employment, and 2.3 percent of commercial employment (208,000 workers). It also represented 4.9 percent of capital investments and 23.5 percent of goods exports, making it the country’s largest export sector.⁶² The main recipients of Ukrainian base-metal exports were EU countries, especially Italy, Poland, Bulgaria, Romania, and the Netherlands, as well as Türkiye and the United States (ITC “Trade Map”).

The industry was mainly concentrated in Eastern Ukraine, particularly in the Donetsk, Dnipropetrovsk, and Zaporizhzhia regions. While complete data for 2022 are not yet available, early indications show that the industry’s physical output dropped by 80 percent. Nevertheless, base metals remain significant exports, accounting for 13.6 percent of exports and ranking second after grain. However, the metals industry also has a significant environmental impact, accounting for 25 percent of Ukraine’s GHG emissions in 2021, or about two-thirds of all emissions from

the manufacturing sector, making it the second most pollution-intensive industry after utilities (State Statistical Service of Ukraine “Statistics on emissions...”).

The metals industry forms part of a vertically integrated domestic supply chain, which has been partially disrupted since 2014. Ukraine possesses significant iron ore deposits, accounting for 18 percent of global reserves (or 11 percent in terms of iron content) (DZI 2019). Iron mines are primarily located in the Dnipropetrovsk, Poltava, and Zaporizhzhia regions. About a dozen major mining facilities supply iron ore concentrate to metals plants. Local production also includes coke and limestone; however, major coking coal deposits are now in territory temporarily not under governmental control. Some processing is done onsite at coke plants situated within metal production complexes. Additional inputs such as specialized machinery and work apparel are also produced locally. While forward linkages are less developed due to most metals being exported, about a quarter of the total output undergoes further local processing. Ukraine’s main metal products include pipes and construction materials.

The metals industry suffered significant losses due to the invasion, with 40 percent of fixed assets destroyed. It accounts for 40 percent of the damage inflicted on the industrial sector. Notable losses include the destruction of Azovstal and MMK Illicha, Ukraine’s second- and third-largest metal plants. The Avdiivka Coke and Chemical Plant was damaged and shut down, and about a dozen smaller enterprises also sustained damage. As of April 2023, estimated damages amount to \$4.5 billion, calculated as the sum of undepreciated fixed assets, unfinished capital investments, and inventories.⁶³

⁶¹ Projections confirmed in an internal IFC assessment of the investment opportunities in the food processing sector.

⁶² IFC calculation based on official statistics from the State Statistical Service of Ukraine.

⁶³ IFC calculations based on public information and financial reports.

4.2.2 Sectoral Context

The base-metals industry in Ukraine is primarily composed of formerly state-owned legacy enterprises, some of which were established before 1900. The exception is Dniprostal, now known as Interpipe Steel, built in 2012 with an investment of \$700 million. The rest of the sector was privatized through non-transparent auctions in which the rules typically favored local players. The only competitive auction was for Kryvorizhstal, Ukraine's largest single enterprise, which has an onsite ore mine and coke plant. The sale was concluded in 2005 at a price equivalent to the state's total revenues from the privatization of all other assets combined in all previous years.

Most of the assets in the metals industry are under concentrated ownership, which limits market competition. Metinvest is by far the largest metals holding company in Ukraine, representing 64-65 percent of the sector's assets and revenues. Market concentration is high; ownership shares of politically connected business elites in the respective sectors are among the highest in the economy (CES "Oligarchic Ukrainian Capital"). The only significant internationally owned facility is ArcelorMittal Kryvyi Rih, formerly known as Kryvoryzhstal, which has the largest production capacity in the country.

4.2.3 Obstacles to Private-Sector Participation

Seaports are no longer able to export metals due to Russia's invasion. In 2021, 76 percent of total metals exports were transported by sea. From late February to July 2022, Ukraine's major ports were blocked, and while Russia participated in the Black Sea Grain Initiative (from July 2022 to July 2023), only grain exports were permitted. No comparable agreement has been reached—or is likely to be reached—for metals exports.

Vertical integration prevents competition. Control of Ukraine's iron ore deposit prevents entry of new players to downstream segments. In addition, current mine owners may prefer to export their ore to their own production facilities in the EU. For example, Metinvest owns a plant in Bulgaria and is considering building more in the country. Some may also prefer to export to China than investing in local processing, as Chinese steelmakers were the largest consumers of Ukrainian ore from 2019 to 2021.

4.2.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

In response to the temporary loss of sea routes, companies have turned to overland logistics, which are more expensive and have lower capacity. The agriculture sector also increasingly relies on overland routes, further straining their capacity. Capital investments have primarily been efficiency-seeking, especially following invasion-related power outages, and have not been directed toward creating new capacities or businesses, except for Centravis, which opened a production subsidiary in Uzhhorod.

Western countries have shown their support for Ukrainian metals production by lifting tariffs. In May 2022, the US suspended the 25 percent tariff on Ukrainian steel that had been imposed in 2018. In the same month, Canada permanently lifted a 20-year-old 77 percent anti-dumping tariff on hot-rolled steel from Ukraine while keeping in place similar tariffs on Brazil, China, and India. A month earlier, the EU suspended all duties on imports from Ukraine.

The capacity of Ukraine's iron mines now greatly outstrips the domestic metal industry's demand for iron ore, which creates an incentive to build new refining plants, preferably closer to the mines. One or two large plants in the Kryvyi Rih basin could compensate for the destruction of Azovstal and MMK. There may be demand

for another plant in the Poltava basin, which currently has a mine but no processing facilities. These investments would require upgrading riverine transport logistics, but they could eventually drive down transportation costs by reducing the need to transport large amounts of iron ore across the country.

The EU's Green Deal provides incentives to invest in electric arc furnaces. European steelmakers are required to significantly decrease their carbon footprint, but non-European steelmakers are not required to comply with the same environmental standards. Given its geographic proximity, the trend toward nearshoring, and growing international political tensions, Ukraine could swiftly become a major supplier of steel to the EU.

Reconstruction efforts will create high demand for construction materials. The RDNA2 estimates the invasion's total damages to the Ukrainian economy at \$135 billion. Many assets have been damaged or destroyed, particularly in the housing, industry and commerce, education, health care, energy, and infrastructure sectors. Rebuilding these assets, especially in a manner that is more energy efficient, accessible, and resilient in the face of further attacks, will generate massive demand for all types of construction materials, including metal.

4.2.5 Risk and Risk Mitigation

The era of low-cost inputs may be coming to an end. Ukraine's large fiscal deficit may prompt the government to raise taxes on extractive industries. Currently, Ukraine has relatively low subsoil usage charges (except for hydrocarbons), which enables mine owners to generate large profits. However, this may not be sustainable from a fiscal standpoint. In addition, lifting restrictions on exports of scrap metal will likely increase domestic prices for a key input.

Electricity shortages could threaten production while Russia's invasion is ongoing. The metals industry—even legacy blast furnaces—is heavily reliant on electricity, and while electricity makes up only about 3 percent of all costs, the amount of energy required cannot be supplied via in-house production. The metal production sector accounts for 12 percent of total electricity consumption, with ore mines adding another 8 percent.⁶⁴ In some cases, such as the Kametstal plant and the Sukha Balka mine, facilities have had to decrease or even halt production in response to power shortages.

4.2.6 Projected Financial Flows

Rebuilding the metal industry to its pre-invasion state would likely require about \$12 billion. A substantial chunk of this sum—almost \$10 billion—would go to the construction of two facilities similar in capacity to the destroyed Azovstal and MMK Illich plants. Assuming the total steel production capacity of the two plants was about 14 million tons per year, the capital investment required would be about \$700 per ton of annual production capacity. The remainder would go toward building additional facilities, such as rolling mills and other smaller plants. This investment could be disbursed gradually, as constructing a plant typically takes 5–10 years. Notably, Ukraine's current production capacity is sufficient to meet local demand, even when considering the additional demand due to post-invasion rebuilding.

Without significant reform, the Ukrainian private sector may struggle to finance the reconstruction of the metal industry. Annual investment flows would average \$1.5 billion over 2023–2026 and \$857 million over 2027–2033. By comparison, the average annual capital investment in metal production during 2017–2021 was \$900 million. While historical profits suggest that the returns to investment

⁶⁴ IFC calculations based on data from the energy balance of Ukraine.

would justify the cost—the average net profit of the entire value chain (including iron ore mining) was \$2.16 billion between 2017 and 2021—the willingness of current owners to make these investments is not assured (Table 4.3).

4.3 Engineering and Machine Building

4.3.1 Strategic Challenge

Prior to Russia’s invasion, engineering and machine building were large and relatively high-tech industries, though they suffered from the legacy of Soviet central planning. In 2020, engineering and machine building accounted for 1.5 percent of gross value-added, 2 percent of national employment, 3.4 percent of commercial employment (309,000 workers), 1.9 percent of capital investment, and 9 percent of goods exports.⁶⁵ Engineering and machine building exports were the country’s fourth largest after metals, grains, and food products, and most were bound for Hungary, Germany, Poland, Czechia, and Romania as well as Russia (ITC “Trade Map”). In 2022, the industries’ revenues fell by about 37 percent in US dollar terms, while exports dropped by 31 percent (NBU 2023a; State Statistics Service of Ukraine). In 2021, engineering and machine building were responsible for about 1 percent of Ukraine’s GHG emissions (State Statistics Service of Ukraine “Statistics on emissions...”).

The machine building industry in Ukraine has long been deeply integrated into broader value chains, both domestically and with other post-Soviet economies. Industries such as mining, metals, transportation, electricity generation and distribution, and national defense have all relied heavily on machinery produced in Ukraine. However, after 2014 the engineering and machine building industries’ integration into post-Soviet value chains began to weaken. In 2013, former USSR countries accounted for 76 percent of the sector’s exports (excluding electrical equipment), but this share had fallen to 41 percent by 2022 (ITC “Trace Map”).

The manufacturing of consumer machines has been less successful. The industry’s strong focus on business-to-business products resulted in the underdevelopment of consumer-oriented machine production. The few segments of the industry that did focus on consumer products, like automotive manufacturing, could not survive competition with foreign products that were not subject to local standards like industrial equipment. As a result, Ukraine imports a significant amount of consumer machinery, including cars, computers, phones, and other electronics. In 2021, machines were the largest import item, amounting to \$23.3 billion and comprising 23 percent of all merchandise imports.

Table 4.3 Metals Industry Needs and Private Financing (\$, billions, at 2023 prices)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	6.0	6.0	12.0
Private sector financing for reconstruction—Non-reform scenario g(a)	6.0	6.0	12.0
Addressing needs identified in the RDNA2	6.0	6.0	12.0
Private sector financing as share of the RDNA2 needs (%)	100.0	100.0	100.0
Other investment opportunities identified	0.0	0.0	0.0

a) Since the private sector meets all RDNA2 needs in the absence of policy reforms, no reform scenario is considered
Source: RDNA2 and IFC estimates.

⁶⁵ IFC calculation based on official statistics from the State Statistical Service of Ukraine.

Russia's invasion has damaged or destroyed two dozen large and medium-sized engineering and machine-building enterprises. Most of these were partially damaged, with irreparable damage occurring only at Zorya Mashproject in Mykolaiv, Kharkiv tractor factory, and a few other facilities. Defense enterprises, including those involved in aviation, armored vehicles, or ammunition production, were intentionally targeted. As of April 2023, direct damage to the engineering and machine building industries was estimated at \$1.259 billion, calculated as the sum of undepreciated fixed assets, unfinished capital investments, and inventories.⁶⁶

4.3.2 Sectoral Context

The ownership structure of Ukraine's machine building industry is quite diverse. While most enterprises are owned by local businesspeople, some strategically important segments are entirely state-owned, including military production and the manufacturing of machines for electricity production. The presence of vested interests is largely limited to facilities that produce machinery and equipment for their principal industries, such as mining, metals, and energy, or specific types of vehicles, like locomotives, cars, and trucks. During the invasion, the state nationalized some of these assets, including AutoKrAZ, Ukraine's largest truck maker, and Zaporizhtransformator, the country's largest producer of electrical transformers.

One notable exception to this domestic ownership pattern is the car-wiring segment. Ukraine has attracted significant investment from major European, American, and Japanese companies specializing in car-wiring systems, including Leoni Wiring, Sumimoto Electric Bordnetze, Yazaki, and Kromberg & Schubert.

Operating primarily in the western regions of Ukraine, these companies produce wiring for renowned car brands like Audi, BMW, Lamborghini, Mercedes, Opel, Porsche, and Volkswagen. This segment has largely continued to operate without disruptions despite the invasion, with some companies even increasing their revenues in dollar terms.

Ukraine also maintains a legacy of high-tech industries from the Soviet era. These include the production of air and space machinery, locomotives, large energy-sector equipment, and military hardware. Though primarily state-owned, some of these industries have succeeded in certain foreign markets, including Motor Sich, an aircraft engine and turbine producer based in Zaporizhzhya. As the largest heavy industrial facility in Ukraine, Motor Sich has supplied engines to Russia and more recently to China. Initially privately owned, the company was nationalized during the invasion.

4.3.3 Obstacles to Private-Sector Participation

The trade disruptions with Russia, Belarus, Kazakhstan, and other Central Asian states present a significant challenge for Ukraine's heavy industrial sector. These markets, while not as lucrative as they once were, still accounted for a significant portion of the sector's revenues (13 percent) in 2021. Identifying and entering substitute markets will require substantial capital investment.

Intense global competition in the engineering and machine building industries compounds this challenge. Manufacturers in China and other emerging markets have significant advantages based on economies of scale and lower labor costs, which make it difficult for new businesses, especially those without unique products, to compete on price. On the other hand, the engineering and machine building industries in

⁶⁶ IFC calculations based on public information and financial reports

advanced economies such as the US, EU, Japan, and South Korea are characterized by high-quality education, advanced technologies, and extensive market ecosystems, as well as robust frameworks for protecting intellectual property rights. These factors can make it difficult for emerging players to compete on technological sophistication and innovation.

4.3.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

The current global nearshoring trend offers significant opportunities for Ukraine to integrate more deeply into European value chains. Given Ukraine's geographical proximity and strong industrial capabilities, it could access EU markets for agricultural machinery and public transit vehicles. The disruption of competition from Belarus and Russia could also be advantageous for Ukraine, which could seize their European market share in key industries, including the production of tractors, trucks, buses, and other special purpose vehicles.

The prospect of a return to traditional car manufacturing, or even a pivot to the production of electric vehicles (EVs), is another exciting possibility. Over the past 25 years, countries such as Czechia, Slovakia, and Poland have significantly increased their share in global auto industry exports, while Ukraine's share has remained broadly unchanged. The development of an auto-parts cluster could lay the groundwork for the production and assembly of complete cars in Ukraine. Given the growing global demand for EVs, Ukraine has considerable potential to integrate into the EV value chain. The country's lithium oxide deposits could be used to manufacture EV batteries, creating further production efficiencies. The increasing incorporation of sophisticated electronics and software into automobiles presents an opportunity for Ukraine and its large pool of skilled IT engineers. Over time, Ukraine

could become a hub for the development and production of automotive software and electronics.

The emergence of new businesses with a focus on military applications during the invasion offers unique opportunities for Ukraine's economy. Having demonstrated their worth on the battlefield, products such as drones and heavy trucks can be repurposed for domestic use in non-military sectors or manufactured for export. Notably, drones have an expanding set of applications in agriculture.

4.3.5 Risk and Risk Mitigation

As the invasion drags on, there is a significant risk that Ukraine could lose vital engineering-related human capital. Each year, approximately 20,000 students graduate from Ukrainian colleges and universities with degrees in mechanical and electrical engineering. However, many of these graduates ultimately apply their skills in other economic sectors or in other countries. Mitigating this risk is not straightforward, given the complex factors at play. However, the state could consider supporting greenfield projects which would provide an avenue for specialists to gain valuable experience.

4.3.6 Financial Flows and Projections

Without reforms, the private sector would have the capacity to finance the RDNA2's total recovery and reconstruction estimate for the machine building industry, which totals \$369 million over 2023–2033. This figure is relatively low because SOEs have incurred most of the damage. Average investment requirements would be \$46 million annually for 2023–2026 and \$26 million annually for 2027–2033. If limited reforms were implemented, these figures would rise to \$86 million and \$49 million, respectively. Both options are within the financing capacity of domestic industry. However, deep reforms would increase annual

investment opportunities to \$1.5 billion and \$857 million, respectively, exceeding the financial capacity of the Ukrainian private sector (Table 4.4).

4.4. Commerce

4.4.1 Strategic Challenge

Commerce is Ukraine’s largest economic subsector and has demonstrated impressive resilience during the invasion. In 2020, commerce accounted for 26.1 percent of commercial value-added, and in 2021 it represented 8.2 percent of capital investment, 15 percent of national employment, and 25 percent of commercial employment (2.3 million workers).⁶⁷

The sector performed relatively well during 2022, with physical trade volumes declining by 21.4 percent, well below the 29 percent decrease in GDP during the period. Commerce also has a modest environmental footprint, contributing just 0.12 percent of Ukraine’s GHG emissions in 2021 (State Statistics Service of Ukraine “Statistics on emissions...”).

The Ukrainian retail sector utilizes both locally produced goods and imports. About 90 percent of local demand for food items is met by domestic production. In recent years, many large retail chains have begun developing their own trademarks, indicating a closer collaboration with food producers. Meanwhile, some food producers have started to develop their own retail chains. Nonfood items such as clothing, footwear, consumer electronics, household goods, cars, and fuels are predominantly imported. While a large volume of pharmaceuticals is produced locally, imports represent a larger share by value. Most industrial equipment is imported.

Russia’s invasion inflicted substantial damage on the retail sector. According to the Retail Association of Ukraine, nearly 3,000 shops and other retail outlets, including pharmacies and gas stations, have been damaged. The Ukrainian Council of Shopping Centers reports that 8 shopping malls have been destroyed and another 18 damaged. As of April 2023, direct damages were estimated at \$2.6 billion, calculated as the sum of damages to buildings, equipment, and inventories in both shops and warehouses.

Table 4.4 Engineering and Machine-Building Sector Needs and Private Financing (\$, billions, 2023 prices, unless otherwise indicated)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	2.2	2.2	4.4
Private sector financing for reconstruction—Non reform-scenario	0.2	0.2	0.4
RDNA2 needs identified	0.2	0.2	0.4
Private-sector financing, % of the RDNA2 needs	8.2	8.2	8.2
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario (a)	0.3	0.3	0.7
RDNA2 needs identified	0.3	0.3	0.7
Private-sector financing, % of the RDNA2 needs	15.5	15.5	15.5
Other investment opportunities identified	0.0	0.0	0.0

Source: RDNA2 and author’s estimates.

⁶⁷ Calculations based on official statistics from the State Statistics Service of Ukraine.

4.4.2 Sectoral Context

The commerce sector is dominated by local private companies, with some state presence in certain segments like gas stations and municipal pharmacies. Notably, the presence of vested interests has been curtailed by a combination of state interventions and competition from specialized players. Foreign involvement in Ukrainian commerce is moderate, with several international retail chains, mostly European, operating in the country. These chains tend to be smaller than the largest local companies. Prominent examples include Metro Cash & Carry, Auchan, Leroy Merlin, JYSK, IKEA, Inditex, Zara, Adidas, Shell, and SOCAR. The largest retail segment consists of food stores, which also sell nonfood essentials. The country also has numerous pharmacies, and restrictions on prescription drugs are relatively lax. In 2021, food accounted for 41 percent of the consumer basket, while food and other essentials accounted for 48 percent.

In the wholesale market, some large foreign producers prefer to distribute their products via their own subsidiaries. This is the case for companies such as Samsung, Apple, Jacobs, Teva, L'Oréal, Corteva, DuPont, Puma, Royal Canin, Sanofi-Aventis, Sandoz, Beko, Pernod Ricard, GlaxoSmithKline, Philips, Electrolux, and Schneider Electric. Car manufacturers also frequently manage their local sales directly, including Toyota, Porsche, Volkswagen, Renault, Nissan, Peugeot, Citroen, Hyundai, Volvo, Scania, and Iveco. Some wholesalers, including suppliers of chemicals, grains, metals, ores, and certain fuels, are purely business-to-business, while some food-industry players are large enough to purchase their inputs directly from producers.

Despite the presence of large retail chains, commerce is the most common activity among small businesses and private entrepreneurs. Widespread demand, modest startup costs,

low regulatory barriers to entry, and a lack of other employment opportunities all increase the attractiveness of commerce. As a result, small businesses account for 47 percent of commercial revenues and 68 percent of commercial employment. Individual entrepreneurs are especially involved in commerce, running small shops, market stands, or online stores. About 51 percent of commercial workers are private entrepreneurs, and about 46 percent of private entrepreneurs work in commerce.

4.4.3 Obstacles to Private-Sector Participation

Consumer demand is improving but remains significantly below pre-invasion levels. With a 30 percent drop in real GDP and several million citizens having left the country, retail chains have faced the largest decline in consumption since Ukraine's independence. The invasion caused damage to roads, bridges, and logistics hubs, limiting the supply of consumer goods and driving up costs. Seaports and airports are no longer available to importers, while land-border crossings are overwhelmed.

National and local restrictions also hinder commercial activity. For instance, government attempts to regulate petrol and diesel prices resulted in deficits and decreased revenues and profits for gas stations. Restrictions imposed by local authorities on the sale of alcohol, either in the form of total bans or limits on hours, have decreased revenues for food chains and specialized venues. Curfews reduce operating hours and create additional logistical challenges. However, these restrictions have gradually been relaxed over time.

4.4.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

The retail sector has proven to be one of the most resilient segments of the Ukrainian economy during the invasion. After suffering major shocks

due to the COVID-19 pandemic and then to the invasion, retail was quick to rebound. Surveys conducted by the NBU suggest that optimism among retail businesses tends to be higher than in other sectors such as industry, services, and construction. In April 2023, the optimism index for retail was even higher than before the invasion. Current operations as measured by the Retail Well-Being Index, which is based on visitor traffic, occupancy rates, and rental rates, have recovered somewhat less dramatically, due primarily to a decrease in consumer traffic. Nevertheless, retail chains, cellphone operators, postal services, and SOBs were among the first businesses to resume operations in areas where government control has been restored. According to the Retail Association of Ukraine, 88 percent of outlets that ceased operations in 2022 have since resumed their business activities, and 97 percent of retail businesses are currently operating. These figures highlight the robustness and adaptability of Ukraine's retail sector in the face of significant challenges.

Some retail venues that were damaged in the invasion have managed to resume operations. This includes the Retroville shopping mall in Kyiv and the Nikolsky shopping mall in Kharkiv, both of which were heavily affected by the invasion. Foreign retailers like Leroy Merlin and Decathlon, which initially ceased operations due to the invasion, have since returned, while others such as H&M and Zara are preparing to return. Several retail chains are showing signs of optimism and continued investment and are moving forward with plans to open new outlets. These include food retailers like Silpo, Tavia V, and SPAR, as well as goods chains like JYSK, Foxtrot, and Eva. Most of these new outlets are opening in western cities like Lviv and Uzhhorod, which have seen an influx of people relocating from the central, southern, and eastern parts of the country. According to the Ukrainian Council of Shopping Centers, eight new shopping malls opened in 2022, and another seven are projected to open in 2023.

Despite considerable disruptions to the energy supply, including two full national blackouts, commerce has continued. The retail sector is a major consumer of electricity, but it has managed to adapt by reducing unnecessary consumption and developing its own power-generating capacities. Retail chains have not only weathered recent blackouts but also helped other businesses and individuals cope with electricity shortages by supplying items like portable generators, power banks, flashlights, and gas appliances.

4.4.5 Risks and Risk Mitigation

There is a risk that landlords may raise rents. Currently, rents are 30 percent lower than they were before the invasion, in dollar terms, due to an excessive vacancy rate. Despite some recovery in the sector, the vacancy rate in Kyiv stands at 21.5 percent, up from 11.5 percent before the invasion, and averages about 30 percent in other regions, according to the Ukrainian Trade Guild. However, landlords may take advantage of the sector's recovery and increase rents. So far, most tenants have managed to resist these attempts or at least negotiate grace periods and gradual increases.

4.4.6 Financial Flows and Projections

Whether or not reforms are implemented, private financing should be capable of covering the total recovery and reconstruction needs estimated for the commerce sector by the RDNA2, which amount to \$4.55 billion in 2023–2033. Annual investment flows are predicted to average \$566 million from 2023 to 2026 and \$323 million from 2027 to 2033 (Table 4.5). Despite a decrease in revenue and an increase in costs in 2022, approximately 1,700 of the 2,500 largest commerce companies remained profitable, with a total net profit of about \$2.6 billion. However, the private sector's capacity to invest may vary across regions.

Table 4.5 Commerce sector needs and private financing (\$, billions, 2023 prices)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	2.3	2.3	4.6
Private sector financing for reconstruction—Non-reform scenario	2.3	2.3	4.6
Addressing needs identified in the RDNA2	2.3	2.3	4.6
Private sector financing as share of the RDNA2 needs (%)	100.0	100.0	100.0
Other investment opportunities identified	0.0	0.0	0.0

Note: Since the private sector meets all RDNA-identified needs without policy reforms, no reform scenario is considered.

Source: RDNA2 and authors' estimates.

CHAPTER 5

Tourism

5.1 Strategic Challenge

Russia's invasion of Ukraine has devastated the country's tourism sector. Tourism contributed 4.9 percent of GDP in both 2018 and 2019, before falling to 3.6 percent in 2020. In 2020, 536,211 people were employed in industries related to travel and tourism (excluding retail trade), representing 4 percent of employed workers. The sector employed 38,514 people in hospitality services, of which 36,073 worked in hotels, holiday accommodations, campsites, and other temporary accommodations, with another 19,765 people working for tour operators, and travel agencies.

While activity in the travel and tourism sector declined before the invasion, it increased sharply as the invasion escalated. The share of travel in Ukraine's goods and services exports fell from 2 percent in 2018 to 0.75 percent in 2021, while its share in imports dropped from 9.8 percent to 5.8 percent (State Statistics Service of Ukraine 2023h). Due to the mass emigration caused by Russia's invasion, the share of travel in imports expanded by 23 percent in 2022. While the share of tourism in services exports fell from an average of 7 percent in 2018-19 to 0.8 percent in 2020, its share in services imports increased from 33 to 48 percent in the same period (State Statistics Service of Ukraine 2023h).

Capital investment in accommodation and food services represented just 0.4 percent of total capital investment in 2018–2021. Within-firm resources financed more than 90 percent of total capital investment in the sector. More than 98 percent of investment was directed toward tangible assets such as construction and reconstruction of buildings (59 percent) and machines and equipment (28 percent), while

1.5 percent of investment funds were used to purchase software.

According to the RDNA2, as of February 24, 2023, total direct damages caused to the tourism and culture sector were estimated at \$2.6 billion, with losses estimated at \$15.2 billion. Direct damages include \$1.7 billion in damages to historic cities, buildings, and cultural sites; \$143 million in damages to movable cultural properties and collections; \$150 million in damages to buildings, workshops, and studios of the cultural and creative industries; and \$650 million in damages to tourism facilities. Losses include foregone revenue due to the disruption of tourism, the arts, sports, entertainment, and recreation, as well as to the protection of valued assets. The largest losses have been incurred by the cultural and creative industries (\$10.8 billion) and tourism (\$3.2 billion). Unlike damages, revenue losses are highly concentrated in Kyiv, which suffered about half of total losses (\$7.3 billion). Another \$4.6 billion in nationwide losses are not specific to any city or region.

Total recovery and reconstruction needs in the tourism and culture sectors over the next 10 years are estimated at \$6.9 billion, including \$2.3 billion in short-term needs (2023–2026) and \$4.6 billion in medium- to long-term needs (2027–2033). Needs during the early stage are expected to include damage assessment and documentation, emergency measures for cultural immovable and movable properties, stabilization and conservation measures for cultural assets, storage management, preparedness plans, and immediate conservation to prevent further loss and looting. This stage will also include support for cultural and creative industries, measures to safeguard intangible cultural heritage, and

the restoration and reconstruction of about 30 percent of sectoral assets. The remaining restoration and reconstruction costs (including operational costs) are encompassed in the estimate for medium- to long-term needs.

5.2 Sectoral Context

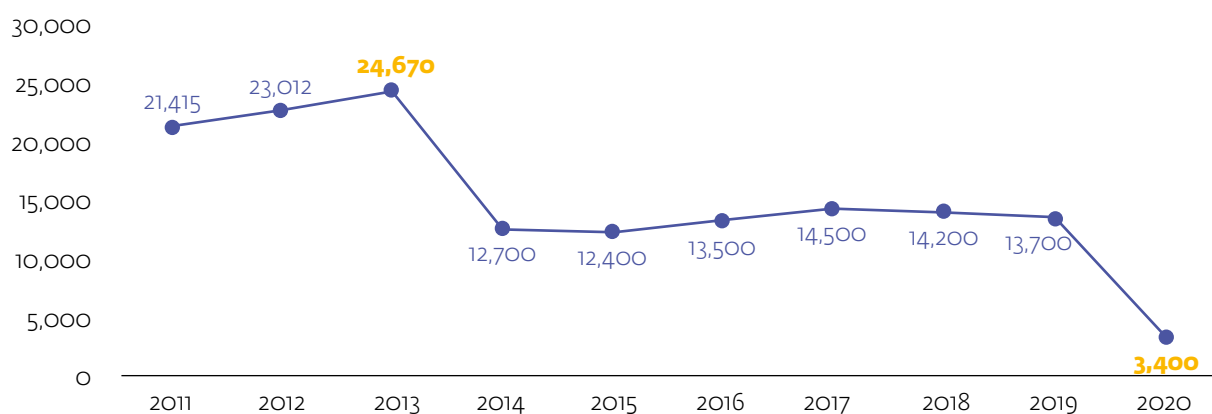
The tourism sector has huge development potential in almost all regions of Ukraine, but a fragmented policy framework, the absence of a clear strategy, and insufficient supportive infrastructure weaken the sector's competitiveness. In the years prior to the invasion, Ukraine substantially improved its business environment, the ranking of which rose from 124th to 103rd out of 140 countries in the World Economic Forum's 2019 Travel and Tourism Competitiveness Index. Its ranking improved in areas ranging from safety and security (127th to 107th) to international openness (78th to 55th) and overall infrastructure (79th to 73rd). Ukraine's index score grew faster than any country in Europe and Eurasia, but the country's overall ranking remained relatively low at 78th in 2019, well below that of regional comparators such as Poland (42nd), Türkiye (43rd), Hungary (48th), and Romania (56th) (WEF 2019).

Ukraine's tourism sector has long suffered from lack of clear institutional guidance. For years,

the main department responsible for tourism development has moved from one ministry to another with each new political administration. These changes have led to inconsistent policies, a failure to secure necessary funding, weak marketing efforts, and the proliferation of uncoordinated, ad hoc programs. In 2020, the Ukraine State Agency for Tourism Development was created, which should help establish a more permanent institutional framework for the tourism sector (Tourism Economics 2021).

Prior to Russia's actions with respect to Crimea, international tourism arrivals were approaching 25 million, with 96.5 percent coming from European countries. From 2010 to 2013, most tourists to Ukraine came from neighboring Russia. Following Russia's actions with respect to Crimea and invasion of the eastern territories of Donetsk and Luhansk in 2014, tourists from both Russia and Belarus steadily declined, approaching zero during the pandemic and remaining negligible since the start of the invasion. Since early 2022, the tourism sector has been forced to rely almost exclusively on domestic tourists and the staff of foreign humanitarian and media organizations. To replace Russian and Belarussian tourists with new visitors from other parts of the world, Ukraine must build its tourism infrastructure and enhance the quality of its tourism offerings.

Figure 5.1 Non-Resident Tourist Arrivals (millions)



Source: State Border Guard Service of Ukraine 2020; UNWTO Tourism Barometer 2020.

Ukraine’s tourism sector can be divided into urban and ecological tourism. Large cities and regional centers primarily offer cultural, business, and event tourism, medical tourism, and industrial tourism. Rural and natural areas offer adventure tourism, agrotourism, food and wine tourism, and health tourism. The development of each of these segments requires an individual approach integrated into a larger strategic framework that prioritizes building the necessary infrastructure for private business, training workers in vital skills, and implementing international standards for safety, quality, environmental responsibility, and inclusiveness.

Before the invasion, the profitability of the tourism industry had started to recover from the impact of the COVID-19 pandemic. Operating profits in hotels and accommodation collapsed from 25.5 percent in 2019 to 28.5 percent in 2020, before rebounding to 16.6 percent in 2021 (Table 5.1). Similarly, profits for tourist operators and travel agencies contracted by 11 and 5 percent, respectively, in 2020, before growing by 5.3 and 4.9 percent, respectively, in 2021. Meanwhile, profits in the restaurant industry fell from 5.9 percent in 2019 to 1.5 percent in 2020, before increasing to 4.7 percent in 2021. Finally, profits related to theme parks and other attractions fell sharply from 44.1 percent in 2019 to -16.5 percent in 2020, before recovering to 1.2 percent in 2021.

In 2021, the hotel occupancy ratio was 20 percent nationwide, well below the EU average of 37 percent, with large differences across regions (NTOU 2020).

The public sector is only modestly involved in the accommodation and food services segment. The public sector’s share in total output fell from 7.4 percent in the first half of 2019 to 5.1 percent in the same period in 2020. In 2020, the public sector represented just 0.3 percent of all accommodation and food service firms, 0.6 percent of total sales revenue, 3.5 percent of the average value of non-current and current assets, 1.7 percent of the sectoral workforce, and 0.3 percent of capital investment (NTOU 2020). Most tourism and hospitality businesses in Ukraine are privately owned SMEs. However, the public sector is responsible for providing the enabling environment necessary for tourism to thrive.

Multiple stakeholders are involved in the recovery of Ukraine’s tourism sector, which increases the need for a cohesive long-term vision, a clear sectoral strategy, and effective coordination mechanisms. The businesses, organizations, and academic institutions involved in different aspects of the tourism value chain together represent 4 percent of the employed population. Tourism is closely connected to the larger national economy,

Table 5.1 Tourism Sector Profitability by Category (2019–2021)

Category	2019	2020	2021
Passenger air transport	2.5	-14.6	-1.3
Hotels and other accommodation	25.5	-28.5	16.6
Restaurants	5.9	1.5	4.7
Tourist operators	-1	-11	5.3
Travel agencies	7.9	-5	4.9
Car rental	12.3	76	34
Museums	-6.5	-10	-2.2
Attractions and theme parks	44.1	-16.5	1.2

Source: NTOU 2020.

and its recovery will be heavily influenced by developments in other sectors. The tourism sector relies on the infrastructure, transportation, construction, culture, sports, health, ecology, and energy sectors, as well as on light industry and food production.

5.3 Obstacles to Private-Sector Participation

Outdated and inefficient regulations inhibit the development of the tourism sector. Ukraine's regulatory environment for tourism is not conducive to effective self-regulation and does not facilitate government support, which is critical to protect the sector against shocks. The sector's governing legislation must be significantly revised to comply with EU requirements, and increased regulatory clarity will be essential to attract foreign and domestic investment in tourism. The authorities should therefore consider: (i) updating the obsolete and ineffective licensing requirements of tour operators and creating modern insurance mechanisms to manage the liability of tour operators; (ii) abolishing the mandatory categorization of hotels, which is based on an outdated methodology, and creating self-regulatory organizations that can provide staff training and certify compliance with industry standards; (iii) aligning governing legislation for tourism operators with international best practices, especially in terms of training standards and service quality; and (iv) creating a legislative and regulatory framework for destination management organizations at the national, regional, and local levels.⁶⁸

Other critical barriers include an inadequate supply of high-quality modern infrastructure and human resources, as well as weaknesses in destination marketing. Ukraine has a limited supply of domestic transportation services and

large accommodation facilities, conference and exhibition centers, tourist attractions, information centers, and other forms of infrastructure, and there is no single database of priority infrastructure investments. Ukraine also lacks a quality education and professional training system, including instruction in foreign languages, for workers in the tourism sector. Moreover, there is no clear guidance on the development and marketing of tourism products, and not enough funds are allocated for promoting Ukraine in key source markets.

5.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

Russia's invasion has had a deep negative impact on Ukraine's tourism industry. Tourism cannot thrive in areas affected by armed invasion. Following the invasion, most companies in the tourism sector were forced to halt their operations, especially during the first few months. Some tourism firms are actively helping the army, territorial defense units, and/or displaced persons by providing food, accommodation, and transport services. Through their contacts with partners across the world, many tourism-related businesses have worked to spread awareness of the situation in Ukraine and the need for humanitarian aid. In areas that have been less affected by the invasion, the tourism industry has been gradually recovering, with a focus on domestic consumers.

Accession to the EU would have a highly positive impact on Ukraine's tourism sector. Harmonizing the legislative and regulatory framework with EU standards would improve the competitiveness of the private sector and lay the groundwork for new investments by European firms. EU accession would also provide additional mechanisms for developing joint tourism and cultural initiatives with other EU members.

⁶⁸ The NTOU has created a model for destination management organizations based on UNWTO recommendations, but there is no legal basis for creating PPPs in the tourism sector in Ukraine.

The authorities are striving to improve the business environment and attract FDI. The government aims to create a level playing field for all companies while digitizing public services and making them more transparent, user-friendly, and efficient. For example, it created the Diia portal to allow companies to quickly register a business, obtain permits, and perform other compliance tasks. The government also created Diia City, its first virtual extraterritorial free economic zone, and it continues to actively develop economic and trade relations with foreign partners and establish contacts with business communities of various countries to implement joint projects.

A comprehensive, systematic, and balanced approach to investments is necessary for the successful and sustainable development of the tourism industry. The government must define and adhere to a unified strategy, while prioritizing investments based on: (i) geographic opportunities (investing in high-potential areas); (ii) sectoral opportunities (investing in underdeveloped segments); and (iii) marketing opportunities (investing in attracting specific types of tourists from high-value source markets). To prepare medium- and long-term investment projects, the authorities need to conduct a comprehensive analysis and create a map of priorities. While the government will be responsible for capital investment in core public infrastructure, some tourism-specific infrastructure can be created and managed by the private sector, given appropriate support. Investments in destination marketing organizations can consolidate key players in the tourism sector and provide them with material, technical, and expert assistance that will enhance their competitiveness in domestic and international markets.

Legislative reforms and the authorization of PPPs could greatly benefit Ukraine's tourism sector. The post-pandemic recovery of tourism worldwide shows that tourist flows often resume and even grow in the aftermath of a major disaster. Once the country's legislation has been

updated and funds made available, tourism firms will need to secure access to qualified labor, logistical support, and marketing services. Regions that have been temporarily not under governmental control or severely affected by the invasion will need massive infrastructure investment, and tourism in these areas will only become possible once basic public services have been restored. Attracting skilled labor will be crucial, but firms have an opportunity to draw on a returning diaspora with knowledge of new languages and with new connections in potential source countries.

5.5 Risks and Risk Mitigation

The commercial risks facing Ukraine's tourism sector vary by region and subsector. Key challenges include: (i) policy and governance risks, including corruption and inefficient regulations; (ii) macroeconomic risks, including interest- and exchange-rate volatility; (iii) an insufficient number of workers with the necessary skills; and (iv) the seasonal nature of tourism in some regions.

5.6 Financial Flow Projections

Financing opportunities in the tourism sector are projected at over \$5 billion between 2023 and 2033. The accommodations industry will require the largest share of financing, with projected \$2 billion required to restore or create small, medium, and large hotels, hostels, and other accommodation facilities across Ukraine (Table 5.2). The dearth of accommodations outside of Kyiv is an especially serious constraint on tourism development.

Investments of \$1.2 billion in children's summer camps and \$1 billion in health and wellness resorts would help leverage the value of areas rich in natural resources. In addition, an investment of \$500 million in convention and exhibition centers will be necessary to foster the growth of small businesses, especially in highly

seasonal destinations. Finally, promoting cultural events and business tourism would increase demand for hotels, travel companies, restaurants,

and other firms throughout the tourism value chain.

Table 5.2 Private Financing Needs in the Tourism Sector, 2023–2033 (\$, millions)

Category	Number of entities	2023–2026	2027–2033	Total
Large accommodations (400-500 rooms)	20	350	650	1000
Medium accommodations (200-300 rooms)	30	150	350	500
Small accommodations (50-100 rooms)	50	150	350	500
Convention and exhibition centers	5	200	300	500
Health and wellness resorts	50	350	650	1,000
Tourism info centers	50	15	35	50
Children's camps	25	400	800	1,200
Adventure tourism	50	30	70	100
Development of the network of regional and local destination management organizations	100	60	140	200
Total		1,705	3,345	5,050

Note: Estimates based on the author's interviews with firms operating in the sector.

Sources: Author's estimates.

1. NTOU 2020.
2. NBU "External Sector Statistics."
3. National Center of Accounting and Greenhouse Gas Emissions "Inventory of greenhouse gases."
4. RDNA2
5. NTOU "Economic Strategy of Ukraine 2030."
6. NTOU "Economic Strategy of Ukraine 2026."
7. EBRD "Tourism Sector Road Map."

PART II: INFRASTRUCTURE

CHAPTER 6 Transportation

6.1 Strategic Challenge

The transport sector plays an especially important role in Ukraine's economy, as transportation networks are vital to enabling infrastructure for other sectors. In 2016–2021, the transport sector contributed an average of 6.2 percent of GDP, though this share dropped to 5.4 percent in 2021 (State Statistics Service of Ukraine 2023 d). The sector employs 961,000 workers, 28 percent of whom work in the railway system, 22 percent in road freight, 20 percent in logistics, and 10 percent in urban mobility (State Statistic Service of Ukraine 2023, c, and f). In 2021, the transport sector received \$1.6 billion in capital investment, with about 7 percent coming from state and local government budgets, 8 percent from local credit funds and investments, 3 percent from foreign investors, and nearly 80 percent from domestic transportation firms (State Statistics Service of Ukraine 2023b).

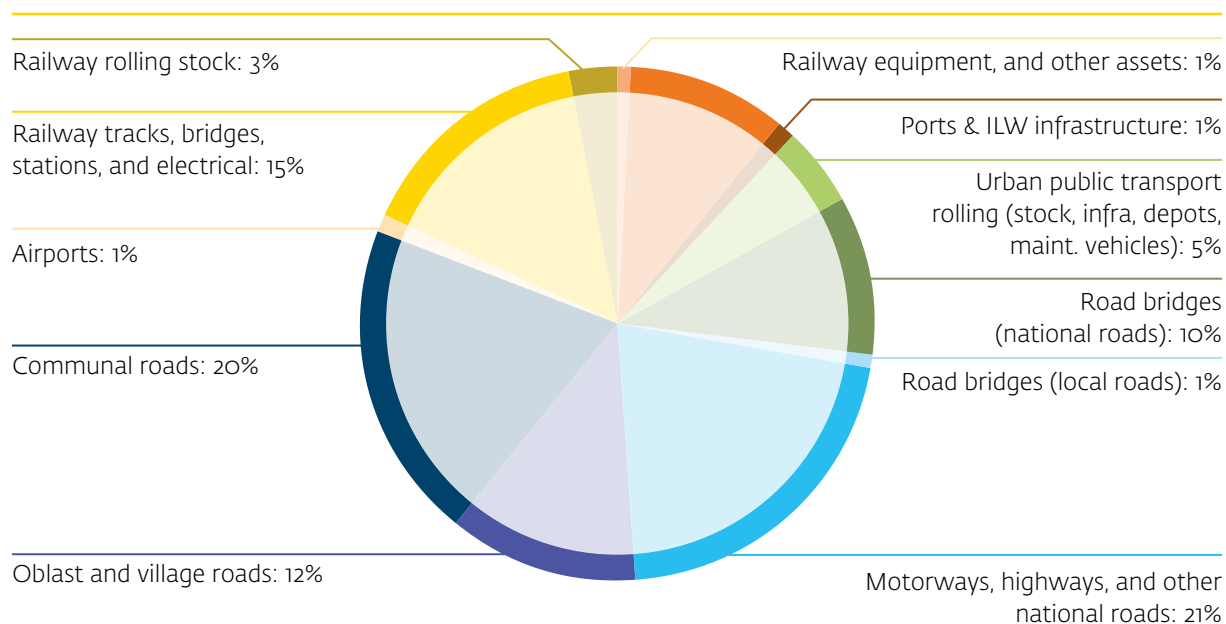
Ukraine's transport sector is highly polluting, with an overwhelming focus on road transportation and characterized by aging vehicles and low emission standards. Even before the invasion, the transport sector was highly inefficient and undermined Ukraine's economic competitiveness, as discussed in the CPSD (IFC 2021a). Emissions from transport dropped due to COVID-19 shutdowns but remain high. In 2020, the sector emitted 31.81 Mt CO₂-equivalent, representing 10 percent of the country's GHG emissions, of which road transport was responsible for 73.5 percent (23.37 Mt CO₂-eq.) In 2021, road transport generated 26.6 tons of suspended particulates (State Statistics Service of Ukraine 2023a). Other

major emitters include the offroad transportation of agricultural machinery and industrial equipment (18.6 percent of sectoral emissions) (UNFCCC 2022). A green and resilient recovery in the transport sector may require shifting from roads to railways, waterways, and other transportation modalities while also decarbonizing road transport by increasing the use of EVs.

After the housing sector, transportation has suffered the highest level of direct damage due to Russia's invasion. Damages to the transportation sector are estimated at \$35.7 billion, with the greatest estimated damage to road infrastructure (63.7 percent) as well as rail infrastructure and the rolling stock (19.2 percent), followed by private vehicles (10.2 percent) and urban transport systems (5.2 percent). An estimated \$92.1 billion will be needed to rebuild Ukraine's transportation assets (RDNA2 and Figure 6.1). The actual damage caused by the invasion may be even higher due to limitations in assessing damages to private transportation and logistics assets.

The blockade of Ukrainian Black Sea ports has severely compromised Ukraine's exports, leading to massive financial losses. The Black Sea Grain Initiative, which facilitated the maritime exportation of roughly 22 million tons of Ukrainian grain starting at end-July 2022, has helped to mitigate about \$1.3 billion in losses (RDNA2). However, even before the initiative was terminated by Russia in July 2023, it did not encompass other forms of cargo, which have historically been three times larger by tonnage than Ukraine's seaborne grain exports. The EU's Solidarity Lanes Initiative, which ships goods by rail, has been instrumental in providing

Figure 6.1 Direct Damage to the Transportation Sector by Asset Class (% of total)



Source: World Bank 2023; Ukraine RDNA2.

alternative trade routes for these goods. As of June 2023, the initiative has facilitated 55 percent food exports from Ukraine via land routes and EU ports (European Council and Council of the EU “Infographic – EU solidarity with Ukraine”).

Investment in the transport sector will be vital for Ukraine’s recovery, contributing to economic development through exports and imports, regional and international connectivity, and freight and passenger logistics. Ukraine’s progressive integration into European and transatlantic markets and value chains will require the restoration, upgrading, and expansion of multiple transport modes, as well as wholly new investments in transportation systems and infrastructure. Restoring access to markets, including in invasion-disrupted areas, plays a vital role in recovery efforts and should be done in a way that strengthens the resiliency of the sector and its infrastructure. To mobilize the necessary funding, the government will need to augment its limited fiscal resources

through active engagement with the private sector. The potential to attract private finance will depend on the institutional capacity of the government to adopt the necessary reforms and the availability of appropriate de-risking mechanisms.

6.2 Road Transport

6.2.1 Sub-Sectoral Context

Ukraine has an extensive but largely undermaintained road network. Despite the creation of the State Road Fund in 2017, investment in road infrastructure remained insufficient, and the invasion caused immense damage to the road network. The density of highways in Ukraine (14.3 km/1,000 km²) is comparable to the EU average (19 km/1,000 km²), but the density of all roads is significantly lower (281 v. 1172 km/1,000 km²), indicating insufficient regional and local connectivity.⁶⁹ About 50 percent of the network does not meet national roughness

⁶⁹ Density of highways and roads is calculated as length of motorways or roads in km / area of Ukraine or the EU * 1000 km. All roads include motorways, main and national roads, and secondary, regional, and local roads. (1) Length of motorways and roads in Ukraine (Ministry of Infrastructure 2020); (2) Length of motorways and roads in the EU (EU Road Federation 2022); (3) Area of Ukraine and the EU (CIA World Factbook “Area of Ukraine and the EU”).

standards, and 40 percent fails strength requirements (OECD 2018). In 2019, Ukraine scored just 3 out of 7 on perceived road quality in the Global Competitiveness Report (WEF 2019b). Investments in road development and repair have not kept pace with traffic growth. Average highway speeds are significantly lower than in western Europe, yet accident and fatality rates are higher (Dornier Consulting and Egis International 2016).

Road freight transport contributes 2-3 percent to Ukraine’s GDP and employs a similar share of the workforce. Road freight accounts for almost 70 percent of all domestic cargo by weight, or about 12 percent of all ton-kilometers (World Bank 2018). Road transport has strong forward linkages with sectors like agriculture, manufacturing, construction, retail, and wholesale trade, as well as backward linkages with fuel and energy, vehicle manufacturing, maintenance, insurance, and finance. Top commodities carried by trucks are metal ore and other mining products (41 percent), agricultural products, food, beverages, and tobacco (24 percent), and chemical products (10 percent) (World Bank 2018). Road transport plays

a crucial role in transporting agricultural products such as grains, vegetables, and fruits to consumers, processing facilities, and ports for export. It also supports the delivery of important inputs such as fertilizers, seeds, and pesticides to farms. The average age of freight road transport in Ukraine (14.6 years) (UkrTransBezpeka 2022) is only slightly above the EU average (13.9 years) (ACEA 2021), although data are only available for officially licensed freight carriers, which, according to industry estimates, represent about 30 percent of the total freight fleet. The average age of remaining trucks is expected to be significantly higher (Roth 2021).

At an estimated \$22.7 billion, the destruction of road infrastructure represents 63.7 percent of total damage to the transport sector. This includes damages to national, regional, and local roads and bridges (RDNA2), and roads need rehabilitation due to heavy armor movements (World Bank et al. 2022). This estimate does not, however, include funds required for maintenance and planned road improvements unrelated to invasion-induced damages. Among sectors, reconstruction needs in road transport are the highest in the transport sector, requiring

Table 6.1 Transport Subsector Needs and Private-Sector Opportunities (\$, billions, 2023 prices)

	RDNA2	Private sector opportunities			
		Non-reform scenario		Reform and intervention scenario	
		Addressing RDNA2 needs	Other opportunities	Addressing RDNA2 needs	Other opportunities
Total	92.1	0.2	8.6	6.6	40.6
Road transport	50.7	0.0	5.6	5.1	14.9
Railroads	27.8	0.0	1.4	0.0	1.8
Inland water and maritime	0.4	0.1	0.0	0.1	8.2
Airports	1.7	0.1	0.0	0.4	0.4
Urban transport (incl. sharing services)	4.6	0.0	1.6	1.1	14.4
Intermodal and logistics	0.0	0.0	0.0	0.0	0.9
Other transport	6.8	0.0	0.0	0.0	0.0

Source: RDNA2 and author’s estimates.

\$48.2 billion (52.4 percent of overall transport sector needs).

The development of the EV market could help to reduce GHG emissions in freight and passenger transportation, but this market is still at an early stage with respect to the size and adoption of charging standards. The Ukrainian network of electric charging infrastructure is limited in size (8,529 charging points in 2021) (IFC 2021c), primarily located in larger municipalities and owned and operated by the private sector. Only 9 percent of charging stations provide rapid charging infrastructure (>22 kW). While Ukraine did not lack grid capacity before the invasion, there may be insufficient access to the electricity grid along interstate roadways.

6.2.2 Obstacles to Private-Sector Participation

The most significant obstacles to private-sector participation and investment in the road network are a lack of experience with road concessions, complex land acquisition processes, and the absence of toll road regulations. Before the invasion, the GoU initiated a process to simplify land acquisitions and reduce uncertainty for private investors. However, until the legislation is implemented, obtaining land for transport infrastructure development in Ukraine remains time-consuming and involves multiple layers of government. Lack of clear legislation for calculating traffic volumes and collecting toll payments creates uncertainty for private-sector investment in road infrastructure projects. There is no legislative framework in place to collect toll payments, unlike in the EU, where Directive 2004/52/EC outlines European electronic toll services and defines the technologies used for electronic toll systems to finance road

infrastructure or collect road usage fees, and the implementation of such a system is not provided for in the association agreement (Ernst & Young 2021). Recent changes to the Budget Code have allowed for long-term financing, which is important for the potential implementation of road concessions.⁷⁰

The development of EV infrastructure along motorways is restricted by limited grid capacity, especially for rapid charging infrastructure. This type of infrastructure is expensive to implement at these locations because they are further away from the primary distribution network. To promote the adoption of EVs, the government will need to help to expand the grid network as part of the road reconstruction process.

Key obstacles to expanding private-sector participation in road freight transportation include incompliance with international standards for operating licenses and permits, limited technical requirements for vehicles,⁷¹ and inadequate safety enforcement. These barriers disadvantage larger operators with high quality standards and thus higher costs. Over 70 percent of road freight operators are unlicensed, leading to illegal activities, tax evasion, and non-compliance with safety and emissions standards (World Bank 2018). The requirements to comply with emissions standards or have appropriate safety equipment can make it expensive for small businesses with limited financial resources to upgrade their existing fleets. Before the invasion, the GoU launched a country-wide weight control system to improve control and safety requirements for cargo traffic. Since the invasion, the system has not been fully operational and requires repairs. In June 2022, Ukraine and the EU signed a temporary bilateral agreement on the

⁷⁰ On February 15, 2022, the Verkhovna Rada adopted Bill No.5090 on Making Amendments to the Budget Code of Ukraine on the Settlement of Budgetary Relations During the Implementation of Agreements that Regulate PPP, Including Concession Agreements. The bill allows the government to make contributions to PPP projects, including water supply and sanitation projects, primarily in the form of periodic payments (up to 30 percent of the general fund of municipal budgets). Prior to this bill, the government could not assume long-term liabilities under PPPs because of the principle of three-year budget planning

⁷¹ In 2023, the GoU adopted changes to technical inspection requirements, in particular for freight transportation, including reviewing technical condition established by Directive 2014/45/EU of April 3, 201

liberalization of road transportation that removes existing limitations imposed by the existing quota and permit systems, reducing the burden on both the EU and Ukrainian transport industry. However, it is not clear if the agreement will be extended and become permanent.

6.2.3 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

Repairing infrastructure and upgrading national, local, and communal roads and bridges is necessary to restore regional passenger connectivity. Infrastructure damage caused by the invasion is not evenly distributed across the country. Transport connectivity plays a critical role in providing security-related logistics and ensuring the mobility of goods and people, including in areas close to the frontline. The financing model to fund the road sector via the Road Fund has been inadequate to cover the infrastructure funding gap, even before the invasion-related destruction of infrastructure. Prior to Russia's invasion, the government considered introducing an infrastructure program based on a private sector contracting model that involved user fees or shadow payment toll mechanisms. Due to increased risks, the private sector will likely be cautious about long-term commitments in the early stages of reconstruction. In the short to medium term, road reconstruction will need to follow a more government-focused delivery model, such as a DPS, rather than a model involving traditional infrastructure PPP programs. Nevertheless, Ukraine will over time be able to consider delivery options that balance the risk between the public and private sectors, and it will be able to utilize commercial finance for road agencies.

The national road network must be reconfigured to support EU integration. While it is urgent to repair damaged road infrastructure, reconstruction plans must also reflect the long-term reconfiguration of the road network to

support closer economic ties with European markets. Ukraine needs to prioritize road infrastructure that links the country with larger transportation networks in Europe and commercial corridors that can sustain a permanent increase in transatlantic trade.

Creating a national charging network will help facilitating the transition to EVs. The Ukrainian network of electric transport infrastructure is limited in size, located primarily in larger municipalities, and owned and operated by the private sector. Integration into the European electric charging infrastructure network will require complying with EU standards and growing the density of the network in line with EU requirements. Developing the EV infrastructure along the country's motorways will require efforts to increase the electric grid capacity, especially for rapid charging infrastructure. This will be expensive to implement because of the distance from the primary distribution network, and additional resources may be necessary to upgrade the grid. Therefore, the government could consider whether to financially support the development of fast and rapid EV charging infrastructure along motorways. It does not have to offer financial support to charging operators directly. Other countries' experience with building and expanding their electric charging networks shows that the greatest expense is the enabling infrastructure required to supply power from the grid. Over the long term, investments in electrification infrastructure could be combined with road reconstruction efforts in a PPP structure.

With respect to modernizing the road freight fleet to increase regional integration and comply with environmental requirements, an agreement was signed in 2022 to simplify the transportation of goods by road between the EU and Ukraine and Moldova, allowing Ukrainian, Moldovan, and EU haulers to transit through and operate between one another's territories without the

need for permits (EUR-Lex 2022b). In the short term, the transportation of goods by road will remain relevant, particularly for agricultural and general commodities. In the long term, however, a significant share of goods will need to be transported by rail and water. Still, to comply with EU regulations and avoid high taxes in case of high emissions, the country's road freight fleet will have to be upgraded and renewed in a timely manner.

With respect to strengthening international connectivity to improve road passenger transportation, there is a growing demand for traveling (especially by road) from Ukraine to the EU and other countries due to many Ukrainians being forcibly displaced to other parts of Europe. As of October 2023, there were 25.6 million border crossings from Ukraine to EU countries and Moldova, and 5.8 million Ukrainians were registered as refugees in EU countries. While passenger transportation is privately operated, regulatory reform is needed to simplify market access for international carriers, improve the quality of passenger services, reduce waiting time at border crossings, and increase the number of routes between

Ukraine and the EU. The private sector will continue to play an important role in rolling stock procurement, operation, and maintenance. There is additional potential to improve the country's underdeveloped real estate services at bus stations to improve service quality to foster integration with the EU over the long term.

6.3 Railways

6.3.1 Sub-Sectoral Context

In 2019, Ukraine's railway sector contributed 2.6 percent of GDP and facilitated exports worth \$44.6 billion. Ore and grain exports constituted 38 percent and 31 percent, respectively, of the country's rail exports in 2019 (Lawrence 2020). The railway system is extensive but outdated, with around 21,700 kilometers of infrastructure (47 percent electrified). It serves as the backbone of long-distance freight transport, accounting for 54 percent of freight turnover and 27 percent of passenger transportation in 2019 (World Bank 2018; Ernst & Young 2021). The Ukrainian railway system is the fourth largest in Eurasia in terms of cargo traffic, with freight-traffic volume per kilometer being 3–5 times higher

Table 6.2 Road Transportation Needs and Private-Sector Financing (\$, billions, 2023 prices)

	2023–2026	2027–2033	2023–2033
RDNA2 needs	8.3	42.4	50.7
Private-sector financing for reconstruction—Non-reform scenario	1.9	3.7	5.6
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private-sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	1.9	3.7	5.6
Private sector financing for reconstruction—Reform and intervention scenario	6.0	13.9	19.9
Addressing needs identified in RDNA2	0.6	4.5	5.1
Private-sector financing as share of RDNA2 needs (%)	6.8	10.6	10.0
Other investment opportunities identified	5.4	9.4	14.9

Source: RDNA2 and author's estimates.

Note: (a) Assuming that the RDNA2's assessed reconstruction of the damage and restoration of basic services is done through combination of public funds and PPP. The share of damaged assets for private freight and passenger transport is assumed at the same level as registered damage for private cars. (b) Assumed reforms include reconsideration of the road network and introduction of PPPs in the road sector; liberalization of international passenger road transport; and alignment with EU regulation on road freight transportation through licensing and emission standards.

than that of other European countries (Castalia 2023).¹⁴⁰ Before Russia's invasion, railway played an essential role in exporting grain and steel to Black Sea ports and supplying intermediate products (e.g., coal, coke, iron, ore, and fertilizers) to industries and farms. Since the invasion, port access has been limited, but the railway has been important in securing regional and international logistics, transporting humanitarian goods to Ukraine, providing an alternative for export goods previously shipped through seaports, and evacuating civilians from high-risk areas.

JSC Ukrzaliznytsya (UZ) has a monopoly on passenger and cargo transportation by railway, which contributes to low productivity and service quality.

UZ employs approximately 270,000 workers (Ministry of Infrastructure 2020b). The private sector has a significant presence in the cargo railcar market, accounting for 40 percent of the total freight car fleet, with private operators owning about 96,000 wagons, mostly gondolas (Dornier Consulting and Egis International 2016; IFC 2021d).

Ukraine's railway infrastructure requires significant modernization. Sharing single tracks between passenger trains and freight shipments results in high freight traffic but lower traffic speeds than in western Europe. The average age of locomotives and passenger cars owned by UZ exceeds 40 years, emphasizing the need for modernization (Dornier Consulting and Egis International 2016; OECD 2018).

Total damage to the country's railways is estimated at \$6.8 billion, representing 19.2 percent of total damage to the transport sector. Most damage has been done to rail tracks (\$4.3 billion), stations (\$306 million), and freight wagons (\$731 million). Reconstruction needs are assessed at \$27.16 billion (29.5 percent of total needs in the transport sector) (RDNA2).

The provision of railway free-of-charge transportation services to refugees, humanitarian aid delivery, and damaged rail connectivity result in \$2.3 billion in projected losses by August 2024 (RDNA).

6.3.2 Obstacles to Private-Sector Participation

UZ's public monopoly and poor governance of the railway sector has contributed to a stagnant sector burdened by enterprise debt, inefficient regulation, and lack of competition. UZ faces significant debt, totaling 39.5 billion hryvnia (approximately \$1.07 billion) at end-2022, of which 94.3 percent was in foreign currency (Fitch Ratings 2023b). Meanwhile, reforms to deregulate the sector that would allow UZ to unbundle core and non-core assets have been delayed. In 2019, UZ's annual investment need was estimated at around 27 billion hryvnia (approximately \$1.1 billion) (World Bank 2019b). The situation seemed to improve in December 2022, as UZ restructured some of its debt, and in April 2023, when S&P Global Ratings upgraded UZ's credit rating to CCC+ (S&P Global Ratings 2023).

UZ's near monopoly on railway passenger and cargo transportation stifles competition and restricts the entry of private firms. Opening the market to the private sector could potentially contribute to increased efficiency and better service quality. Policy and regulatory reforms to encourage private-sector participation and investment include developing a transparent regulatory framework (adoption of the new Law on Railway Transport), modernizing the rolling stock, and providing financial management training to address enterprise debt.

In 2019, the Cabinet of Ministers of Ukraine approved a pilot granting private companies access to locomotive traction on particular routes of public railway tracks in cargo transportation. However, since end-2021, only two companies have been admitted to participate, and neither of them have started cargo transportation,

the pilot has been discontinued. Nevertheless, harmonizing legislation with the EU and supporting private participation could increase transparency and competition, encouraging investment in locomotives while keeping rail tracks state-owned.

6.3.3 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

Prioritizing railways as a core component of the logistics system and improving the efficiency of UZ will be vital to support private-sector-led development. Under the 2017 Association Agreement with the EU, Ukraine is obligated to offer equal access to railway infrastructure, eliminate UZ's monopoly, and develop a competitive market. Following Russia's invasion, the railway sector has become vital to passenger and freight transportation. Under the current circumstances, public ownership of UZ will continue to be important in the railway sector. However, to avoid it becoming a bottleneck during the economic recovery, the authorities need to improve the efficiency of UZ by providing access to third-party operators, allowing for better and fairer services, implementing more transparent tariffs, and progressively open the market to private sector operators. This will require introducing public service contracts to make the public sector more accountable for the quality of public services and establishing a railway agency that acts as a supervisory body to prevent a single entity from controlling both the railway infrastructure and the means of rail transport.

The government can leverage UZ's assets to crowd in private investment in freight logistics infrastructure. Prior to the invasion, the Ministry of Infrastructure was investigating concessions as a means to attract private investment (particularly from a capable international operator), with the aim to support the commercialization of passenger stations

and development of freight container terminals. This would require changes in the regulatory framework, as the law currently prohibits privatization of railway infrastructure. However, UZ can utilize its assets to develop joint projects with European partners. Private investment can be generated through a combination of equity investment of national and foreign private companies, including foreign SOEs, as well as debt financing. This is particularly relevant for the development of terminals around the border with EU countries (possibly on both sides of the border), especially considering the shift of supply routes toward western Ukraine and the EU. To meet Ukraine's reconstruction needs, UZ could also attract private finance for liquidity support.

Integrating the railway network and logistics centers into the EU system will be crucial to the country's economic reorientation. The shifting of supply routes, both within Ukraine and across the region, presents opportunities to diversify the transportation network. The need to switch between different gauge widths and a long border control has been the key bottleneck for integrating Ukraine's railway sector into the EU. However, the need to rethink logistics networks creates opportunities to develop a system of transshipment terminals in Ukraine that are connected to the EU by standard European gauge (1,435 mm). While implementation of a change in gauge is a massive and expensive undertaking and should remain with the public sector, the private sector can assume the risk of developing logistics terminals. The private sector can also play an important role in deploying the rolling stock necessary to meet the requirements of the standard European gauge. While this greenfield project would be expensive and require extensive coordination between the public and private sectors, it is an important step to integrate the railway networks and logistics chains of Ukraine and Europe. Rail Baltica, a greenfield project to integrate the Baltic countries into the European network, is an example of a project to overcome the difference in gauge.

Table 6.3 Railroad Needs and Private-Sector Financing (\$, billions, 2023 prices)

	2023–2026	2023–2026	2023–2026
RDNA2 needs	4.0	23.9	27.8
Private sector financing for reconstruction—Non-reform scenario	0.2	1.2	1.4
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private-sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.2	1.2	1.4
Private sector financing for reconstruction—Reform and intervention scenario	0.3	1.5	1.9
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private-sector financing as share of RDNA2 needs (%)	0.0	0.1	0.1
Other investment opportunities identified	0.3	1.5	1.8

Source: RDNA2 and author's estimates.

Note: (a) Assumes reconstruction and no change of ownership, with the level of damage for the privately owned rolling stock assumed to be the same as that of the publicly owned stock. (b) Reforms include deregulation of UZ, including adopting regulatory changes to allow private business to enter the railway subsector; modernization of the rolling stock; and developing the standard European gauge.

6.4 Maritime and Inland Waterway Transport

6.4.1 Sub-Sectoral Context

Ukraine has 18 international seaports, including five in Crimea and 13 on the mainland. Prior to Russia's invasion, the four largest seaports—Pivdennyi, Odesa, Mykolayiv, and Chornomorsk—accounted for about 80 percent of total capacity (Figure 6.2). Over 90 stevedoring companies⁷² operate in the country, some of which are owned by SOEs and are unprofitable. Despite COVID-19 restrictions, handling volumes continued to grow for several years, before stopping due to blocked access to the Black Sea in 2022 (Ernst & Young 2021).

With the ability to service large vessels, Ukraine's waterborne transport industry employs 130,000 people and consists of sea and river ports, loading terminals, moorings, and transport facilities (Dornier Consulting and Egis International 2016). Prior to the invasion, grain, ore, and metals were the key cargoes handled in Ukrainian ports, accounting for about

64 percent of total transshipment volume in 2019. The agriculture, mining, and metallurgical sectors relied heavily on ports and waterways for exporting goods. Iron and steel exports fell by 45.9 percent between 2021 and 2022. Due to the blockade of Black Sea ports, steel companies were forced to reroute their shipment via railways. As a result, shipping costs doubled while rising demand overwhelmed the capacity of railway infrastructure and border crossing services.

Historically, inland waterway transport has performed far below capacity, though a slight improvement was observed in recent years. The Dnipro river was primarily used by big manufacturing and agricultural centers with seaports, but it became non-operational during the invasion due to its proximity to the frontline. Instead, the historically underutilized Danube river was more actively used in 2022, revealing the poor condition of its river fleet and port facilities. Nevertheless, transshipment of goods via the Danube reached 95,000 tons per day in March 2023, and private investors are building five new terminals along the river. In June

⁷² Stevedoring refers to loading and offloading cargo to and/or from a ship.

Figure 6.2 Operational Status of Ukraine's Seaports (May 2023)



Source: Ministry of Infrastructure, 2023.

2023, the Kakhovka dam on the Dnipro river was destroyed, causing massive flooding and likely resulting in the long-term interruption of navigation on the Dnipro. As of the date of this report, insufficient information is available to assess the level of damage and consequences for transport sector.

6.4.2 Obstacles to Private-Sector Participation

Prior to Russia's invasion, the government had begun restructuring and liberalizing the inland waterway transport sector. The National Transport Strategy of Ukraine 2030 outlines a path to increasing inland waterway cargo movement by setting up a network of multimodal transport and logistics facilities, reducing port bureaucracy, and simplifying procedures for private-sector participation. Since the beginning of Russia's invasion in July 2022, the Verkhovna Rada has adopted changes to the law On Privatization of State and Communal Property to simplify privatization, including to facilitate the relocation of enterprises.

Since the start of the invasion, the blockade of Ukrainian ports on the Black Sea has become the subsector's most serious challenge. In 2022, Lloyd's Market Association included all territorial and internal waters of Ukraine on the list of potentially dangerous areas for shipping. As a result, insurance premiums increased 20 times, from 0.025 percent to 5 percent of vessel value. After the resumption of grain shipments along a "temporary humanitarian corridor" in late September, the market somewhat stabilized, although any military or political complications can either raise rates again or completely close the reinsurance market for Ukraine (Center for Transport Strategies 2023). Meanwhile, the extensive placement of mines across Ukraine and in sea lanes has impeded transportation and prevented infrastructure restoration. As a result, Ukraine is losing approximately \$170 million worth of exports each day (Bandura et al. 2022).

6.4.3 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

Once the security situation improves, further privatization of public stevedoring companies and the concession of port and inland water infrastructure should enable the port sector to return to its full potential. Prior to the invasion, the government successfully tendered concessions for two seaports, Olvia and Kherson, and had started preparing for a third, Chornomorsk. After the invasion, resuming the privatization of seaports should require no immediate regulatory changes, though further reforms may be required to keep port operations competitive. Privatization will require the full reopening of ports for all goods, not just grain, as well as restoring normal commercial operations and ensuring security in the Black Sea region. Modernization of Dnipro river infrastructure, in particular state mooring facilities, may be considered for PPPs to increase their capacity and support the development of the sector.

To balance the interests of the state and investors, restore infrastructure, and increase

the competitiveness of seaports, the GoU needs to implement regulatory and infrastructure improvement. To simplify the mechanism of construction in the territorial waters of Ukraine, ensure that all construction is planned, and create more favorable conditions for attracting investments in the state sectors of the economy, Ukraine needs to carry out land reform related to the country's ports. To increase the capacity of ports, especially those in the Danube cluster, the state needs to support the development of access roads and highways and implement the reconstruction project targeting the deep-sea Danube-Black Sea shipping lane. Furthermore, proper depths of the Danube need to be maintained to ensure uninterrupted traffic and increase fleet tonnage.

Strengthening the Danube corridor will support the diversification of Ukrainian exports and will likely remain important to support the resilience and sustainability of exports after the security situation stabilizes. Further restructuring of the Danube ports and expanding the Danube fleet to handle exports to Europe are immediate priorities to support exports from Ukraine. To increase efficiency and stimulate investment, the

Table 6.4 Inland Waterway and Maritime Transportation Needs and Private-Sector Financing (\$, billions, 2023 prices)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	0.1	0.3	0.4
Private sector financing for reconstruction—Non-reform scenario	0.0	0.0	0.1
Addressing needs identified in RDNA2	0.0	0.0	0.1
Private-sector financing as share of RDNA2 needs (%)	9.5	16.6	15.1
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario	7.0	1.2	8.2
Addressing needs identified in RDNA2	0.0	0.1	0.1
Private-sector financing as share of RDNA2 needs (%)	50.0	17.6	24.2
Other investment opportunities identified	7.0	1.2	8.2

Source: RDNA2 and author's estimates.

Note: (a) Assuming fleet expansion and modernization at a scale that includes the expected increase in cargo transportation on the Danube and forecasts for the Dnipro River. (b) Reforms include the privatization of SOEs, particularly in the Danube ports; further privatization of stevedoring companies and concession of ports and river infrastructure; and fleet modernization, especially on the Danube river.

government may focus on privatizing SOEs and opening port facilities for privatization.

Greening public and private fleets will be necessary to comply with EU requirements. Most of the Ukrainian fleet is outdated, causing commercial inefficiency. In 2020, the average age of registered vessels exceeded 36 years. Upgrading and expanding the fleet operating on the Danube should be an immediate priority, followed by similar efforts to improve the Dnipro fleet once commercial navigation resumes on the Dnipro.

6.5 Airports

6.5.1 Sub-Sectoral Context

Prior to Russia's invasion, the aviation sector was an important driver of Ukraine's economy, contributing 1.1 percent to GDP and generating 146,000 jobs (IATA 2018). The country has 20 commercial airports, out of which 5 are in concession and 5 more were prepared for concession before the invasion, including the popular international airport in Lviv (UkrAeroRukh 2023). There were cargo terminals in the privately operated Kharkiv, Kyiv-Zhuliany, and Zaporizhzhia airports, as well as in the publicly owned KyivBoryspil and Kryvyi Rih airports. Kyiv Boryspil Airport accounts for over half of the nation's passenger traffic, with 7 other major, regional, and local airports handling the remaining traffic (Figure 6.3). Despite COVID-19, Ukraine's aviation sector has experienced significant growth in recent years, with airport traffic doubling in the past 5 years and increasing the penetration of low-cost carriers (i.e., Wizz Air and Ryanair) (Ernst & Young 2021).

Ukrainian aviation infrastructure is predominantly publicly owned, with 77 percent of airports being owned by the state or

municipalities, while most of the air fleet is privately owned. In 2021, 97 percent of passenger airplanes and 89 percent of cargo airplanes were privately owned. Since 2019, private investment has made up 94–98 percent of investments in air transport, with public investment making up a mere 2–6 percent (State Statistics Service of Ukraine 2022c). The average age of the country's passenger and freight airplanes is 27 and 43 years, respectively (UkrAeroRukh 2022). In 2021, cargo airplanes delivered only 0.016 percent (0.1 tons) of all goods in the country. Since it is more expensive to transport goods by airline than by rail and road, the cost of air freight transportation still accounts for 3.3 percent of the total cost of delivered goods.

The country's airports were among the first targets of Russia's invasion and have continued to suffer attacks, resulting in severe damage to airport infrastructure. Five airports have been destroyed, and 11 have been partially damaged, contributing to the \$447.6 million in damages in the transport sector (1.3 percent of total damages in the sector). The closure of the country's skies has caused \$6.7 billion in losses (21.3 percent of total losses),⁷³ representing the second biggest loss after the Black Sea blockade. Considering comparatively low needs for reconstruction (\$1.7 billion or 1.8 percent of total transport reconstruction needs) and high losses, airports could be of high priority for Ukrainian reconstruction efforts.

6.5.2 Obstacles to Private-Sector Participation

Publicly operated airports were poorly managed before the invasion, and a combination of significant damage and limited resources threatens their recovery. As public airports require significant capital investment, the sector's reconstruction will proceed very slowly under a fully public-sector model, and unless more attractive conditions for private participation

⁷³ As calculated by August 2024 in the RDNA2

can be created, both airlines and investors may decline to reenter the market. The regulatory framework limits private operation to only some airport infrastructure such as terminals, as runways and airport infrastructure are deemed to be strategic assets and belong to the government. However, there are not enough public funds to maintain the country's airports, and private investment is needed. Ukraine's integration with the EU may drive changes in sectoral legislation and open airports to private investment and competition, but the alignment of Ukrainian legislation with EU regulations is still in progress, as evidenced by the unapproved draft rules for access to the airport handling services market as of 2021.⁷⁴

6.5.3 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

Once commercial aviation has been restored, the government should focus on attracting international and domestic airlines in the common aviation area with the EU. The

Common Aviation Area Agreement, signed by the EU and Ukraine in 2021, paves the way for a common aviation area based on shared standards for aviation safety, security, and air traffic management (EC 2021b). The alignment of this legislation is in progress and is expected to open market access for consumers and airlines on both sides after the end of the invasion. The reconstruction process may allow the authorities to reconfigure Ukrainian airports, rebuild traffic and operations according to new legislation, and establish automated and digital processes in line with the Single European Sky initiative to unify the European air traffic management system.

Prior to the invasion, the government considered various options to secure capital investments for airports, including preparing some for a partial or full concession in 2021. While PPP models based on concession agreements have been successfully implemented in many Eastern European countries, in Ukraine, this approach may encounter regulatory and administrative barriers (Ernst & Young 2021). The Ministry of Infrastructure has prioritized private

Figure 6.3 Airports in Ukraine



Source: Kyiv School of Economics.

⁷⁴ Castalia, 2023. Draft.

participation in airports and had before the invasion identified six regional airports for concessions: Lviv, Zaporizhzhia, Rivne, Kherson, Vinnytsya, and Chernivtsi.

A strategy for rebuilding Ukraine's damaged airport infrastructure must consider changes in demand that will outlast the invasion. Some airports will benefit from becoming new multimodal hubs for passengers and freight, while others will see their roles diminish. Ukraine will need to develop a master plan on reconfiguring the airport network, including ways to attract potential private financing. Creating an airport development fund similar to the existing road fund could help finance the redevelopment of regional airports in the medium to long term.

Retrofitting aircraft and airports is important to reduce emissions. Efforts to fulfill the goal of the EU Green Deal on reducing CO₂ emissions from aviation may help attract sustainable financing for public infrastructure. PPPs and concession arrangements will require the participation of creditworthy private airlines and coordinated policy action to accelerate the recovery of the air transport sector.

6.6 Urban Transport, Including Sharing Services

6.6.1 Sub-Sectoral Context

Urban transportation plays a vital role in Ukraine's economy, but large inflows of IDPs into some cities have put pressure on transport networks. In 2021, 70 percent of the Ukrainian population lived in urban areas (State Statistics Service of Ukraine 2021c). In February 2023, 4.8 million people were officially registered as IDPs, most of whom had relocated to cities in western Ukraine. An estimated 7 million people are IDPs, though many are unregistered (Government portal 2023).

Urban transport in Ukraine is supervised by local governments. All electric public transport (trams, trolleybuses, and metro) and related infrastructure are municipally owned. Some buses in big cities belong to municipalities, but most buses and minibuses belong to private operators, with about 20 and 80 percent being municipally and privately owned, respectively (UkrTransBezpeka 2022).

Table 6.5 Airport Needs and Private-Sector Financing (\$, billions, 2023 prices)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	0.2	1.5	1.7
Private sector financing for reconstruction—Non reform scenario	0.0	0.1	0.1
RDNA2 needs identified	0.0	0.1	0.1
Private-sector financing, % of RDNA2 needs	6.5	6.6	6.6
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario	0.3	0.6	0.9
RDNA2 needs identified	0.0	0.4	0.4
Private-sector financing as share of RDNA2 needs (%)	8.4	26.6	24.4
Other investment opportunities identified	0.2	0.2	0.4

Source: RDNA2 and author's estimates.

Note: (a) Assumed reconstruction needs as per the RDNA2 and as identified by Ukraine's PPP agency. (b) Reforms include the optimization of airport networks; concession of airports; and automatization and digital processes for airport facilities.

Productivity and service quality of passenger transportation networks lag EU standards due to outdated infrastructure, low fares, and poor revenue collection.

The limited integration of public transport modes and lack of local institutional capacity to implement quality contracting and route network redevelopment have led to excessive competition between fragmented private and municipal operators. These operators face low revenues, bear the demand risk associated with government-regulated tariffs, and lack a proper compensatory framework. Inability to secure long-term financing and uncertainty associated with the business model hinder the implementation of green solutions (World Bank 2023c).

The government, international organizations, and private investors have invested in urban transport infrastructure and alternative modes of transportation, but prior to the invasion the rehabilitation of infrastructure was proceeding slowly. The National Transport Strategy, which runs until 2030, aims to replace all urban public transport with EVs. In November 2020, the European Investment Bank extended to Ukraine an Urban Public Transport Framework Loan, and IFC and the European Bank for Reconstruction and Development have signed agreements and disbursed loans to improve the country's urban transport (Ernst & Young 2021). Despite these efforts, implementation has suffered from delays and stalled after the invasion, and challenges persist in fleet modernization, implementing smart city technologies like traffic management systems, and coordinating renewable electricity generation.

The development of shared transportation services was at an early stage prior to Russia's invasion. A few major cities have introduced micromobility sharing services like bike-sharing (e.g., Nextbike and Bikenow) and shared e-scooters (e.g., Bolt, Zelectra, and Bikenow).

In addition, local SMEs and a mix of foreign and domestic firms participate in the car-sharing market. Major international rideshare services (e.g., Uber and Bolt) were present in major Ukrainian cities alongside national and local app-based services (e.g., Uklon).

Invasion-related damage to urban transport is concentrated in the areas most affected by the invasion and are estimated at \$1.858 billion, with reconstruction needs assessed at \$4.408 billion. Most damage to the urban public transport rolling stock has affected the 514 kilometers of trolleybus catenary infrastructure, 116 kilometers of tram rail, 361 tram wagons, and 359 trolleybuses (RDNA2).

6.6.2 Obstacles to Private-Sector Participation

The invasion has further narrowed Ukraine's already limited scope for borrowing while eroding its technical capacity to prepare urban transportation projects. Municipal public transport operators face high overhead costs and require a high level of subsidies, which may be difficult to sustain with increased public expenditure in other sectors. Municipal and private operators' low and unstable fare revenues lower their borrower credit quality, which limits their accessibility to other financing sources.

Substantial improvements in public transportation will require a review of the regulatory framework to allow for risk-sharing between operators and the government. It will also require extended terms of contracting arrangements to allow for long-term financing. The public transport tariff system is regulated by the government and restricts the ability to improve infrastructure through capital growth. Affordability of services in the post-invasion context will be a major impediment to the financial sustainability of urban transport services. Private operators and SOEs need access to new business models.

Weak household purchasing power and the low cost of private vehicle ownership relative to other European countries weaken the business case for privately provided public transportation services. The absence of a public policy to regulate private car use and implement a user-pays principle has led to a high use of private cars, with a relatively low but rising motorization rate.

6.6.3 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

Municipal finance is available for urban transportation, provided that cities have sufficient borrowing capacity. Overcoming the challenges involved in financing urban public transport will require developing alternative business models that allow for aggregating demand of the rolling stock and/or unbundling asset ownership. To improve public transport, Ukraine can separate ownership and operations risks by creating a regulated fleet aggregator that can be implemented by the private sector. This aggregator would own the fleet and provide it to

municipal and private operators. Implementing operating reforms would be necessary to set up a completely new system to procure public transport services.

Post-invasion reconstruction offers a window of opportunity for transformative change in transport provision, the decarbonization of transport fleets, and the implementation of a transit-oriented approach to urban development. Harmonizing domestic laws with EU regulations, leveraging western funding sources, and adopting decarbonization strategies can promote the development of electric public transport, sustainable mobility plans, and renewable electricity generation for urban transport. Additional opportunities include importing good-quality used rolling stock, adopting smart cities technologies, introducing e-bikes and e-scooters, and promoting multimodal systems and electromobility hubs. These reforms would encourage private-sector participation and investment, ultimately improving Ukraine's urban transport systems in the long term (World Bank 2023c).

Table 6.6 Urban Transportation Needs and Private-Sector Financing (\$, billions, 2023 prices)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	0.8	3.9	4.6
Private sector financing for reconstruction—Non-reform scenario	0.4	1.2	1.6
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private-sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.4	1.2	1.6
Private sector financing for reconstruction—Reform and intervention scenario	4.3	11.1	15.5
Addressing needs identified in RDNA2	0.1	0.9	1.1
Private-sector financing as share of RDNA2 needs (%)	17.1	24.3	23.1
Other investment opportunities identified	4.2	10.2	14.4

Source: RDNA2 and author's estimates.

Note: (a) Assumes a split between public and private ownership of urban transport fleets and services at the current level; (b) reforms include the renewal and electrification of public transport fleet in line with the Ukraine Transport Strategy and Law #8172; introduction of asset separation and/or aggregation models of fleet renewal; and promotion of sustainable urban transport solutions, including multimodal systems and hubs, e-bikes and e-scooters, and shared services.

Municipalities will need technical and financial support to transition to low- or zero-emissions technologies. Both blended finance and donor funds can be leveraged to bridge the finance viability gap for expanding electrified transport networks and adopting new technologies in the transport sector. A coordinated approach by the government is required to overcome market inertia by providing a single, well-structured procurement model that addresses the needs of operators, municipalities, suppliers, and financiers. Integration with the EU opens opportunities to tap into EU regulatory and financial support to develop decarbonized transport, especially the EU Green Deal.

6.7 Intermodal Transport and Logistics

6.7.1 Sub-Sectoral Context

Prior to the invasion, the capacity of Ukraine's logistics sector was underutilized, and shippers and logistics providers lacked adequate infrastructure and services. In the 2018 Logistics Performance Index, Ukraine's level of logistics quality and competence was ranked 66th out of 160 countries based on external evaluations, a slight improvement compared to previous years. The current invasion has greatly exacerbated the country's logistics challenges.

Before the invasion, logistics costs for transporting grain from farms to Black Sea ports were about 40 percent higher in Ukraine than in France and Germany, and they have further increased during the invasion. Ukrainian farmers receive lower world market price shares and bear the costs of logistics inefficiencies, resulting in \$600 million to \$1.6 billion worth of foregone revenue each year (World Bank 2015; World Bank and IRU 2017).

The existing logistics network is fragmented, suffers from low density, and is not incorporated

into a single system. Six private companies operate 11 out of 16 multimodal hubs, while Liski, a state-owned subsidiary of UZ, operates the other 5 (IFC 2021d). Even though some hubs (e.g., West Terminal Ternopil and Mostyska dry port) are used by several operators, there is limited communication between them. Some cities have a concentration of multimodal transportation hubs (e.g., Kyiv, Odesa, Dnipro, and Kharkiv), leaving the remaining territory uncovered, especially along rivers. There is a shortage of reliable and affordable advanced (third and fourth party) logistics providers and high-quality warehousing capacity, including cold and grain storage (World Bank 2018).

The intermodal containerization rate in Ukraine is below the EU average. In 2021, 1 percent of Ukrainian road exports and imports were transported in containers (State Statistics Service of Ukraine 2021b) (compared to the EU average of 6 percent), 6.1 percent via rail (EU average of 21 percent), and 0 percent via inland water (EU average of 7.6 percent). Meanwhile, Ukraine's container (24.9 percent) and contrailer (3.5 percent) transportation by sea was greater than the EU average (16.8 percent) (Eurostat 2022).⁷⁵

There has been a significant shift of supply routes since the invasion, highlighting the need for investment in freight transport infrastructure on new routes. The blockade of sea and inland water ports has increased Ukraine's reliance on rail and road transportation, showcasing the gap in transshipment logistics along the EU border. The cancelled Black Sea Grain initiative allowed Ukraine to export nearly half the preinvasion volume of grain, but the export of other goods has been interrupted, forcing companies to look for alternative routes. The prospect of EU accession has helped liberalize Ukrainian legislation by simplifying customs and cross-border transportation procedures, but protests in neighboring Poland and Hungary have put the

⁷⁵ Basic unit measurements are tonne-kilometers and gross weight.

recently emerged westward value chains under threat. These challenges highlight the importance of cross-border inland water transport and increased capacity of the multimodal network.

The EU accession process has accelerated the alignment of Ukrainian logistics legislation with EU requirements, helping to liberalize the logistics market. The Law on Multimodal Transportation, adopted in 2021, approximates multimodal operations with EU Council Directive 92/106/EEC. After assessing Ukraine's progress in implementing reforms in February 2023, the EC noted that the GoU had adopted legislation on the carriage of dangerous goods, but it still needs to implement the EU Directive on the inland transport of dangerous goods (EC 2023a). The liberalization of customs and the cross-border transportation of goods ⁷⁶ launched in 2022 simplifies the procedures to access the EU market, although existing capacity at the country's borders remains limited.

Emissions-intensive transportation modes dominate Ukrainian logistics. Although Ukraine transported most goods by rail (over 180 billion TKM or about 62.3 percent of total goods transportation) (State Statistics Service of Ukraine 2023e), ⁷⁷ 53 percent of Ukrainian railroads are not electrified, and most locomotives use fossil fuels (Ministry of Infrastructure of Ukraine 2019). To ensure further integration of supply chains into EU markets, the fleet will need to be modernized and decarbonized.

6.7.2 Obstacles to Private-Sector Participation

A fragmented system of multimodal terminals raises transportation costs. The low density of multimodal hubs and lack of connectivity between them create barriers for routes that are not operated by a single player. Bottlenecks

in the inner capacity of terminals restrict the amount of goods that can be transhipped.

Heavy reliance on state-owned assets and underdeveloped transport infrastructure, along with the low capacity at border crossings, limit the growth of the logistics sector. Due to restrictions at seaports (only grains are allowed) and inland crossings with Poland and Hungary (no agricultural production allowed until June 30, 2023), the pressure on Ukraine's logistics system and border crossings increases. International logistics is heavily dependent on a state monopoly in railways and the IWW ports along the Danube River. As a result, the country lacks the ability to adapt quickly and efficiently to increased demand.

Weaknesses in tariff policy, inefficient customs processes, and continued pricing pressures hinder private-sector development. With a score of 2.46, Ukraine's customs ranks 95th out of 138 countries on the 2023 Logistics Performance Index. As a result, Ukrainian traders suffer from a lack of appropriate customs procedures, increasing undue delays and additional costs.

6.7.3 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

Russia's invasion disrupted historical logistics value chains and destroyed facilities, forcing operators to look for immediate solutions to close gaps. Ukraine can use the upcoming opportunity for reconstruction to build a multimodal logistics system in a sustainable, digitalized way and establish stable connections with the EU logistics network (in terms of both physical implementation and the adoption of regulation). Private-sector strategies will emerge from reconstruction-related opportunities and the liberalization of Ukrainian legislation related to the EU accession process.

⁷⁶ EU-Ukraine agreement on the carriage of freight by road 2022. Convention on Common Transit, ratification of Ukraine in 2022

⁷⁷ Tonne-kilometers performed by type of transport.

Creating seamless multimodal systems by reorganizing logistics networks and attracting private-sector participation would contribute to the overall development of the logistics system. A dense network of multimodal hubs should be developed with the Trans-European Transport Network as the backbone, and it should incorporate existing promising hubs. This new network would bring an opportunity to construct European-standard gauge railroads. Developing new and improving existing nodes at the EU border (dry ports) will be important to increase cross-border capacity and strengthen westward value chains. The multimodal hubs will need to be constructed according to EU regulations and include facilities that can accommodate Ukrainian export goods (e.g., grain, vegetable oil and seeds, ores, iron, and steel). The multimodal operations would benefit from the digitalization and automatization of processes, which would allow easier access to the EU smart multimodal system.⁷⁸ Redesigning the multimodal network is a public responsibility, while the creation of hubs, such as dry ports and new river ports, has the potential for private investment and PPPs.

Seamless cross-border connections, fewer controls, and access to unified digital accounting systems would help to cut costs for both EU and Ukrainian businesses while reducing border processing time. Recently launched legislation for simpler cross-border transportation and freight customs processes liberalizes the logistics system between Ukraine and the EU. It also prepares Ukraine for a smoother EU accession process.

Digital registration through the EU's New Computerized Transit System provides Ukrainian businesses with a single documentation package, guarantees smooth goods transportation in 36 European countries, and provides opportunities for further digitization of logistic services (Zakon Rada 2022c). An agreement on freight road transportation withdraws the permit system for deliveries in EU countries and speeds up road-based border crossings (EUR-Lex 2022b). The agreement is in effect until June 30, 2024, and has the potential to be extended as part of the EU accession process.

Table 6.7 Intermodal Transport and Logistics Needs and Private-Sector Financing (\$, billions, 2023 prices)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	0.0	0.0	0.0
Private sector financing for reconstruction—Non-reform scenario	0.0	0.0	0.0
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private-sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario	0.6	0.3	0.9
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private-sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.6	0.3	0.9

Source: RDNA2 and author's estimates.

Note: Reforms include the expansion of the multimodal network oriented to westward supply chains; transition to EU standard railway gauge; and concession of seaports and river infrastructure. The RDNA2 does not cover assets discussed in the Logistics and Intermodal sector, thus no share of this cost can be estimated.

⁷⁸ Delegated Regulation 2015/962 on real time traffic information services, Delegated Regulation 2017/1926 on multimodal travel information services.

6.8 Risks and Risk Mitigation

Financial market risk, including fluctuations in inflation, will be a risk to the fragile Ukrainian market for some time following the end of Russia's invasion. Private partners expect that this risk will be borne and managed by the contracting authority during the contract term. Mitigation measures include introducing standardized contracts that reflect a balanced and realistic risk allocation, as well as creating a regulatory framework and contracts that allow for the conversion of local currency-denominated flows into hard currency-denominated flows.

Safety of assets. Mobilizing the private sector will require efforts to ensure some level of security around assets during a period after the end of the invasion. Mitigation efforts include introducing invasion-related insurance mechanisms and investment guarantees to reduce the risk for the private sector and stimulate additional financial flows into Ukraine. Investing in movable assets can reduce risk by splitting the location of assets between inside and outside Ukraine.

Demand risk. The economic recession and risk of invasion escalation hinder efforts to project demand. Mitigation measures include having the public sector assume demand risk for PPP projects at the early stage of the post-invasion period; introducing a financial incentive mechanism based on geographic location to ensure a higher share of donor and public finance in areas heavily affected by the invasion; and building activities around core economic sectors, such as agriculture, fuel, and consumer goods imports, to address risks related to logistics and freight transportation.

Energy availability and cost. Continued disruptions to the electricity supply and the high cost of fossil fuel increase overall transportation costs while diminishing the reliability of electricity. Mitigation measures include transitioning to renewable energy sources (RES)

and developing micro-grids that are integrated into the transport system.

Compliance with EU regulations and standards. The government and the private sector in Ukraine may not be ready to comply with more stringent EU requirements for project development and implementation. Inadequate compliance with environmental standards may result in high taxes and fees. For example, the revision of taxation of aviation in the EU, including the extension of the EU Emissions Trading System to the aviation sector, will probably increase the cost of trips and transportation for final users, affecting demand. Mitigation measures include establishing a project preparation office and ensuring capacity development programs for relevant staff members. Since the private sector tends to be more sensitive and responsive to requirements related to business opportunities, leveraging the private sector in project implementation would help to quickly upgrade the rolling stock and transport infrastructure.

Ukraine lacks the positive experience of enacting the necessary legislative changes to increase private participation in the railway sector and reduce execution risk related to coordinating with SOEs and operating in EU markets. Mitigation measures include focusing on investing in existing markets in the short term and reviewing EU accession requirements and conditions to ensure a smooth transition.

Lack of institutional and professional capacity at the project development stage may jeopardize implementation of the 'build back better' strategy, especially in the road sector. International capacity development, project advisory and leveraging experienced industrial sponsors for project development may reduce these risks.

CHAPTER 7

Energy and Extractives

7.1 Sector Overview

Ukraine has a diversified energy mix with considerable potential to increase the energy supply and improve efficiency. In 2020, the total primary energy supply consisted of natural gas (28 percent), coal and peat (26 percent), nuclear (23 percent), oil (16 percent), and renewables (7 percent).⁷⁹ In 2020, imports accounted for 36 percent of Ukraine's total primary energy supply (State Statistics Service of Ukraine 2021). Most recent estimates indicate Ukraine's notable technical RES potential, with 83 gigawatts (GW) of photovoltaic (PV), 438 GW of onshore wind power, and 250 GW of offshore wind power (NASU 2020; Cooperation for Restoring the Ukrainian Energy Infrastructure Project Task Force 2022). Ukraine's biomethane potential could fully replace its pre-invasion gas imports or supply 10–20 percent of the EU's biomethane market (Amelin, et al. 2020; Bne IntelliNews 2023). The potential for energy savings is greatest in the industrial sector (33 percent) and the residential sector (30 percent), while the public sector also offers considerable scope for efficiency gains (World Bank 2022). Ukraine is a world leader in supplying a wide range of mineral resources. The abundance and diversity of minerals and metals is due to the complexity and variety of Ukrainian geology. While it only covers 0.4 percent of the Earth's surface, Ukraine has about 5 percent of the world's mineral resources. It ranks in the global top 10 in deposits of several raw materials (metallic and non-metallic) such as titanium, ball clays,

Fe-Mn and Fe-Si-Mn alloys, and gallium (Livtseva 2022). Lithium, graphite, and magnesium, as well as gas, oil, and coal, among others, are also present in Ukraine (Livtseva 2022; IEA 2020). Ukraine's lithium deposits are among the largest in Europe. Proven reserves of titanium ores are among top ten worldwide, accounting for 6 percent of global production (Ukrainian Geological Survey 2021).

7.2 Strategic Challenge

The energy and extractives sectors are a key engine of economic growth and offer relatively high wages and export earnings, but they are also the largest source of Ukraine's total GHG emissions. In 2020, energy contributed 2.91 percent to GDP,⁸⁰ and extractives⁸¹ contributed another 4.57 percent (State Statistics Service of Ukraine 2022). In 2021, the energy sector employed 282,000 people (4 percent of the workforce), and the extractives sector employed 184,000 people (2.6 percent of the workforce), including 62,000 people working in coal mining. Wages in the energy sector were 38 percent higher than the national average, while wages in the extractives sector were 41 percent higher (State Statistics Service of Ukraine 2022). The energy and extractives sector contributed to 8.5 percent of exports in 2020: 6.38 percent of exports were iron ores and concentrates, 0.36 percent were electricity (mainly to Poland and Hungary), and 0.2 percent were titanium ores (Atlas of Economic Complexity 2022). The energy and extractives sectors have also accounted for the

⁷⁹ According to the Energy Community Implementation Report for 2022, the share of Energy from Renewable Sources for Ukraine constituted 9.19 percent in 2020, which was lower than the 2020 target of 11 percent. This indicates a significant potential for Ukraine to catch through the reconstruction and rebuilding process. Subsection 7.2 provides more analysis on this opportunity and related risks (European Community Secretariat 2022, p.169)

⁸⁰ Includes electricity, gas, steam, and air-conditioning supply.

⁸¹ Includes mining and quarrying.

largest share—around 43 percent—of Ukraine’s total GHG emissions in 2020: energy industries represented 27 percent of GHG emissions, fugitive emissions from oil and natural gas represented approximately 12 percent, and fugitive emissions from solid fuels represented approximately 3 percent (Ministry of Environmental Protection and Natural Resources of Ukraine 2022).⁸²

The energy and extractives sectors have extensive backward and forward linkages. Energy’s backward linkages include equipment manufacturing, civil works, the repurposing of agricultural waste for biogas, including biomethane, and extractive industries such as coal. Forward linkages encompass virtually all sectors. Extractives’ backward linkages include energy and transportation infrastructure as well as local economic development, while its forward linkages include metal, energy, and manufacturing. Metals accounted for 14.3 percent of gross exports in 2020 (Atlas of Economic Complexity 2020b). Titanium and its alloys are inputs to aviation and missile technology, shipbuilding, machine building, food, the medical industry, and non-ferrous metallurgy. Lithium utilization has potential for lithium-ion batteries, glass, and ceramics (Ukrainian Geological Survey 2021). Due to the destruction of leading steel plants and other invasion-related disruptions, steel production fell by 70.7 percent to 6.26 million tons between 2021 and 2022, while rolled steel output fell by 72 percent and pig iron production dropped by 69.8 percent (Polityuk. 2023).

To improve its competitiveness in global value chains and align with the EU acquis, Ukraine needs to transition from a high-emissions, energy-intensive economy to a more sustainable model, and the energy and extractive sectors will be critical to this process.⁸³ Between 1999 and 2019, the GHG intensity of Ukraine’s economic output fell by 86 percent, but it remains 2.5 times the global average and 4.6 times the ECA average (Climate Watch “Historical GHG Emissions”).⁸⁴ Similarly, between 1996 and 2020, the energy intensity of GDP fell by 60 percent, but it remains 1.5 times the global average and 1.9 times the average for European countries (IEA 2023).⁸⁵

The energy intensity of Ukraine’s economy is driven by demand for residential heating, an industrial structure that focuses heavily on capital- and energy-intensive activities, and energy-inefficient infrastructure and buildings, while regulated energy prices discourage investments in energy efficiency and conservation. Ukraine’s high GHG emissions and high energy intensity make its products less competitive in markets that apply the Carbon Border Adjustment Mechanism or other forms of carbon pricing. Leveraging the country’s largely untapped solar, wind, and biomass potential could rapidly decarbonize its economy and help it to compete in EU markets that offer renewable energy premiums. Ukraine’s biomethane from biomass could supply 1,020 percent of Europe’s biomethane market (Ukrinform 2023a). Furthermore, Ukraine has a well-developed gas network and the largest gas storage facilities in Europe, which could be used to store

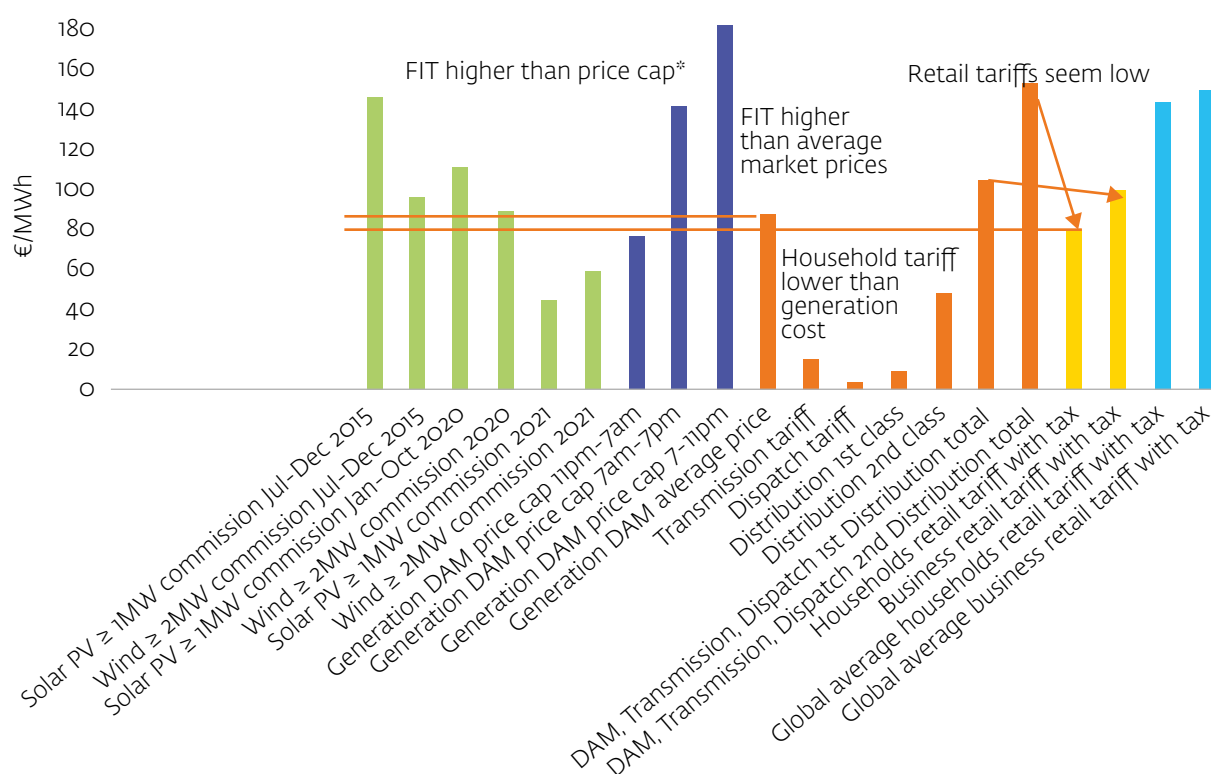
⁸² Energy industries include emissions from stationary fuel combustion in production of electricity and heat by thermal power plants, CHPs, heating plants (HPs), heat power plants of enterprises, waste incinerators, petroleum refineries and gas processing plants, and fuel combustion at the enterprises that are engaged in production of energy materials and other energy industries.

⁸³ In 2022, the energy intensity of GDP increased to 0.193 kilos of oil equivalent per \$ in 2015 prices due to a steeper decrease in GDP relative to the decline in energy consumption caused by the invasion. As a result, Ukraine needs to do more to attain the EU level of GDP intensity. This creates additional incentive for the Ukrainian government to stimulate the decoupling of GDP growth from energy consumption by increasing energy efficiency and conservation as part of the recovery and reconstruction process (Energy Data. “World Energy & Climate Statistics – Yearbook 2023”)

⁸⁴ GHG data include land-use change and forestry.

⁸⁵ Total energy supply per unit of GDP in megajoules in 2017 purchasing-power-parity terms.

Figure 7.1 Illustration of Ukrainian Electricity Potential Price Mismatches (€/MWh, 2023 prices, business retail data from March 2023, other data from July 2023)



Source: Mylenka 2020, National Energy and Utilities Regulatory Commission (NEURC), Cabinet of Ministers of Ukraine, European-Ukrainian Energy Agency (EUEA) and GlobalPetrolPrices.com.

Note: DAM = Ukraine's Integrated Power System DAM prices; solar PV and wind power plants' FIT rates are based on each plant's commissioned dates; the tariff has two voltage classes, depending on the level of voltage: first class, 27.5 -154 kV, and second class, 0.4 -10 kV (Dubrovskaya n.d.) * As from July 2023 Ukrainian regulator increased the maximum price caps, including DAM, to ca. 140 Euro per MWh (7:00-19:00), 185 Euro per MWh (19:00-23:00) and 75 Euro per MWh (23:00-7:00). Link: <https://www.nerc.gov.ua/acts/pro-vstanovlennya-granichnih-cin-na-rinku-na-dobu-napered-vnutrishnodobovomu-rinku-ta-balansuyuchomu-rinku>.

biomethane. Meanwhile, outdated industrial practices in areas such as cement production and agriculture, as well as the aging building stock, provide ample opportunities to improve energy efficiency and conservation.

Ukraine's energy sector is constrained by a legal, regulatory, and market environment that hinders financial performance and discourages investment. Laws limit private-sector participation in electricity transmission, large hydropower, nuclear power, and district heating systems. Among the five major companies present on the wholesale electricity market, four are SOEs. Public service obligations (PSOs) and price caps are the regulations that have largest effect on the market by restricting free price

formation (OECD 2023). Still, the price caps in the Ukrainian wholesale electricity market remain lower than the maximum (and higher than the minimum) levels in the EU. Further implementation of measures to prevent market concentration and abuse of market power, specifically by strengthening reporting and transparency, would allow the price caps to be used exclusively as an instrument to provide price signals to investors (OECD 2023; World Bank 2021a). There are potential price mismatches along electricity supply chains (generation, transmission, dispatch, and distribution) compared to end user consumer prices in Ukraine (retail tariffs (Figure 7.1). Due to the data in Figure 7.1 being compiled from different sources, caution should be used in interpretation. Day-

ahead market (DAM) prices illustrate wholesale market prices for electricity generation, and DAM clearing prices contribute to estimating or determining other wholesale market segments.⁸⁶ In Ukraine, household retail prices do not seem to allow for recovery even of generation prices (i.e., average DAM prices). Feed-in-tariffs (FITs) paid to support electricity generation from RES commissioned in earlier years are higher than the DAM average or the DAM price cap (maximum allowed for DAM) for mid- and/or off-peak periods (7:00 am–7:00 pm; 11:00 pm–7:00 am). Retail prices in Ukraine appear to be lower than global averages. Similar pricing mismatches appear to exist in the district heating and gas segments (OECD 2021a; OECD 2021b). Inadequate governance of low end-user tariffs of electricity, district heating, and gas without energy efficiency and conservation support worsens the financial sustainability of the sector.

The direct damage of Russia’s invasion to Ukraine’s energy and extractives sectors is estimated by the RDNA2 at \$10.6 billion, of which power accounted for 59.8 percent, followed by fuel oil, including oil refineries, fuel depots, and fuel stations (15.8 percent); gas (11.9 percent); district heating systems (11.6 percent); and coal mining (1 percent). Estimated invasion-related revenue losses in the energy and extractives sectors exceed \$27 billion, including power generation and transmission (45.9 percent), gas production and transportation (22 percent), coal mining (15.6 percent), fuel oil (16.4 percent), and district heating systems (0.1 percent). The sector’s estimated reconstruction and recovery needs total almost \$47 billion, including about \$5.7 billion over 2023–2026 and \$41.3 billion over 2027–2033. Reconstruction accounts for 97.4 percent of these needs, while the restoration of services makes up 2.6 percent.

Reconstruction needs are heavily concentrated in the power industry (78.8 percent), followed by the fuel oil (7.2 percent), gas transportation and distribution (5.35 percent), district heating systems (5.3 percent), and coal mining (0.7 percent) industries (RDNA2).

To ensure consistency with the RDNA2, the assessment is in 2023 US dollar prices at an exchange rate of \$1 to 36.5686 hryvnia for 2023. For values in different years and/or currencies, unless otherwise noted, the assessment adjusted the values to 2023 dollar prices using IMF GDP deflators and exchange rates in the World Bank’s World Development Indicators database for historical exchange rates and in public website sources for 2022 and 2023.⁸⁷ Investment costs are initial capital costs in terms of overnight costs,⁸⁸ and thus do not include costs for replacement, upgrade, modernization, and fixed and variable operation and maintenance costs or financing costs. Reform and intervention scenarios are assumed to take effect at the earliest in 2024, with the impact being spread over the 2024–2033 period.

Assuming the reforms and conditions reported in Chapter 1, the private sector could cover an estimated 76 percent of RDNA2 reconstruction needs. This estimate is largely based on private investment in RES-based electricity energy generation (Table 7.2) as well as private investment in building energy efficiency and exploitation of critical mineral resources. additional potential opportunity for the private sector could be even larger at \$132 billion; together with the RDNA2 needs, private investment potential of \$167 billion (Table 7.2).

Private sector participation can take various forms such as PPPs, commercial financing of

⁸⁶ For example, in the balancing market, the National Energy and Utilities Regulatory Commission (NEURC) sets the maximum price cap at 125 percent of the DAM price for each settlement period of the corresponding trading day (Energy Community 2023).

⁸⁷ 2022 average: \$1 = 32.649 hryvnia; April 10, 2023, 6:43 PM UTC: EUR 1 = \$1.09. Data from Refinitiv

⁸⁸ Overnight cost is the cost of a construction project if no interest was incurred during development and construction, as if the project was completed overnight or single day. Overnight cost provides a simplified cost comparison between power plant projects or technologies.

Table 7.1 Energy and Extractives Sector Needs and Private-Sector Financing (\$, billions, 2023 prices)

	RDNA2	Private sector opportunities			
		Non-reform scenario		Reform and intervention scenario	
		Addressing RDNA needs	Other opportunities	Addressing RDNA needs	Other opportunities
Total	47.0	2.2	28.5	35.6	131.7
Electricity sector, Total	37.2	2.2	0.8	29.9	82.8
Electricity generation	28.2	1.8	0.7	25.0	72.1
Energy storage	1.7	0.1	0.1	1.5	7.0
Electricity Transmission	3.7	0.0	0.0	0.3	3.0
Electricity Distribution	3.7	0.3	0.0	3.1	0.7
District heating	2.5	0.0	4.9	1.7	14.2
Extractives	7.3	0.0	22.8	4.0	34.7

Source: RDNA2 and IFC estimates.

SOEs (with loans from IFIs, bonds, and/or commercial bank financing), divestiture, and privatization.

7.2 Electricity Generation Sector

7.2.1 Sectoral Context

In general, Ukraine's renewable energy performance in terms of capacity factor ⁸⁹ is lower than the average of EU countries in 2000–2021. ⁹⁰ Ukraine's renewable energy capacity factor was 13 percent in 2021, lower than EU average of 28.6 percent.

Ukraine's mostly coal thermal power plants operate at low capacity factors (21 percent), and nuclear generators even operate at 65 percent load, significantly below industry standards (World Bank 2021a). Levels of hazardous emissions at Ukrainian coal-fired plants exceed

EU standards for large combustion plants by up to 40 times. The total cost of retrofits necessary for existing thermal power plants to meet the requirements of the EU Industrial Emissions Directive is estimated at EUR 2.6 billion (Savytskyi 2021). Ukraine's unit capability factor in 2021 was 73.8, lower than that of Germany (95.6), Finland (93.2), and Belgium (92.7), but higher than that of France (72.7) and Switzerland (72.4). ⁹¹

Supported by the government's generous FITs, renewable energy's share in electricity generation has increased, although it remains below the EU average. In 2021, renewables accounted for 13 percent of electricity generation and 25 percent of total capacity, well below the EU average of 44.8 percent and 45 percent, respectively. ⁹² Solar photovoltaic (PV) had the most installed capacity (8 GW) in 2021, followed by hydropower (6.7 GW), wind power

⁸⁹ Capacity factor: The ratio of the electrical energy produced by a generating unit for the period of time considered to the electrical energy that could have been produced at continuous full power operation during the same period.

⁹⁰ IRENA 2022a. Data for 2021 are from <https://countryeconomy.com/energy-and-environment/electricity-generation>.

⁹¹ The unit capability factor is defined as the ratio of the available energy generation over a given time period to the reference energy generation over the same time period, expressed as a percentage. Both of these energy generation terms are determined relative to reference ambient conditions. International Atomic Energy Agency (IAEA). <https://pris.iaea.org/PRIS/WorldStatistics/ThreeYrsUnitCapabilityFactor.aspx>.

⁹² 2021 data are from <https://countryeconomy.com/energy-and-environment/electricity-generation> and Eurostat [https://ec.europa.eu/eurostat/databrowser/view/NRG_CB_E\\$DEFAULTVIEW/default/table](https://ec.europa.eu/eurostat/databrowser/view/NRG_CB_E$DEFAULTVIEW/default/table) and [https://ec.europa.eu/eurostat/databrowser/view/NRG_IND_URED\\$DEFAULTVIEW/default/table](https://ec.europa.eu/eurostat/databrowser/view/NRG_IND_URED$DEFAULTVIEW/default/table)

(1.8 GW), biogas (123 MW), and other solid biofuels 152 MW.⁹³ In January 2022, coal represented 39 percent of total installed capacity, followed by nuclear at 25 percent and combined heat and power plants (CHP) at 11 percent, while RES represented 26 percent of total capacity.⁹⁴ In 2021, nuclear power contributed 55.6 percent to total electric power generation, followed by thermal power at 24 percent and CHP and cogeneration at 5.5 percent, with RES making up the remainder.⁹⁵

The cost of RES-based electricity generation has declined in Ukraine. In line with global trends, the levelized cost of electricity for Ukrainian solar PV and wind power fell by 83 percent and 64 percent, respectively, during 2010–2020.⁹⁶

International and domestic private companies own and operate most renewable electricity generation infrastructure in Ukraine, except for large hydropower plants.⁹⁷ Households owned about 22 percent of solar PV installed capacity in 2022.⁹⁸ The much smaller wind market is more concentrated than the solar market, with two firms owning over half of all installed capacity. There were 73 biogas plants in operation in 2021, led by the plants at the Oril-Leader and Vinnitsia poultry factories (17.7 MW), the Teofipol sugar plant (15.6 MW), and the Astarta-Kyiv bio-energy complex (12 MW) (Heletukha 2023; Latifundist.com 2020). Nuclear power and large hydropower are under state ownership, and other thermal power plants are largely privately owned by the energy sector's leading private company, DTEK.

By the end of 2019, the private sector had invested \$10 billion in renewable energy, placing it among the top five sectors in terms of

investment (in nominal prices) in the Ukrainian economy. Domestic and foreign investors from Austria, Belgium, Canada, China, Great Britain, Norway, Spain, Switzerland, Türkiye, and the United States, among others, have raised funds for Ukraine's renewables industry based on a stable, equitable regulatory framework and their productive relationship with the GoU. Leading IFIs such as the European Bank for Reconstruction and Development, the US Overseas Private Investment Corporation, and their peers in France, Denmark, Finland, Sweden, and the Netherlands have provided long-term financing for renewable energy projects in Ukraine (Kozakevich 2020). DTEK invested a total of €1.8 billion (in nominal prices) to develop 1.5 GW in solar PV and wind power, avoiding 4.4 million tons of CO₂e emissions each year and creating 81 full-time jobs as of June 2021 (DTEK 2021; IRENA 2022a). No data are available on either the total asset value or the value added by private companies in renewable energy.

7.2.2 Obstacles to Private-Sector Participation

Key obstacles to private-sector participation in RES-based electricity generation include regulatory gaps and challenging wholesale markets. Retroactive changes in sectoral regulations, the inability of producers to enforce payment, and delays in implementing auctions for electricity from RES all discourage private investment (State Agency on Energy Efficiency and Energy Savings of Ukraine 2021). A FIT was introduced in 2009 at a level too high to be sustainable. Since 2020, a sharp increase in nonpayment has eroded investor confidence and spurred regulatory changes in FITs and

⁹³ IRENA 2022a.

⁹⁴ Ukrenergo in Dixi Group website: <https://map.ua-energy.org/en/dashboards/5/>

⁹⁵ Data provided by the Ukrainian government and other sources (<https://www.epravda.com.ua/news/2022/01/11/681292/>; <https://www.ueex.com.ua/presscenter/news/osoblivosti-vitchiznyanogo-virobnitstva-elektroenerгии/>); and the team made adjustments of those data sources to be consistent

⁹⁶ IRENA 2022b; IRENA 2022c.

⁹⁷ The nuclear power and large hydropower are of state ownerships, and thermal power plants are largely of private ownership by DTEK.

⁹⁸ Ukrainian Energy 2022 and Dixi Group data from Ukrnergo <https://map.ua-energy.org/en/dashboards/5/>

other sectoral incentives. The government has also implemented policies designed to limit the influence of powerful vested interests.⁹⁹ Investors expect greater regulatory certainty, including a new support scheme of auctions, full repayment of the FIT and curtailment arrears,¹⁰⁰ and consents for damaged or destroyed RES-based power generators to retain their established FIT (Ukrainian Wind Energy Association 2023). Meanwhile, unreasonable price caps and a lack of competitive forward markets distort wholesale transactions.

Nuclear power and large hydropower remain publicly owned and must comply with PSOs. While the partial privatization of the hydropower SOE Ukrhydroenergo had been under discussion, the Cabinet of Ministers decided in 2020 that 100 percent of the company's shares should remain under state ownership (OECD 2021a).

Under the PSO for RES, RES producers with the FIT scheme sell their output to the SOE Guaranteed Buyer (GB) at the applicable FIT, and GB resells it on the wholesale market through an electronic auction on the DAM or intra-day market (IDM). Since wholesale market prices are on average lower than those under the FIT, GB incurs losses. To cover the losses, Ukrenergo compensates GB from Ukrenergo's transmission tariff revenues (OECD 2023).

The PSO for RES effectively excluded RES-based electricity producers with FITs from directly participating in the wholesale electricity market, as only producers that sell their output to GB were eligible for the FIT. Furthermore, RES-based electricity producers could not offer balancing services on a competitive basis. Instead, the transmission system operator (TSO) Ukrenergo curtailed power generation from RES-based electricity producers when required (OECD 2023).

While the initial FIT for RES in Ukraine was among the most generous in Europe, it resulted in arrears that undermined investor confidence in Ukraine's renewables support mechanism and its electricity sector overall (OECD 2023; Anatolitis and Grundlach 2020). Initial FITs are high, for example, at €465/MWh for a land-based solar power station in 2009 in nominal prices (PV Europe 2017), while the FIT reduction is occurring gradually and constantly (Figure 7.2). Ground-based solar panels with up to 12 MW capacity received €61/MWh in France (PV Magazine, n.d.), while a similar solar panel in Ukraine received between €144/MWh if commissioned in 2015 and €39/MWh if commissioned between 2025 and 2029 (Baker McKenzie, 2021). In 2017, Ukraine's FIT for PV plants installed on buildings was €348/MWh, which was reduced in 2020 to €112.5/MWh, making the FIT for small-scale projects comparable to FITs in Germany, Hungary, and Slovakia (Figure 7.3). Nevertheless, FIT levels for large-scale projects are still at the high-end of FITs in Europe, especially compared to countries with RES auctions in place (Anatolitis and Grundlach 2020). The surge in finished RES projects in 2019 led to a significant increase in support expenditures for RES, which increased indebtedness of GB and Ukrenergo toward RES producers. In 2020, the government adopted Law 810-IX, reducing the FIT by between 2.5 percent and 60 percent, depending on the type of renewable energy generated, plant size, and commission date (OECD 2023; PV Magazine 2020).

The new PSO model introduced in October 2021 was not fully financial but a hybrid physical and financial model (OECD 2023). Under the latest version of the PSO for households, Energoatom must sell part of its output¹⁰¹ to universal service suppliers through electronic auctions on the Ukrainian Energy Exchange at a price not

⁹⁹ OECD 2021a; OECD 2021b; OECD 2021c.

¹⁰⁰ In March 2023, GB made payments to RES producers at a level of 49.9 percent under FIT (EUEA 2023a).

¹⁰¹ The volume corresponds to the minimum hourly electricity consumption by households in the same month of the previous year (OECD 2023).

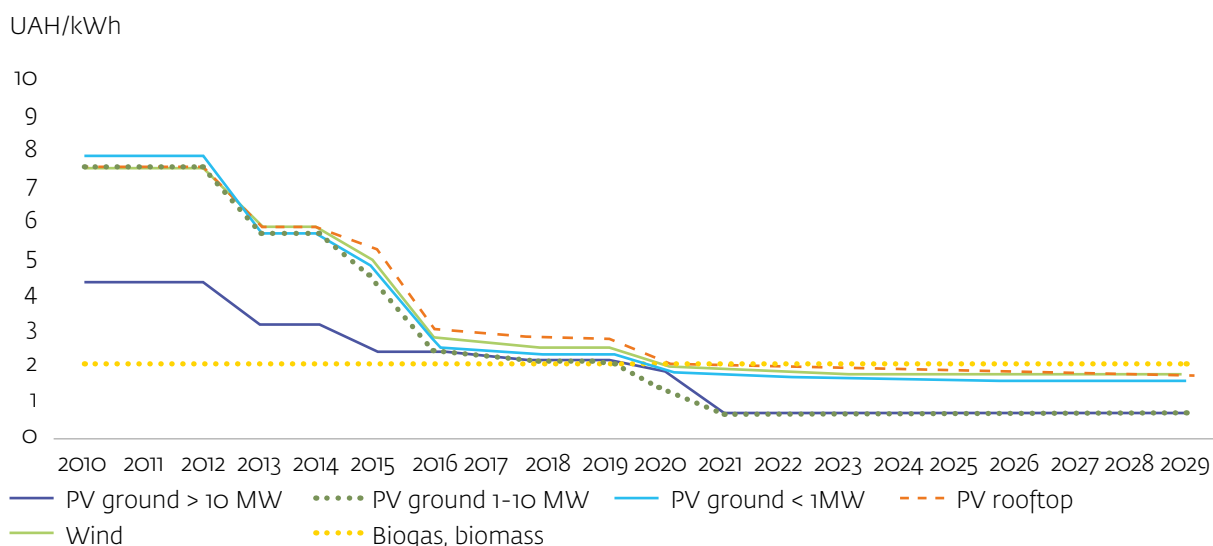
to exceed the price determined in accordance with the PSO Act (OECD 2023). Energoatom and Ukrhydroenergo must pay a financial contribution to GB to compensate universal service providers for the price difference between the DAM baseload price and the regulated household price. The higher household price was less than one-quarter of the average in the EU in the second half of 2021. The pre-VAT forecast for the fourth quarter of 2021 of the new PSO model was 0.6 billion hryvnia, much lower than the actual cost of 3 billion hryvnia. Ukrhydroenergo estimates that 30 percent of its revenues go toward the financial compensation of GB/universal service providers (OECD 2023).

In July 2023, the Energy Community Secretariat assessed NEURC Resolution No 1126 dated 27 June 2023 on setting price caps for the electricity markets. Regulation (EU) 2019/943 on the internal market for electricity (the Electricity Regulation), Regulation (EU) 2015/1222 establishing a guideline on capacity

allocation and congestion management (the CACM Regulation), and Regulation (EU) 2017/2195 establishing a guideline on electricity balancing (the EB GL) are yet to be fully implemented in Ukraine, which will support free price formation.¹⁰² The Energy Community Secretariat recommends that NEURC develop a roadmap for further price cap liberalization, following the synchronization of the Ukrainian and Moldovan electricity networks with the Continental European Network. The Secretariat recommends that the application of harmonized minimum and maximum price limits based on the value of lost load and the corresponding adjustment mechanism in the EU should be the ultimate goal (Energy Community Secretariat 2023a).

Price cap levels in Ukraine could have been failing to let the electricity markets signal investor incentives to invest in the electricity sector to address the energy trilemma: security, affordability, and sustainability. In competitive

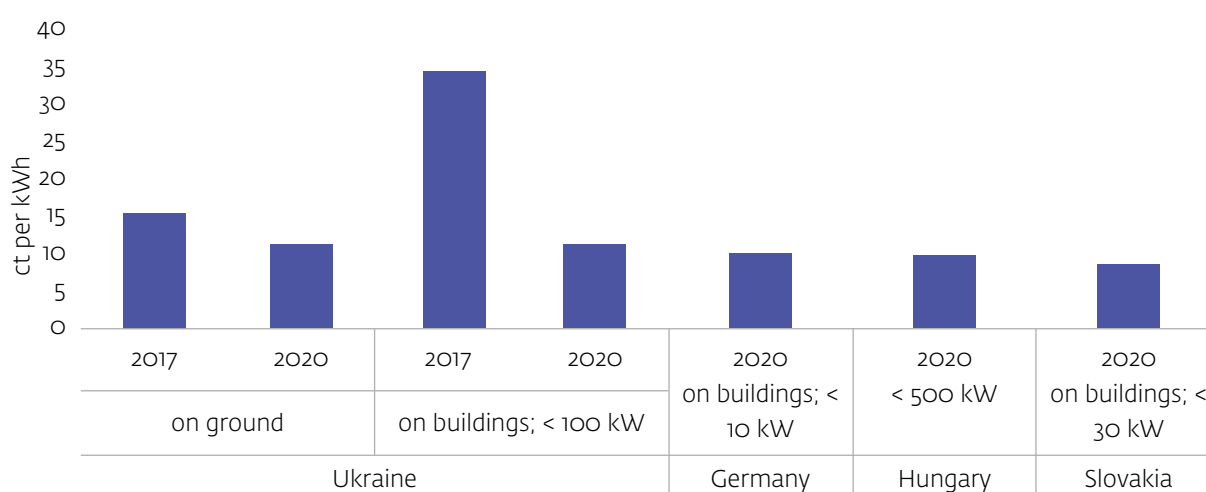
Figure 7.2 FITs for Renewables in Ukraine



Source: Verkhovna Rada of Ukraine, in OECD 2023.²²⁴

¹⁰² Implementing these regulations will require amendments to the draft methodology for determining significant price fluctuations and setting price caps by the end of 2023. This is important to ensure compliance with the principle of free price formation, the maximum/minimum IDM, and balancing prices (as the first step), integration into ENTSO-E's single day-ahead coupling (SDAC), and the application of harmonized maximum and minimum clearing prices approved by the European Union Agency for the Cooperation of Energy Regulators for the DAM (as a second step). The Electricity Balancing Guidelines also needs to be implemented to ensure the TSO's participation in the cross-border balancing process (Energy Community Secretariat 2023a).

Figure 7.3 Selected Country FITs (€ cents/kWh)



Note: Ukraine 2017 FITs predate the reductions mandated by Law 810-IX in 2020.

Source: Anatolitis and Grundlach 2020.

electricity markets, most producers bid at the level of their short-term marginal cost related to generating each additional unit of electricity (e.g., MWh). Marginal producers recover their capital costs during hours when scarcity prices occur. Scarcity pricing occurs when market prices rise above the marginal cost of the marginal unit, under conditions in which the system lacks generation capacity to meet high demand. Scarcity pricing is necessary to generate profits to cover the capital costs of marginal producers. Scarcity pricing is a natural occurrence in the market, as short-term price spikes (the lefthand side near the vertical-axis EUR/MWh of Figure 7.4) reflect the mismatch between supply and demand during certain periods. Avoiding price spikes through price caps would reduce additional revenue from high prices to cover the long-term marginal EUR/MWh 250 costs of some generators and incentivize optimal levels of investment. If high prices and corresponding revenues during times of scarcity cannot be collected, generators may be tempted to bid above their short-term marginal costs, resulting in higher average electricity prices. On the other hand, negative prices (the right-hand side of Figure 7.4) accommodate not only short-term adjustments in supply and demand but also signal the need

to invest in transmission and storage. As of June 2023, Ukraine's DAM Market Rules did not permit negative prices (OECD 2023).

Due to relatively high financing costs, risks to private sector RES projects are high. RES power plants have a much higher share of CAPEX and financing or capital costs than fossil fuel-based power plants (Kitzing 2023). Furthermore, the share of financing cost in average lifetime cost (levelized cost of electricity) escalates quickly with increasing interest rates (Kitzing 2023). The global cost advantage of wind and solar projects does not necessarily fully apply to the situation in Ukraine. The cost calculation depends on key assumptions relating to the weighted average cost of capital (WACC), projects' economic lives, and operating and maintenance costs. For example, the global levelized cost of electricity values calculated by the International Renewable Energy Agency are based on technology-specific WACC values, which are averaged and weighted across countries. The real after-tax WACC for Ukrainian wind and solar projects is 9.9 percent (OECD 2023), which is above the global weighted average of 7.5 percent (IRENA 2022b). Thus, the cost of capital for such projects in Ukraine is relatively high, which reduces their cost competitiveness. For the types of RES most

relevant for Ukraine (wind, solar and hydro power), the cost of capital is the main driver of cost competitiveness. Since such generation facilities run on free fuel, construction costs are the biggest component of total cost.

End-user electricity, heating, and gas tariff reforms are urgent to improve the private sector’s confidence in RES investment. The energy sector has historically suffered from the cross-subsidization of residential energy consumption by industry, and debt levels within the energy sector are rising. Legislative reforms based on the EU’s Third Energy Package have only partially addressed these challenges, as opposition from vested interests and the political sensitivity of energy prices have undermined implementation.

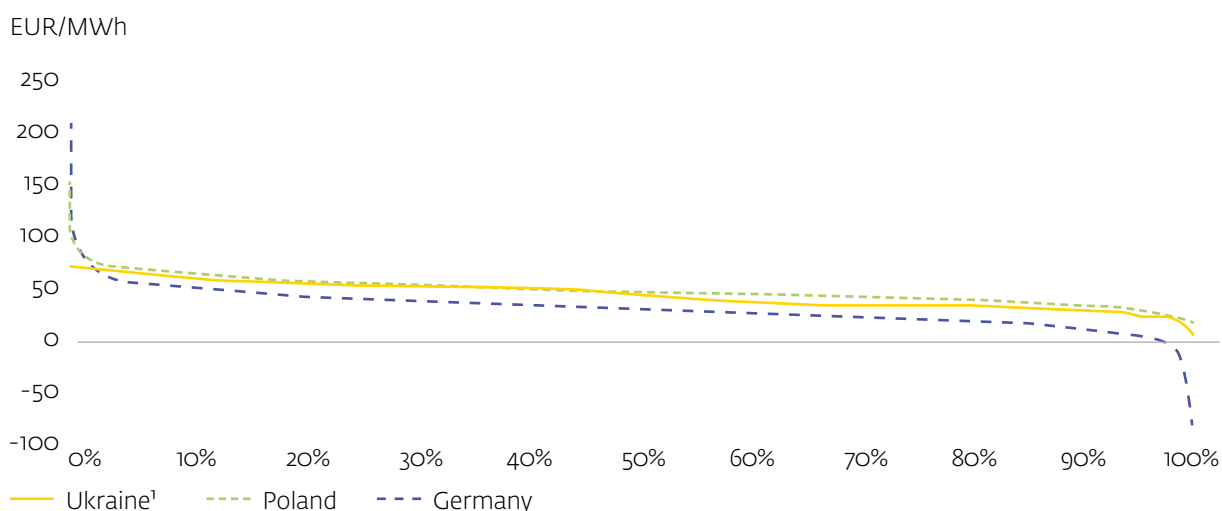
The government has committed to addressing the obstacles facing private investment under an IMF Extended Fund Facility. The program supported by the Extended Fund Facility includes energy sector reforms designed to enhance competition, improve market mechanisms, and reduce large quasi-fiscal risks. Timely integration with the

EU single market and the implementation of EU accession requirements will be crucial to completing long-delayed institutional and structural reforms (IMF 2023e).

7.2.3 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

Attacks on critical energy infrastructure have highlighted the importance of distributed generation. The private sector, the government, and Ukraine’s development partners are deploying solar-power systems to prevent blackouts and power critical infrastructure, and the commercial rooftop and facade solar PV market is growing. Cross-subsidization persists, with households paying regulated tariffs while businesses pay market prices, which are often much higher. Consequently, firms have started installing solar systems to offset their consumption of grid energy and increase their price certainty (PV Magazine 2022). Firms are starting to invest in energy efficiency, given high grid tariffs and the need to self-supply electricity from solar PV and battery energy storage systems (BESS) that may not be

Figure 7.4 DAM Price Duration Curves in 2020



¹ Integrated Power System trade zone.

Note: Horizontal axis indicates share of the year 2020.

Source: OECD 2023

sufficient. The commercial and industrial¹⁰³ segment accounted for approximately 58 percent of electricity demand in 2020, creating opportunities for suppliers of decentralized generating systems and energy efficiency solutions, including direct current appliances (e.g., refrigerators) that can use BESS more efficiently and longer (Eurostat 2023). Given the high GHG intensity of Ukraine’s grid electricity, RES-based distributed power generation could help the commercial and industrial segment meet increasing regulatory objectives and maintain competitiveness in EU markets.

As of August 2022, RES producers can temporarily opt out of the renewable support scheme and GB’s balancing group and trade directly in the market. By the end of August 2022, a few dozen companies, mostly mid-sized solar producers, out of almost 1,000, had decided to do so (OECD 2023). A switch to direct marketing by a significant number of RES producers would benefit competition by encouraging more diverse bidding strategies. Direct marketing for RES producers would also create stronger incentives to reduce forecasting errors and thereby lower the cost of balancing (OECD 2023).

Law 3220-IX of June 30, 2023, on Amending Certain Laws of Ukraine on the Restoration and Green Transformation of the Energy System of Ukraine covers key rules on guarantees of origin for RES electricity producers, net billing, and other amendments to Ukrainian legislation in respect to renewables, and it entered into force on July 27, 2023 (Zakon Rada 2023b). The law includes measures to: (i) extend technical conditions and pre-power purchase agreements (PPAs) for eligible wind projects and reduce FIT rates; (ii) allow RES producers with FIT to exit GB’s balancing group; (iii) allow RES producers to export and import electricity; (iv) lift restrictions for non-state-supported PPAs

of RES electricity producers; (v) introduce guarantees of origin; (vi) introduce feed-in premium for auctions for long term electricity from RES; (vii) implement net billing; and (viii) allow market aggregators.

The EU accession process could enable further large-scale renewable energy investments, especially when it becomes feasible to increase exports of electricity and hydrogen. As of June 2023, Ukraine’s electricity trade with the EU was limited (1,200 MW imported and 400 MW exported) (Ukraine Today 2023), but trade flows could rise to 2 GW in both directions (Reform Energy 2023). Increased electricity trade will help ensure liquidity for the wholesale electricity market, while greater alignment with the EU electricity market will bolster investor confidence. Development of low-carbon hydrogen and ammonia produced with solar and wind power could be of use for fertilizer and steel production, given the large domestic agricultural and steel industries and substantial gas transportation and storage systems. In February 2023, Ukraine and the EC concluded a memorandum of understanding for a strategic partnership on biomethane, hydrogen, and other synthetic gases.

Renewable energy could offer immediate investment opportunities for the private sector. In the near term, invasion-related risks for investments would be likely to be lower or could be better mitigated in the regions under full control of the Ukrainian government. Areas that have suffered less direct damage can provide the private sector with an adequate degree of confidence and security. Over the longer term, eastern Ukraine could offer higher returns on investment due to its greater wind and solar capacity, but investors would need assurance that the security situation had permanently stabilized.

¹⁰³ The commercial sector includes public services (Eurostat data category is “Final consumption - other sectors - commercial and public services - energy use”).

7.2.4 Risk and Risk Mitigation

Regulatory risks—including potential policy reversals, uneven reform implementation, and further delays in establishing the RES auctions—are high in Ukraine’s electricity generation sector. The government has yet to implement the RES auctions originally scheduled in December 2019. Ukrenergo’s FIT arrears to RES producers remain unresolved and, as of April 2023, GB’s monthly payments to RES producers under FIT are often incomplete (Guaranteed Buyer 2023; Energy Map “guaranteed buyer”). To avoid such imbalances in the future, it is crucial that tariffs are set at a sustainable and competitive level and that electricity suppliers improve the efficiency and quality of services, reduce system losses and interruptions, and ensure competitive procurement, all of which will lead to lower electricity supply costs. Consumers must be incentivized to improve demand-side energy efficiency and conservation and demand response. Coupling of Ukraine’s electricity market with that of the EU and the overall EU accession process should help accelerate these reforms and mitigate regulatory risks.

The Ukrainian government mitigates currency risks with eurodollar-denominated payments to renewable energy producers under existing FIT support schemes and a blend of eurodollar and hryvnia currency payment under new auction support schemes. Producers without a FIT support scheme could also sell their electricity on the hryvnia-denominated market and under bilateral contracts. Hryvnia-denominated local transactions would support the economic recovery, but investors may need additional guarantees against currency risk.

Invasion-related risks include the destruction of assets, supply disruptions, labor shortages, and the possible imposition of mobility restrictions

and capital controls. Such risks are especially high for RES projects, as many potential RES generation sites are in territories beyond the control of the Ukrainian government. Investments in domestic equipment production and decentralized systems including mobile assets (e.g., mobile solar PV), and finding alternative suppliers and transport routes can mitigate the risks of asset destruction and supply disruptions. Relocating staff and facilities to more secure areas of the country can further hedge against invasion-related risks. Completing synchronization with European Network of Transmission System Operators for Electricity (ENTSO-E) would help boost cross-border trade, further stabilizing the sector. Mobilizing support from development partners could ease financial constraints. Investments in technical training and reskilling—with a focus on women and IDPs—could help ensure a steady supply of qualified workers for the renewable energy sector, despite the ongoing invasion.

7.2.5 Financial Flows and Projections ¹⁰⁴

Estimates of private sector opportunities in the electricity generation sector are based on certain assumptions (Table 7.2). The private sector share of thermal power plants (TPPs)—61 percent—is estimated based on the share of TPP installed capacity of DTEK: 13.3 GW under private ownership out of a total of 21.84 GW of TPP installed capacity. ¹⁰⁵ In the non-reform scenario, key assumptions are: (a) much less RES-based capacity investment (i.e., 10 percent of the baseline projection), as only commercial and industry electricity consumers with solid long term revenues would enter into corporate/direct PPAs with RES-based electricity producers; and (b) no private financing to SOEs. In the reform and intervention scenario, key assumptions are: (i) all RES-based power plants are privately owned; (ii) low carbon hydrogen

¹⁰⁴ This energy and extractive sector and telecommunication section sector analysis assumes potential investment capital costs as overnight cost

¹⁰⁵ Total TPP 21.84 GW January 2022 (Ukrenergo, Dixi Group website; DTEK Group 2021).

(with 50 percent grant support and guarantee) is developed, with additional RES-based power plants brought online for export, in addition to the baseline projection; and (iii) a suitable form of commercial financing is arranged for electricity generation SOEs prior to 2033.¹⁰⁶

7.3 Energy Storage

7.3.1 Sectoral Context

The productivity and service quality of pumped storage hydropower plants (PSHPPs) have risen steadily and are approaching the EU average. During 2000–2020, the capacity factor for PSHPPs in Ukraine averaged just 8.6 percent, well below the EU average of 14.6 percent. By 2020, however, the capacity factor for Ukrainian PSHPPs had risen to 13.8 percent, close to the EU average of 14.3 percent.

Ukraine has been developing large-scale lithium-ion BESS since 2021. In May 2021,

DTEK launched the country’s first industrial lithiumion BESS at the Zaporizhzhia TPP in the city of Energodar. The system has a capacity of 1 MW/2.25 MWh (Energy Industry Review 2021). Budpower company, part of the KNESS Group, has received a license for conducting economic activity in energy storage (the first such license in Ukraine), ratified at a meeting of the National Commission for State Regulation of Energy and Public Utilities on June 8, 2023. Budpower is the owner of a 1 MW BESS, which the KNESS Group developed, designed, and manufactured in Ukraine. As an energy storage system operator, the company plans to provide ancillary services and balancing services to the TSO (Kness 2023).

Ukrhydroenergo plans to procure and install a 197 MW BESS at selected HPPs in Kyiv, Kaniv, Kremenchuk, and Seredniodniprovska, with World Bank support (World Bank 2021a). Ukrhydroenergo dominates PSHPPs and accounts for a growing share of energy

Table 7.2 Electricity Generation Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023–2026	2027–2033	2023–2033
RDNA2 needs	1.5	26.7	28.2
Private sector financing for reconstruction—Non-reform scenario	0.3	2.1	2.5
Addressing needs identified in RDNA2	0.1	1.7	1.8
Private sector financing as share of RDNA2 needs (%)	7.3	6.2	6.3
Other investment opportunities identified	0.2	0.5	0.7
Private sector financing for reconstruction—Reform and intervention scenario	11.4	85.7	97.0
Addressing needs identified in RDNA2	0.1	24.9	25.0
Private sector financing as share of RDNA2 needs (%)	7.3	93.1	88.6
Other investment opportunities identified	11.2	60.8	72.1

Source: RDNA2 and IFC estimates

Note: (a) The non-reform scenario assumes delays in or poor implementation of reforms. (b) The reform and intervention scenario assumes (i) EU accession and coupling of electricity markets; (ii) RES electricity and hybrid RES with energy storage auctions; (iii) tariff, price cap, RES, energy storage and PSO reforms in respect of electricity wholesale markets, transmission, distribution and end users to ensure cost recovery, competition and transparency and improve efficiency in supply and demand, (iv) similar reforms as above (iii) in the gas and district heating sectors; (v) implementation of guarantees of origin; and (v) private sector involvement, such as financing of SOEs with IFI loans or blended finance, commercial banks loans, capital market instruments, PPPs, etc.

¹⁰⁶ Technical tables are available upon request.

storage. As of January 2022, Ukrhydroenergo's large hydropower facilities included 1.5 GW of pumped-hydro storage (Energy Map. "dashboards/5"). Regulatory reforms could help scale up private sector involvement in BESS.

7.3.2 Obstacles to Private-Sector Participation

An inadequate regulatory framework and deficiencies in the legal system constrain the growth of investment in energy storage. Attracting new players will require improvements in the design of wholesale markets, especially the ancillary services market. Nearly uniform price caps restrict trading of different products with different costs.¹⁰⁷ The Ukrainian government should phase out all price caps in wholesale markets, with exceptions for emergencies (e.g., scarcity pricing), and/or properly differentiate between ancillary service categories based on supply costs and value to the grid, allowing for ample liquidity in the wholesale markets. As in the electricity generation sector, end-user tariff reform is critical. The government should set adequate incentives for private investment and amend the regulations governing the ancillary services market based on a detailed analysis of reserve adequacy and resource planning.

The Ukrainian government has been making progress on regulatory reform. In February 2022, just before the invasion, the legislature passed a law to incentivize investment in energy storage systems.¹⁰⁸ The law defines an energy storage system operator as any individual, firm, or legal entity that stores energy for sale and/or renders ancillary services and/or balancing Services (Sysoiev 2022a). By the end of 2022, the government had promulgated implementing regulations for the new law (Bondarchuk

2022). Complementing this effort, a second law on e-vehicles and charging infrastructure has been developed.¹⁰⁹ However, some regulations under the laws, such as rules on ownership and operation of e-charging infrastructure by a distribution system operator and payment arrangements for transmission, distribution, and dispatching for energy storage operators that are inconsistent with those for electricity producers, are at variance with EU standards. The government will need to amend regulations as part of the EU accession process (Zagnytko 2023; EUEA 2023d; Sysoiev 2022a; and Asters 2023). To enable greater private-sector participation in energy storage, policymakers must eliminate distortions in the electricity market and ensure that regulatory policies do not favor SOEs over private competitors (EUEA 2023d).

7.3.4 Risks and Risk Mitigation

Commercial risks could arise if the ancillary services market is insufficient or if demand is lower than expected. Revenue stacking is essential to the commercial viability of BESS. Energy-price arbitrage could generate revenue if the regulator allows electricity suppliers to charge time-differentiated tariffs in wholesale markets (Toba, et al. 2023). Implementing auctions for hybrid RES with energy storage for long-term PPAs could complement wholesale markets, which could help revenue diversifications of the hybrid and stabilization of wholesale market price volatilities. Alleviating the distortions caused by administrative tariffs will be vital to mitigate commercial risk.

Execution risks arise from the greater security offered by other markets in Europe, North America, and Asia. Due to surging global demand for lithium-ion technologies, high

¹⁰⁷ Such as ancillary services that respond to demand and generation imbalances and other contingencies, engage reserve units, and restore service following system-wide shut-down.

¹⁰⁸ Draft Law on Introduction of Changes to Certain Laws of Ukraine on Development of Energy Storage Systems (ESS) No. 5436-d dated 17 September 2021 (the "ESS Draft Law")

¹⁰⁹ The law entered into force on March 23, 2023 (Asters 2023).

commodity prices, and tariffs on key inputs, the cost of batteries is expected to remain elevated through 2025 (Plentisoft 2023). While the cost of raw materials, including lithium, has fallen from record highs in 2022, many large-scale developers are locked into long-term supply agreements. A shortage of workers also inflates project costs; most construction firms are fully booked into 2024 (Brower, et al. 2023). As the invasion continues, firms may be inclined to invest in markets with lower exogenous risks. Cybersecurity is also a challenge, and battery systems should include stringent cybersecurity protocols informed by the experience of software companies that participated in DTEK’s pilot BESS and that work with Ukraine’s electricity distribution and transmission systems. Cybersecurity is an issue for reconstruction, given the history of cyberattacks on power infrastructure and the risks presented by the need to digitally communicate among segments in the electricity system, such as BESS, solar PV, grids, other power generation sources, and loads (e.g., demand response). EU accession will help mitigate these risks with cybersecurity support.

7.3.5 Financial Flows and Projections

Private investments are feasible under the current legal and regulatory framework, while reforms and interventions would create new opportunities. As the available relevant hydropower data did not differentiate between hydropower and pumped-storage hydropower, the energy storage financing assessment includes only BESS, and the assessment on electricity generation includes pumped-storage hydropower plants. In the non-reform scenario, key assumptions are limited solar and wind and BESS or hybrid BESS-solar-wind of corporate/ direct PPAs in commercial and industry segments with stable long-term revenues, resulting in 10 percent of BESS investments in the baseline projection (see Annex to Chapter 7. Notes on Assumptions and Methodology). In the reform and intervention scenario, key assumptions are: (i) no reform impacts in 2023, as reform implementation takes time; and (ii) extra 2 GW BESS for low carbon hydrogen in additions to the baseline, which may require guarantees (Table 7.3).

Table 7.3 Energy Storage Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	0.2	1.5	1.7
Private sector financing for reconstruction—Non-reform scenario	0.1	0.1	0.3
Addressing needs identified in RDNA2	0.0	0.1	0.1
Private sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.1	0.0	0.1
Private sector financing for reconstruction—Reform and intervention scenario	1.2	7.3	8.4
Addressing needs identified in RDNA2	0.0	1.5	1.5
Private sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	1.2	5.8	7.0

Source: RDNA2 and authors’ estimates

Note: (a) The non-reform scenario assumes delays in reforms or poor implementation of reforms. (b) The reform and intervention scenario assumes (i) EU accession and coupling of electricity markets; (ii) RES electricity and RES electricity hybrid with energy storage auctions; (iii) tariff, price cap, RES, energy storage and PSO reforms in respect of electricity wholesale markets, transmission, distribution and end users to ensure cost recovery, competition and transparency and improve efficiency in supply and demand, with similar reforms in the gas and district heating sectors; and (iv) implementation of guarantees of origin.

7.4 Electricity Transmission

7.4.1 Sectoral Context

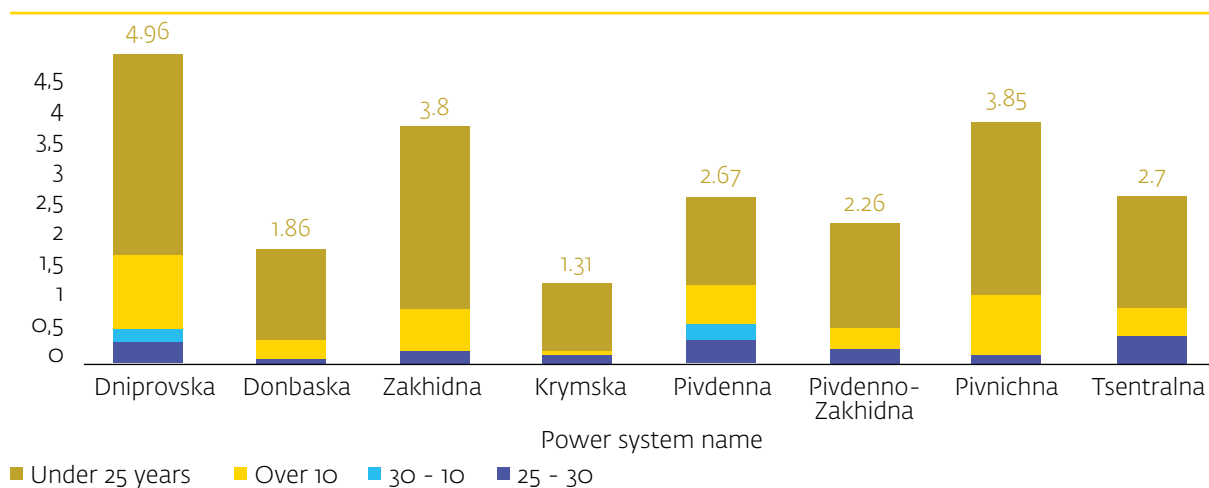
The Ukrainian transmission network’s productivity and service quality in terms of technical losses and interruptions is lower than in EU countries. The transmission network’s 2018 technical loss rate was 2.58 percent, higher than the 32 EU countries’ average of 1.87 percent in the same year (CEER 2020).¹¹⁰ The most recent data for Ukrainian transmission network average technical losses are lower, at 1.96 percent in January–September 2022, but there are no comparable EU data available (Energy Map “transmission system loss”).¹¹¹ The Ukrainian transmission network’s 2018 rate of unplanned interruptions per customer per year, or System Average Interruption Frequency Index (SAIFI), excluding exceptional events, is 0.17, higher than in 12 EU countries, whose average was 0.15 in 2018 (CEER 2022). Ukraine’s SAIFI at 0.17 in 2018 increased from 0.07 in 2010.

The Ukrainian transmission network’s 2018 unplanned interruptions minutes per customer per year or System Average Interruption Duration Index (SAIDI), excluding exceptional events, is 9.17 minutes, higher than the 10 EU countries’ average of 6.02 in 2018 (CEER 2022).¹¹²

The aged Ukrainian transmission network likely contributes to lower productivity and service quality (Figure 7.5; World Bank 2014).

Ukraine started synchronizing the operations of its power system with ENTSO-E on March 16, 2022, and began trading electricity with European countries in June 2022. ENTSO-E authorized emergency synchronization after Ukraine’s power system was disconnected from the Russian Integrated Power System and Unified Power System. Synchronization of Ukraine’s power system has been a strategic long-term goal that had been prepared thoroughly for many years since Ukraine’s expression of interest in

Figure 7.5 Length and Service Life of Overhead Power Transmission Lines (1,000 km, 2019)



Source: Ukrenergo.¹¹²

Note: Since Sweden’s data was exceptionally high in 2018, the average of 10 EU countries does not include Sweden. Including Sweden, the average of 11 EU countries is 38.7 minutes.

¹¹⁰ Within the Council of European Energy Regulators (CEER)’s 35 member countries, including Ukraine, 31 countries include non-technical losses either in distribution (10 countries) or both in distribution and transmission (25 countries). Ukraine includes non-technical loss only in distribution. The most recent transmission loss data in the CCER

¹¹¹ NEURC, Dixi Group website https://map.ua-energy.org/en/search/resources/?search_query=transmission+system+loss.

¹¹² The report is for 2018, and includes data for 33 countries, including Ukraine, out of 35 members (CEER 2020).

¹¹³ Dixi Group website, <https://map.ua-energy.org/en/dashboards/12/>.

Table 7.4 Ukrenergo Financial Summary (nominal 1,000 hryvnia, 2019–2020)

	2019	2020
Operating income	26,328,179	58,249,460
EBIDTA	4,284,917	-26,079,315
EBIDTA, %	16.3%	-44.8%
Net profit	1,857,391	-27,498,470
Net profit, %	7.1%	-47.2%
Fixed assets	44,309,629	44,424,161
Accounts receivable	3,927,933	10,656,411
Equity capital	37,459,578	9,944,694
Accounts payable	4,732,452	47,313,669
Cash, including:	2,951,240	2,966,505
- available funds	2,353,318	1,695,505
- special accounts	597,922	1,271,000
Current liquidity ratio	0.9	0.4

Source: Ukrenergo 2020.

implementing synchronization with ENTSO-E in 2006. Synchronization allowed Ukraine and Europe to stabilize the entire synchronized power grid and make electricity exchanges between regions. Since then, aside from temporary disruptions due to targeted attacks in October and November 2022, the transmission grid has maintained its stability. Ukraine stopped exporting electricity in October 2022 to meet domestic needs, and it resumed electricity exports to Europe in April 2023.

Ukrenergo, an SOE, is the TSO and owns and operates the national transmission network. The Law on Amendments to Some Legislative Acts of Ukraine Regarding Certification of the TSO states that the TSO can only be the owner of the transmission system or an economic entity, 100 percent of the corporate rights in the

authorized capital of which belong to the state (Zakon Rada Law No. 1396-IX; Ukrinform 2021). Since the law authorizing PPPs (Zakon Rada 2023c) does not allow the private sector to own or operate the transmission system or participate in transmission system operation under PPPs, Ukrenergo is effectively excluded from participating in any energy transmission PPPs.

Ukrenergo's fixed assets are 44.4 billion hryvnia or \$1.65 billion in 2020 prices (Table 7.4) (Ukrenergo 2020). Ukrenergo's Fitch rating is CC and Moody's rating is Ca as of April 2023. The SOE's deficit significantly increased in 2019, when the Ukrainian government required Ukrenergo to compensate the deficits of GB to pay RES electricity producers under a FIT as part of the RES PSO.¹¹⁴ However, NEURC¹¹⁵ does not consider the RES PSO to be part of Ukrenergo's mandate,

¹¹⁴ GB is responsible for fulfilling both households and RES PSOs. Energoatom and Ukrhydroenergo must pay a financial contribution to GB, which in turn compensates universal service suppliers for the difference between the DAM baseload price and the regulated price for households. RES producers with FIT sell their output to GB at the applicable FIT, and GB resells it on the wholesale markets through electronic auctions on the DAM or the Intraday market. Since wholesale market prices are, on average, lower than those under the FIT, this results in a loss for GB. To cover this loss, Ukrenergo is obliged to compensate GB from its transmission tariff revenues (OECD 2023).

¹¹⁵ NEURC is Ukraine's energy regulatory authority, which the Cabinet of Ministers set up as a central executive body. In this area, Ukraine has not yet aligned with the EU acquis, which requires independent operation of the regulator from other public bodies. NEURC's independence and reputation have been negatively impacted by some non-transparent appointments (EC 2023a; OECD 2021b).

and it therefore does not include the PSO in the transmission tariff calculation. In the context of financial stress and GB's legal actions, Ukrenergo issued a 6.875 percent, \$825 million, 5-year green and sustainability-linked sovereign guaranteed Eurobond in 2021 (the bond's term was extended to seven years in 2022) (Fitchwire 2022). As of September 18, 2023, Ukrenergo's debt to GB was 29.56 billion hryvnia or \$808 million in nominal prices (Energy Map "debt").

In July 2022, the Ukrainian government imposed two additional PSOs on Ukrenergo and electricity export companies. An export PSO obliges exporters to transfer 80 percent of their profit to GB to cover the deficit of universal service suppliers under the PSO Act. A coal PSO requires Ukrenergo to provide a 2.5 billion hryvnia loan to Ukrvugillya to ensure electricity generation from coal for the heating season 2022–2023 (Energy Community Secretariat 2022; Sysoiev 2022b; Omelchenko 2023).

7.4.2 Obstacles to Private-Sector Participation

Key obstacles to private-sector participation in the transmission networks include legal and regulatory market arrangements as well as the financial challenges of the TSO, Ukrenergo. Ukrainian law does not allow the private sector to own or operate the transmission system or participate in transmission operation under PPPs. If the government were to allow private sector participation in the transmission network, private sector opportunities could include completely private transmission lines or PPPs for transmission lines. If Ukrenergo could financially restructure and borrow commercially without a sovereign guarantee, the private sector could invest in Ukrenergo or participate in PPPs, such as build-own-operate-transfer arrangements for independent power transmission. Furthermore, the private sector, such as a large RES-based electricity developer, could build private

transmission lines for export and provide third-party access to their lines.

Despite some progress toward alignment with EU energy market practices, private investors may be deterred by overregulation by the PSOs and price caps in the Ukrainian market. Ukraine has yet to implement the EU Regulation on Wholesale Energy Market Integrity and Transparency, for which Ukraine passed a law in June 2023,¹¹⁶ or a fully compliant cross-border capacity allocation procedure (Energy Community Secretariat 2023b).

7.4.3 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

Private firms have an opportunity to support the reconstruction of the transmission network as contractors for Ukrenergo. The RDNA2 priority reconstruction needs for 2023 in the energy sector are \$1.1 billion or 33 percent of the sector's value. Private firms could serve as contractors for Ukrenergo in areas such as engineering, procurement and construction, original equipment manufacturing, input supply and logistics services, and facility operations and management.

The EU accession process could create an opportunity to bolster Ukrenergo's financial performance. This opportunity would involve restructuring Ukrenergo's balance sheet and reforming tariffs to ensure its financial stability and sustainability. In many countries, TSOs are robust companies that regularly borrow from the private sector and capital markets. EU accession could help increase Ukrenergo's revenues from the transmission tariff for electricity exports to European countries. The improved financial status of Ukrenergo could boost the private sector's confidence in the electricity market in general, but furthering improving the confidence

¹¹⁶ The Law on Amendments to Certain Laws of Ukraine on Prevention of Abuse in Wholesale Energy Markets

of the private sector would require fundamental reforms that allow for cost recovery, competition, and regulatory independence and ensure efficient and quality performance. Additional revenue of about \$80 million per month through exports will be needed, given that the electricity sector is accumulating financial deficits of \$50–100 million per month due to extremely low revenues. During the winter, Ukraine could import electricity from European countries to mitigate the impact of disruptions in domestic electricity generation, including the disconnection of the Zaporizhzhia nuclear power plant. Increasing electricity trade capacity is vital for Ukraine, but prospects are limited due to concerns over grid stability (World Bank 2023a).

Modernizing the outdated transmission network would increase investment opportunities in a green and resilient reconstruction if the legal framework is reformed to allow for private participation. To permit private sector investment and participation in the transmission network business in the long term, the government could consider revising the PPP law to include the transmission network and the law on the TSO and the transmission system.

Digital technology has aided in combating cyberattacks and balancing the transmission line. The cloud supports Ukrenergo's critical infrastructure. Virtual operation of energy transmission enables centralized data security and accessibility, ensuring business continuity and disaster recovery. Having implemented the latest technologies before the invasion, along with a business recovery plan, Ukrenergo can respond rapidly and modify its operations as necessary. Collaborating with Microsoft and its partners, Ukrenergo has successfully upgraded its security and productivity platforms to strengthen its resistance to cyberattacks (CEE Multi-Country News Center 2022).

7.4.4 Risk and Risk Mitigation

The primary regulatory risk lies in the transmission tariff. The transmission tariff neither covers the gap payment between FIT and wholesale market rates under the RES PSO, nor does it allow for full cost recovery of the transmission system (World Bank 2022; EUEA 2022). The Ukrainian government's strong interest in EU accession and electricity exports could help mitigate this risk.

Execution risks, such as recurring physical and cyberattacks on the transmission network, as well as lack of equipment, supplies, and human resources are related to the invasion. Ukrenergo is countering these risks by leveraging digital technology and maintaining a state of disaster preparedness. Other risk mitigation measures could include securing equipment stocks, fostering domestic equipment production, utilizing mobile assets, identifying alternative suppliers and transport routes, relocating labor and facilities, employing IDPs, and increasing the hiring of female staff.

7.4.5 Financial Flows and Projections

In the reform and intervention scenario, it is assumed that no private investment would be possible until 2027–2033. Private sector participation could take various forms, including loans from IFIs, bonds, commercial bank financing, PPPs in the form of build-own-operate (BOO), build-operate-transfer (BOT), rehabilitate-operate-lease (ROL), and/or rehabilitate-operate-maintain (ROM) structures, divestitures, and/or privatizations. Furthermore, the private sector, such as a large RES-based electricity developer, could build private transmission lines for export and provide third-party access to the lines. The non-reform scenario assumes no private financing (Table 7.5).

7.5 Electricity Distribution

7.5.1 Sectoral Context

The Ukrainian electricity distribution network's productivity and service quality in terms of technical losses and interruptions are lower than in many other European countries. The electricity distribution network's 2018 average technical losses was 9.84 percent, higher than an average of 7.05 percent among 30 European countries' distribution network loss for the same year.¹¹⁷ The Ukrainian medium voltage distribution network's unplanned interruptions per customer per year (as measured by the System Average Interruption Frequency Index [SAIFI]), excluding exceptional events, was 5.93 in 2018, higher than the 12 EU countries' average of 1.06 (CEER 2022). The low voltage distribution network's SAIFI was 0.72, higher

than the 16 EU countries average of 0.49 (CEER 2022). The Ukrainian medium voltage network's unplanned interruption minutes per customer per year (as measured by the System Average Interruption Duration Index [SAIDI]), excluding exceptional events, was 580.46 minutes in 2018, higher than the 16 EU countries' average of 62.35 minutes (CEER 2022). Finally, the Ukrainian low voltage network's unplanned interruptions in minutes per customer per year (SAIDI), excluding exceptional events, was 102.94 minutes in 2018, higher than the 16 EU countries' average of 36.95 minutes (CEER 2022). Ukraine's 2020 SAIDI for interruptions due to the distributor's fault varies across distribution companies, ranging from over 2,275 minutes to 1 minute (Figure 7.6).

There were 34 distribution system operators (DSOs) in Ukraine, including Crimea, in

Table 7.5 Electricity Transmission Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	1.2	2.6	3.7
Private sector financing for reconstruction—Non-reform scenario	0.0	0.0	0.0
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private-sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario	0.0	3.4	3.4
Addressing needs identified in RDNA2	0.00	0.3	0.3
Private-sector financing as share of RDNA2 needs (%)	0.0	12.9	8.9
Other investment opportunities identified	0.0	3.0	3.0

Source: RDNA2 and IFC estimates

Note: (a) The non-reform scenario assumes delays in reforms or poor implementation of reforms. (b) The reform and intervention scenario assumes (i) EU accession and coupling of electricity markets, (ii) renewable energy electricity auctions, (iii) tariff, price cap and PSO reforms in electricity wholesale markets, transmission, distribution and end users to ensure cost recovery, competition and transparency and improve efficiency in supply and demand sides and also similarly in the gas and district heating sectors, (iv) implementation of guarantee of origin and (v) any suitable form of private sector involvement, such as commercial financing, PPP, private transmission, etc.

¹¹⁷ Among CEER's 35 members, 31 countries include non-technical losses either in distribution (10 countries) or in both distribution and transmission (25 countries). Ukraine includes non-technical loss only in distribution. The year 2018 is the most recent transmission loss data in the CEER report, which provides data for 33 countries including Ukraine, out of 35 (CEER 2020).

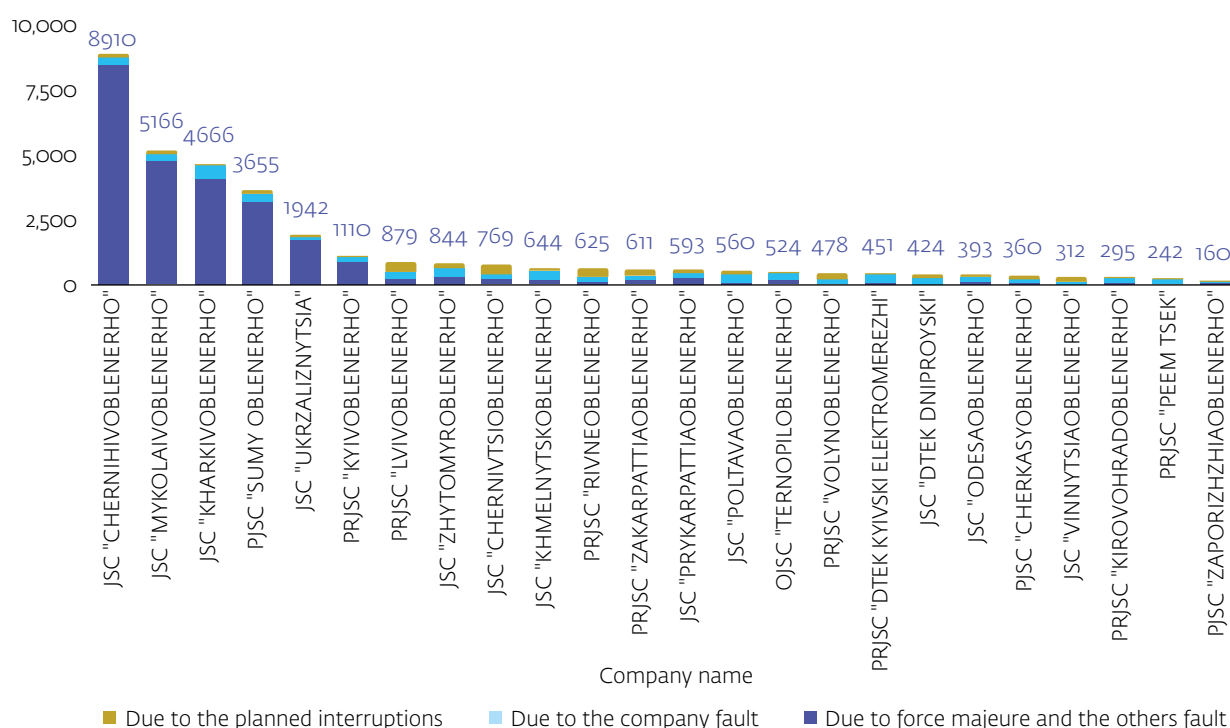
September 2023, according to the GoU.¹¹⁸ Based on data from Ukraine’s Stock Market Infrastructure Development Agency, an estimated 27 DSOs are mostly under mixed public and private ownership, and there has been an increasing level of nationalization of shares of and sanctions on certain private owners as of September 2023.¹¹⁹ The estimated private ownership share of the 27 DSOs (including those that were considered for nationalization in 2023 and without regard to relative size) was 62 percent in 2022.¹²⁰ A 2020 electricity market monitoring report notes that DTEK’s share of 43 percent in the country’s electricity distribution is done by controlling 7 out of Ukraine’s 32 DSOs (Mykhailenko 2020). DTEK’s investments in its grids totaled

3.5 billion hryvnia, or \$23 million, in 2019 and 4.9 billion hryvnia, or \$29 million, in 2020 (nominal prices) (DTEK 2020).

7.5.2 Obstacles to Private-Sector Participation

Previous cost-plus tariff regulations limited investments in the electricity distribution network, but NEURC adopted new regulatory asset base (RAB) tariff regulations in 2020 to promote investment. An assessment of the RAB reform results in November 2021 shows that out of 32 DSOs, 25 apply RAB tariffs (88 percent of distributed volumes) and 7 apply cost plus tariffs (12 percent of total distributed volumes). The assessment finds an increase in investment by 59 percent of all DSOs and 66 percent of DSOs

Figure 7.6 Electricity supply interruptions in 2020, (minutes/year)



Source: NEURC¹²⁰

¹¹⁸ The GoU’s comments on this report’s draft version.

¹¹⁹ The Stock Market Infrastructure Development Agency of Ukraine, listed 73 entry lines for ownership of DSOs as of June 2023; this accounts for the practice of using several different companies by one owner to register their ownership in a particular DSO; applying aggregation of the entry lines this report estimated 27 DSOs (Energy Map “distribution”). Ownership of DSOs as of February 2023 (Comments.UA. 2023).

¹²⁰ Links to news on the nationalization of DSOs: <https://delo.ua/energetics/biznes-druziv-putina-yak-ukrayina-dva-roki-namagajetsya-zabrati-pyat-oblenego-u-blizkix-do-kremlya-biznesmeniv-421219/> and <https://delo.ua/energetics/sumniyni-kroki-navishho-u-vladi-zagovorili-pro-nacionalizaciju-energeticnimi-kompaniyami-i-comu-roboti-z-nix-derzpidprijetstva-ce-pogana-ideya-423285/>. OECD (2023) notes that Ukraine has 32 DSOs, 8 of which the State Property Fund controls.

¹²¹ NEURC, Dixi Group website, <https://map.ua-energy.org/en/dashboards/12/>

with RAB tariffs. The assessment finds a significant increase in investment planning and setting key performance indicators, but it also notes the need to attract more banking and external financing. In general, banks are aware of the RAB reform. To proceed with financing, banks need to understand DSOs' financial model and loan repayment streams. The assessment also notes the need for capacity building among DSOs on detailed regulatory reporting and improvement of RAB accounting (Karaguttoff, et al. 2021). The increased investment should eventually reduce distribution network costs by improving efficiency and reducing technical losses, resulting in a lower end-user tariff. The DSOs and NEURC need to continue monitoring, evaluating, reporting, and verifying the impact of investment in and performance of DSOs. The Energy Community Secretariat in 2021 noted that the applied RAB tariff methodology is not compliant due to lack of transparency and cost-reflectivity (Energy Community Secretariat 2021).

Regulatory uncertainties and non-compliance with the EU acquis may discourage investment in DSOs. For example, in August 2022, some energy experts feared that the Ukrainian government may cancel the RAB tariff regulations. They noted that, given high inflation and a 30 percent decrease in electricity distribution volume, the RAB tariff had become the only source for purchasing materials, carrying out repairs, paying salaries, and mitigating accidents, the number of which had been steadily increasing as a result of military operations (RBC-Ukraine 2022). DSOs have to buy a significant amount of their losses from state-owned Energoatom at a fixed price, in contravention of the EU acquis (Energy Community Secretariat 2022).

7.5.3 Ongoing Developments, Emerging Opportunities, and Private Sector Strategies

The invasion has increased the need for potential private investment in the distribution network, not only for its restoration but also for its modernization and inclusion of smart

grids, which is in alignment with EU accession. Electricity distribution systems in Ukraine have a low level of digitalization. DSOs still manually record many basic indicators such as SAIDI and technical losses. This practice allows for potential manipulation of electricity metering information. One of NEURC's requirements for DSOs is the total digitalization of metering, which would significantly reduce opportunities for electricity misuse and interference with the operation of measuring instruments (OECD 2021a). Furthermore, smart grids are essential for the integration of variable renewable energy, demand response, energy efficiency and conservation, building electrification, e-mobility, cybersecurity and climate resilience. For example, DTEK launched pilot drone power line diagnostics, which reduced power outage time by 10–15 percent and accidents by 300 percent. DTEK has completed measures for automatic infrastructure defect recognition with computer vision and lidar scanning technologies, and it has performed an analysis and prediction of accidents with the use of 3D modeling software (DTEK 2020).

7.5.4 Risk and Risk Mitigation

Regulatory risk stems from uncertainties around RAB tariffs. NEURC needs to improve RAB tariff methodology and standardize RAB accounting, reporting, and transparency, and it should ensure no surprise of regulatory reversal. EU accession may mitigate this risk.

Finance risk arises from the lack of commercial financing. Loan conditions (high interest rates at 14–17 percent and short repayment periods of 12–60 months) have not changed since the transition to the RAB tariff. To mitigate this risk, banks have suggested the following changes to increase the ease of obtaining commercial credit: (i) introduction of a special account with automatic allocation of funds for loan repayment based on an approved schedule, and (ii) improvement of DSOs' internal controls and investment analysis (Karaguttoff, et al. 2021).

7.5.5 Financial Flows and Projections

In the no reform scenario, it is assumed that the private sector will not continue to invest due to market uncertainties. In the reform and intervention scenario, it is assumed that no further private investment would be possible until 2027–2033. Private sector participation could then take various forms, including loans from IFIs, bonds, commercial bank financing, PPPs in the form of BOO, BOT, ROL, and ROM structures, divestitures, and/or privatizations (Table 7.6).

7.6 District Heating

7.6.1 Sectoral Context

Compared to EU averages, Ukraine’s district heating has low service quality and very low productivity in terms of heat losses in heating networks and the efficiency of boilers. Ukraine’s share of heat losses in heating networks is very high, averaging 21.9 percent and ranging from 10.5 percent to 39.9 percent in 2020 (Energy Map “heat loss”), much higher than the 2018 average of 6.9 percent in the 24 EU countries, and very high compared to international

standards (EC et al 2022; Tetra Tech ES, Inc. 2020). Most boilers in Ukraine date from the Soviet era and operate at low efficiency, resulting in heat losses of 10–15 percent (OECD 2021b). The poor quality of hot water service, particularly in the summer, and the byzantine system for redressing billing disputes are two of the most common complaints about Ukraine’s district heating companies (no comparable EU data are available) (Tetra Tech ES, Inc. 2020) Ukraine’s district heating uses much less renewable energy, much more natural gas, and much less cogeneration than EU member countries. Of all the energy sources for Ukraine’s district heating in 2018, gas provided around 75 percent, coal and peat around 10 percent, biomass biofuels and renewable waste around 8 percent, and oil around 6 percent, and the share of cogeneration was around 34 percent in 2018 (EC et al 2022). In the EU, the sources of produced district heating in 2018 was natural gas at 30.4 percent, biomass, biofuels, and renewable waste at 26.9 percent, and coal and peat at 26.7 percent, while the share of cogeneration was around 63 percent (EC et al 2022). While GHG emissions data are not available, given the high share of gas, coal,

Table 7.6 Electricity Distribution Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023–2026	2027–2033	2023–2033
RDNA2 needs	0.3	3.3	3.7
Private sector financing for reconstruction—Non-reform scenario	0.3	0.0	0.3
Addressing needs identified in RDNA2	0.3	0.0	0.3
Private sector financing as share of RDNA2 needs (%)	82.2	0.0	7.4
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario	0.5	3.3	3.8
Addressing needs identified in RDNA2	0.3	2.9	3.1
Private sector financing as share of RDNA2 needs (%)	82.1	86.2	85.9
Other investment opportunities identified	0.2	0.5	0.7

Source: RDNA2 and IFC estimates.

Note: (a) The non-reform scenario assumes delays in reforms or poor implementation of reforms. (b) The reform and intervention scenario assumes all suitable forms of private sector involvement.

and peat in Ukraine’s district heating energy production and low efficiency, GHG emission intensity in relation to GDP is likely to be substantially higher than the EU average.

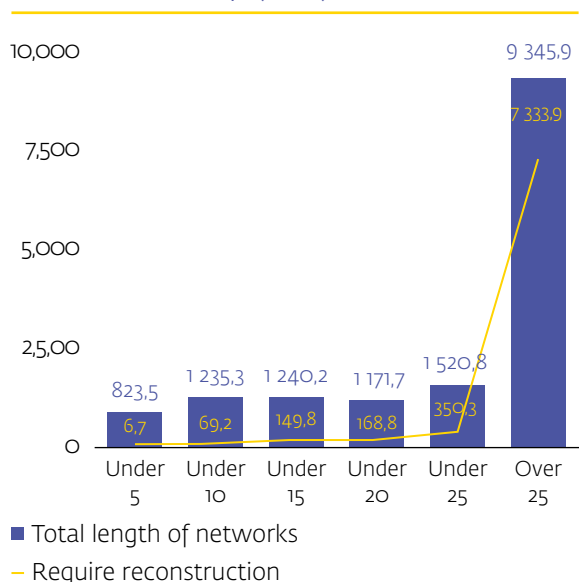
Ukraine’s aged heating network, end-user tariff that does not recover costs, and widespread consumer non-payment contribute to a vicious cycle of poor service quality, deteriorating infrastructure, and lack of investor interest (Figures 7.7 and 7.8). Most of the heating infrastructure is over 25 years old, close to or beyond its design lifespan, and needs to be rebuilt (Figure 7.7; OECD 2021b). Below-cost tariffs discourage energy efficiency and conservation. Low revenues resulting from widespread nonpayment and low tariffs cannot provide sufficient funds for maintenance and new investment. Over 60 percent of boilers have exceeded their typical engineering lives, and over 60 percent of heating networks require insulation or replacement (Tetra Tech ES, Inc.

2020). These outdated assets provide poor quality services, which further increase costs and encourage more customers to leave (Tetra Tech ES, Inc. 2020).

Most of Ukraine’s more than 1,600 district heating companies are owned by municipalities and cities. District heating companies provide centralized heat and hot-water supply services and employ more than 65,000 workers (Tetra Tech ES, Inc. 2020).¹²² In Ukraine, district heating serves 37 percent of families and accounts for a significant share (estimated at over 20 percent) of their housing and utility expenses in urban areas (Tetra Tech ES, Inc. 2020). District heating’s end consumers in 2018 were 48 percent residential, 32 percent services, and 20 percent industry (EC et al. 2022).

Ukrainian law does not allow for the privatization or concession of district heating systems, but it allows co-generation facilities to be owned by private investors without a network

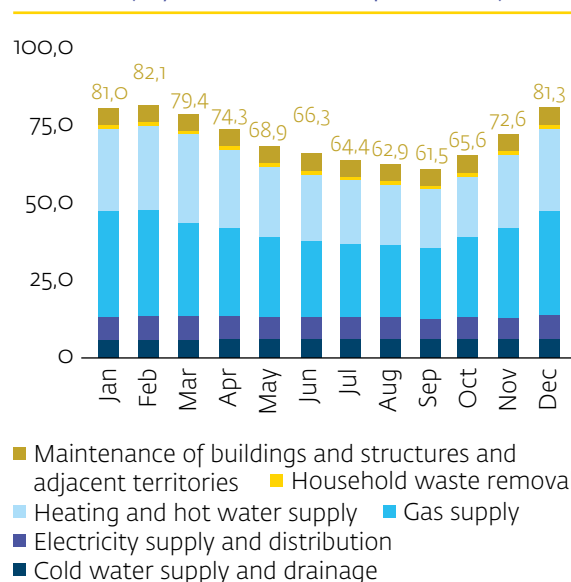
Figure 7.7 Length of District Heating Networks by Service Life (2020)



Source: NEURC.

Note: Figures from Dixi Group website, <https://map.ua-energy.org/en/dashboards/12/>

Figure 7.8 Housing and Communal Services Debt (hryvnia, billions, 2021 prices, 2021)



Source: State Statistics Service of Ukraine.

Note: Figures from Dixi Group website, <https://map.ua-energy.org/en/dashboards/7/>

¹²² Data year unavailable

connection guarantee.¹²³ Private investment in district heating is rare in Ukraine, with private investment often focused on disconnecting buildings from district heating due to its low service quality and inefficiency (Tetra Tech ES, Inc. 2020). Most local governments provide financial subsidies to district heating companies for operations and emergency maintenance or repairs. The key source of investment for district heating companies has been loans from IFIs, usually mixed with grants and technical assistance from other donors. The total financing committed by IFIs for district heating modernization is close to \$600 million as of 2020 (base year of price unavailable; Tetra Tech ES, Inc. 2020). However, implementation and disbursement rates for these projects remain low due to intrinsic problems in district heating companies as well as complex regulation (Tetra Tech ES, Inc. 2020).

7.6.2 Obstacles to Private-Sector Participation

Ukrainian law limits private sector participation in district heating systems. Ukrainian law allows co-generation facilities to be owned by private investors without a network connection guarantee. However, the Law on Lease of District Heating, Water Supply and Waste Water Disposition Facilities that are in Communal Ownership provides an option to lease the integrated complexes of relevant communally owned facilities (Zakon Rada 2023d). Utility agreements can be entered into for one year, and consumers have the right to terminate the agreement. Despite the aforementioned limitations on private sector participation, private co-generation projects exist, such as Kramatorsk city's CHP (PPP with

ContourGlobal, subsequently sold to Econnect in 2018) (Econnect 2018) and Chernihiv city's CHP (PPP with Technova from 2000 to 2023, when the lease was terminated due to lack of finance for repair or investment following extensive damage, estimated at 803 million hryvnia, to the CHP) (Liza 2023; Buna Time 2023).

District heating providers' high indebtedness and end-user tariffs that insufficient for cost recovery are challenges to private sector participation in district heating. As of February 2022, the cumulative debt of district heating companies to gas supplier Naftogaz was \$1.5 billion (2022 prices) (Energy Map "heat loss"). Legal steps have been taken to reduce district heating providers' indebtedness. Law 1639-IX aims to promote financial stability in the gas market and support the debt settlement procedure of natural gas supply, distribution, and transportation entities (Zakon Rada 2023e), and Law 1730VIII, updated in August 2022, aims to resolve district heating companies' indebtedness (Zakon Rada 2023d). In August 2023, the Cabinet of Ministers extended Naftogaz' obligation within the PSO framework to supply gas to thermal utility enterprises at a price of 7,420 hryvnia (\$203) per 1,000 cubic meters until April 15, 2024 (Ukrainian News 2023). Tariffs should be determined with consideration given to district heating providers' reasonable cost recovery, including fuel costs and the investment costs of transforming and developing the system, as well as to performance improvement, including operational efficiency and technical and non-technical losses.

Old and energy inefficient buildings unnecessarily increase heating costs, which exacerbates consumer non-payment and undermines the

¹²³ According to Article 4 of the Law On Privatization of State and Communal Property, any networks, buildings, and equipment related to the heat supply are not subject to privatization. According to Article 3 of the Law On Lease of State and Communal Property, the lease of such facilities is also not allowed. Article 7 of the Law On Combined Production of Heat and Electric Energy (co-generation) directly allows for the co-generation facility to be owned by a private investor. The regulator has also issued regulation on Investment Programs Development on Electric and Heat Power on Heat Networks and Cogeneration Facilities. The issue with cogeneration lies within the connection to the district heating networks. The regulation envisages a sophisticated, not always clear set of rules, and the Law On Heat Supply provides no guarantees that the potential supplier will be connected to the networks. However, the Law On Lease of Heat Supply, Water Supply and Waste Water Disposition Facilities that are in Communal Ownership provides options for leasing the integrated complexes of relevant communally owned facilities

potential private investment. Most buildings in Ukraine were built during the Soviet era without much consideration to energy efficiency. Most of these buildings have not been properly maintained, lowering energy efficiency even further. Given the fact that end-user tariffs in heating, electricity, and gas do not enable cost recovery, and the high upfront costs and short repayment terms for energy efficiency financing, the quality of utility services and levels of comfort, health, and safety continue to deteriorate.

The GoU has three laws related to building energy efficiency¹²⁴ and major building energy efficiency programs, including the Warm Loans program, which is financed directly from the state budget, has been operating since 2015, and mostly benefits owners of single-family houses. A total of 89,560 Warm Loans—of which 95.19 percent were to individual homeowners and 4.81 percent to apartment building co-owners’ associations—were issued from

November 2017 to December 2021. During the same period, Warm Loans subsidy payments went to individual homeowners (60.3 percent) and apartment building co-owners associations (39.7 percent) (Energy Map “dashboards/7/”). Another major energy efficiency building program is EnergoDim, operated by the Energy Efficiency Fund, launched in September 2019, and focuses on multifamily buildings. Table 7 presents a key summary of the EnergoDim program, as of April 2023, with financial, tax, and climate benefits. Package B is a more comprehensive and sustainable option than package A.

7.6.3 Ongoing Developments, Emerging Opportunities and Private Sector Strategies

Ukraine has a great advantage in the energy transition in its capacity to use bioenergy, including biomethane as well as potentially

Table 7.7 Key Results, EnergoDim Energy Efficiency Building Program (nominal prices, April 2023)

	Package A	Package B	Total
Inputs			
Investment [hryvnia]	66,505,774	2,191,710,968	2,258,216,741
Investment [euro]	1,653,418	54,488,727	56,142,145
Outputs			
Total renovations [no of projects]	46	195	241
Renovated area [m ²]	417,743	1,294,763	1,712,506
Results			
Internal rate of return (IRR)			
IRR, including energy savings	71%	3%	4%
IRR, including energy savings & taxes	102%	4%	5%
IRR, including energy savings, taxes & CO ₂	277%	8%	10%
NPV at 8% discount rate			
NPV, including energy savings	121,711,318	- 638,341,804	- 516,630,486
NPV, including Energy savings & taxes	130,697,994	- 453,812,824	- 323,114,829
NPV, including energy savings, taxes & CO ₂	222,715,091	28,247,748	250,962,840

Source: Energodim 2023.

¹²⁴ Law No. 2118-VIII on Energy Efficiency of Buildings (<https://zakon.rada.gov.ua/laws/show/2118-viii?lang=en#Text>); Law No. 2095-VIII about Energy Efficiency Fund (<https://zakon.rada.gov.ua/laws/show/2095-viii#Text>); and Law No. 2392-IX on Amendments to Some Laws of Ukraine Regarding the Creation of Conditions for the Introduction of Complex Thermal Modernization of Buildings.

Table 7.8 District Heating Needs and Private-Sector Financing (\$, billions, 2023 prices, unless otherwise indicated)

	2023–2026	2027–2033	2023–2033
RDNA2 needs	0.7	1.7	2.5
Private sector financing for reconstruction—Non-reform scenario	1.8	3.1	4.9
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private-sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	1.8	3.1	4.9
Private sector financing for reconstruction—Reform and intervention scenario	1.8	14.1	15.9
Addressing needs identified in RDNA2	0.0	1.7	1.7
Private-sector financing as share of RDNA2 needs (%)	0.0	100.0	70.0
Other investment opportunities identified	1.8	12.4	14.2

Source: RDNA2 and IFC estimates.

Note: (a) The non-reform scenario assumes delays in reforms or poor implementation of reforms. (b) The reform and intervention scenario assumes (i) any suitable forms of private sector involvement, including commercial financing and PPP, (ii) cost recovery end-user tariffs for heating, electricity and gas, (iii) implementation of building energy efficiency laws,¹²⁴ (iv) financing terms adjusted for energy efficiency investment (e.g., long term, interest rates waiver for first years, etc.), and (v) EU accession.

geothermal solutions, for district heating networks. Ukraine has both major agribusiness feedstock and available centralized heating networks, which most European countries are aiming to achieve to reduce GHG emissions (Tetra Tech ES, Inc. 2020; Nugent 2022). In Ukraine, climate-conscious foreign donors have been funding retrofits of ailing systems as pilot projects in towns such as Kyiv, Zhytomyr, and Kremenchuk (Rosca 2021; Prince, et al. 2021; Ramboll 2021).

Potential private sector investment opportunities exist in energy efficiency, which is often called the ‘first fuel’ in clean energy transitions. Energy efficiency upgrades provide some of the quickest and most cost-effective CO₂ mitigation options while lowering energy expenditures and strengthening energy security (IEA 2021). Private investment in building energy efficiency may require complementary public financing, guarantees, climate or green finance, and long-term financing with initial interest payment waivers, until energy savings materialize.

One of such instruments is the State Fund for Decarbonisation and Energy Efficiency Transformation that becomes operational in Ukraine in 2024 (the Law of Ukraine No 3035-IX of April 11, 2023). Ukraine should aim to minimize non-commercial financing support consistent with EU levels.

7.6.4 Risk and Risk Mitigation

Regulatory risks are both related and not related to the invasion. A private CHPP or biomethane plant’s offtaker will often be a government entity, such as a municipality, or gas TSO (GTSO). Such plants may receive payment for energy produced under an offtake agreement. However, government entities may not provide financial support to private plants to recover from damage caused by the invasion, as was the case for the Chernihiv city’s PPP CHP with Technova. Other regulatory risks are indirect: offtakers may default due to nonpayment and energy tariffs for heat, electricity, and gas that do not allow cost recovery. While biomethane cannot compete

¹²⁵ Law No. 2118-VIII on Energy Efficiency of Buildings <https://zakon.rada.gov.ua/laws/show/2118-viii?lang=en#Text>; Law No. 2095-VIII about Energy Efficiency Fund <https://zakon.rada.gov.ua/laws/show/2095-viii#Text>; Law No. 2392-IX Amendments to Some Laws of Ukraine regarding the Creation of Conditions for the Introduction of Complex Thermal Modernization of Buildings.

with subsidized low gas prices, they can compete in export markets where it can be sold at a premium. Low-quality district heating services lose customers, which is a commercial risk to the offtaker, with indirect impacts on the private CHPP or biomethane plant.

7.6.5 Financial Flows and Projections

The non-reform scenario assumes that building energy efficiency will require grants, guarantees, and/or climate or green finance for about half of the program, with limited financing options provided through Ukraine’s two major energy efficiency building programs.¹²⁶ The reform and intervention scenario assumes such financial support at, on average, 20 percent of total energy efficiency investment during 2027–2033, based on the trend in European countries such as Germany, where subsidies range from 10 to 50 percent, averaging around 15 percent (BAFA 2023).¹²⁷ The reform and intervention scenario also assumes that in 2027–2033, private sector participation in district heating might be done using various instruments, including loans from IFIs, bonds, commercial bank financing, PPPs in the form of BOO, BOT, ROL, and ROM structures, divestitures, and/or privatizations. Table 7.8 sets out the share of private sector financing for district heating both with and without reform and intervention.

7.7 Extractives

7.7.1 Sectoral Context

Ukraine’s performance in the extractives sector is lower than that of other European countries (Natural Resource Governance Institute 2017). The 2017 Resource Governance Index assessed

89 countries rich in oil, gas, and mineral wealth, and it ranked Ukraine 44th in terms of value realization, revenue management, and governance in the sector.¹²⁸

Private sector participation is increasing in the extractives sector, driven by large domestic industrial groups that are attracting foreign investors (Figure 7.9). Natural gas producers include SOEs, with a market share of 77 percent in 2022, and private companies, with a market share of 23 percent in the same year (Association of Gas Producers of Ukraine 2022; Ministry of Defense 2022, NSSMC 2022). The largest oil producer Ukrnafta (representing 62.7 percent of Ukraine’s oil and gas condensate production and 5.8 percent of its gas production in 2021) (UKRNAFTA “About us”) is fully operated by the state (the SOE Naftogaz owns 50 percent of Ukrnafta’s shares, while 49.9 percent of the shares are owned by the oligarchic business entity Privat Group but managed by the Ministry of Defense of Ukraine) (Association of Gas Producers of Ukraine 2022). Ukrainian law does not allow private investment in gas transmission infrastructure, but it permits investment in gas distribution (UKRNAFTA “About us”).

Biomethane, which can fetch a premium in the export market, presents opportunities for private investment, given that Ukraine’s gas transportation system is well integrated with the EU and that Ukraine has the largest gas storage facilities in Europe. Investment opportunities include the optimization and modernization of the gas transportation and distribution network to accommodate the use of renewable and synthetic gases, including biomethane and hydrogen. On April 12, 2023, Ukraine’s gas network connected to the country’s first

¹²⁶ The Energodim program supports up to 70 percent of the investment costs. For the Warm Loans program, the state provides assistance in the form of partial compensation from 20 percent to 35 percent. <https://energodim.org/detalna-informatsiia/>; <https://www.ukrinform.net/rubric-economy/3226668-more-than2000-ukrainian-families-take-advantage-of-warm-loans-program-this-year.html>.

¹²⁷ In Germany subsidies are mostly around 15 percent, and range from 10 percent to 50 percent. https://www.bafa.de/DE/Energie/Effiziente_Gebaeude/Sanierung_Wohngebaeude/Anlagen_zur_Waermeerzeugung/anlagen_zur_waermeerzeugung_node.html.

¹²⁸ The 89 countries covered by the 2017 Resource Governance Index’s include oil and gas countries, such as Ukraine, Norway, the United Kingdom, as well as countries focused on mining, such as Chile, which was ranked 2nd

biomethane production plant (Vodyanyi 2023). On May 5, 2023, the state gas TSO received applications from over 10 companies for the construction of 31 biomethane plants. The gas TSO is ready to provide biomethane transportation services.

In February 2023, Ukraine and the EU concluded a memorandum of understanding for a strategic partnership on biomethane, hydrogen, and other synthetic gases. To sell Ukrainian biomethane to Europe, mechanisms for cross-border trade in biomethane are needed to allow the sale of biomethane by EU countries' gas transportation system. It is important to unify regulatory requirements for biomethane between Ukraine and EU countries, remove internal restrictions on biomethane export, and provide for the issuance and recognition of guarantees and certificates of origin in domestic and foreign markets. Development of the industry requires the creation of financial instruments for cross-border lending to fully or partially cover producers' costs for connecting to the network. In August 2022, NEURC approved the supply of biomethane to Ukraine's gas transportation system (Bryl 2023).

In coal mining, the private sector represents 79 percent of production, with SOEs making up the remainder (Energy Map “dashboards/9/”). Of Ukraine's 300 coal mines, has government has privatized or transferred profitable mines that were under long-term concessions, mainly to DTEK. The remaining mines are owned by SOEs whose operations are subsidized by the Ukrainian government (IEA 2020). Ukraine's largest mining region in the east has been severely affected by Russia's invasion. Coal mining in Ukraine includes numerous unprofitable mines, governance challenges, and labor issues such as considerable wage arrears, especially by SOEs (OECD 2021b; World Bank 2016).

The extraction of critical raw materials attracts strong interest by the domestic and foreign private sector, presenting privately funded opportunities for Ukraine to become a part of the EU's extractives value chains. As of 2021, existing concession licenses for production or exploration include: 1 for lithium ore; 7 for nickel, cobalt, copper, and chromium; 3 for tantalum, niobium, apatite rare metal ores; 1 for beryllium and zinc; 2 for zirconium, scandium, and rare earth elements; 1 for molybdenum; 16 for titanium, zircon-rutile-ilmeniteapatite placers, and scandium; 8 for gold and polymetallic ores; and 3 for graphite (Ukrainian Geological Survey 2021).¹²⁹

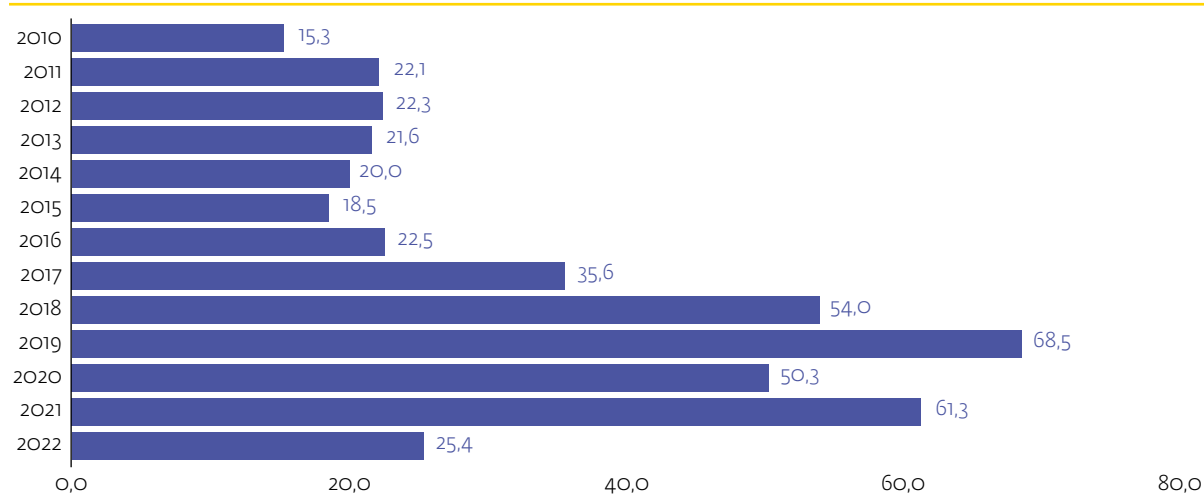
7.7.2 Obstacles to Private-Sector Participation

The location of productive metal and non-metal resources in eastern Ukraine is an obstacle for active private participation in developing the sector during the invasion. Several deposits of titanium ore are in the Sumy, Kharkiv, and Dnipropetrovsk regions, although the majority of already licensed deposits are located in central Ukraine (mostly in the Zhytomyr region). Deposits of nonferrous metals, including cobalt, are in western and central Ukraine, with two located in eastern Dnipropetrovsk region. Rare earths, including graphite, are in the eastern regions (Dnipropetrovsk, Donetsk, Zaporizhzhia and Kharkiv) as well as in central Ukraine (Ukrainian Geological Survey 2021).

Ukraine needs to adopt legislative documents on methodologies and lists of strategic and critical raw materials, and it needs to address challenges related to ESG (Ukrainian Geological Survey 2023a; Suprun 2023). Issues related to environmental impact assessment guarantees in case of permit change or transfer permits remain to be addressed (EPL 2023). On environment criteria, Ukraine needs to adopt

¹²⁹ Ukrainian Geological Survey 2021. Investment Opportunities in Exploration & Production Strategic and Critical Minerals. Ukrainian Geological Survey, Ministry of Environmental Protection and Natural Resources of Ukraine and UkraineInvest.

Figure 7.9 Capital Investment in Extractives (hryvnia, billions, nominal prices)



Source: States Statistics Service of Ukraine.¹²⁹

new amendments to the Law on Environmental Impact Assessment that would shorten the procedure for environmental impact assessments to three days (Ukrainian Geological Survey 2023b). Ukraine also needs to implement sustainable and green mining principles.

Restrictions on the functioning of the gas market, including a ban on gas exports under martial law, limit possibilities for foreign investment. Since ban on gas exports (Association of Gas Producers of Ukraine 2022, p. 23). Law 2261-IX on calculation of royalty fees, which entered into force in May 2022, temporally allows certain rent payers not to pay rent tax liabilities for the gas volumes extracted and pumped into underground storage facilities until the third calendar month after the end of the martial law in Ukraine (Zakon Rada 2022e). Cost recovery in the gas sector is limited by low prices in the domestic market, in part to ensure affordable prices for gas-powered heat generation until April 15th 2024 (Zakon Rada 2023f). Upon expiration of martial law, the government will need to liberalize the wholesale and retail gas market to accelerate integration with the EU gas market (IMF 2023b) and transition to decarbonized gas systems (Energy

Community 2022) and support the targeted vulnerable consumers by promoting energy efficiency and conservation and providing social assistance.

7.7.3 Ongoing Developments, Emerging Opportunities and Private Sector Strategies

Despite the invasion, existing private businesses in Ukraine's critical raw materials industry continue operating. UkrLithiumMining, a Cyprus-registered company with Ukrainian ownership, is developing a Polokhivske lithium project in central Ukraine to potentially become one of the suppliers to the growing EU market in the future as of October 2023 (ULM 2023). Another Ukrainian business, BGV Group, a large private consortium owned by the 16th richest person in Ukraine, operates in the extractives sector, including in the exploration of graphite in the Odesa and Kirovohrad regions (BGV Group Management "Graphite"). Zavalivskiy Graphite Ltd. has been operating since 1934 as a producer of natural graphite in central Ukraine, serving European and world markets (Zavalivkiy Graphite "About Company"). Foreign capital is also active in the industry: the Australian

¹³⁰ Dixi group, <https://map.ua-energy.org/en/dashboards/9/>. Data includes coal and iron ore mining, crude oil and natural gas production as well as extraction of other mineral resources.

company Volt Resources Limited has a 70 percent controlling interest in licenses to operate graphite deposits in the Odesa region for EU export (Volt Resources “Graphite Business”). The Ukrainian government has been using e-auctions for licensing new fields since 2016, and it sold 352 licenses through e-auctions totaling 3.8 billion hryvnia in nominal prices in 2016–2022 (Ukrainian Geological Survey 2023a).

Amendments to the Ukrainian subsoil law, effective March 2023, will further attract investors (Zakon Rada “Law of Ukraine No. 4187”). Key features of the amended law are: (i) deregulation and digitalization of the subsoil sector; (ii) free market for special permits; (iii) new terms for special permit extension; and (iv) terms for revocation and suspension of subsoil rights (Petrov 2023). The amendments eliminate challenges previously faced by subsoil users by: (a) limiting the ability of the state control body to suspend or cancel permits without an independent court decision; (b) allowing the sale of special permits to other subsoil users (ULM “Mining in Ukraine...”); and (c) increasing the visibility of benefits generated by fees for subsoil use permits (Ukrainian Geological Survey 2023a). The government is also advancing the digitalization of the sector by, for example, implementing a special permit (license) process through e-auctions and digitization of geological data (Ukrainian Geological Survey 2021; Directorate-General for Neighborhood and Enlargement Negotiations 2022).

Private businesses will benefit from the strategic partnership in critical raw materials and batteries that Ukraine signed with the EU in July 2021. The partnership supports businesses expanding or starting new projects in extractives and may help secure Ukraine’s place in the EU’s supply chain as it transitions to a climate neutral economy (Directorate-General for Neighborhood and Enlargement Negotiations 2022; EC 2021c).

The Fact Sheet on EU Critical Raw Materials Act 2023 notes that EU demand for lithium batteries is set to increase 12 times by 2030 (EC 2023c).

Among the main factors enabling private gas producers to maintain their operations during martial law is an adjustment of royalty fees to the actual volume of gas sold on the domestic market (as defined by Laws 2261-IX and 2139-IX) (Association of Gas Producers in Ukraine 2022, pg. 21). In 2019, Ukraine held a series of oil and gas tenders for production sharing agreements (PSAs) that attracted Ukrainian and foreign investors. At the end of 2020 and the beginning of 2021, the government and field operators signed agreements on oil and gas projects. The invasion significantly revised the plans of gas producers, as most of the PSA blocks are in the east of Ukraine. According to the Ukrainian Geological Survey, 11 out of 13 valid hydrocarbon PSAs are suspended due to force majeure circumstances. However, one PSA became a breakthrough: even during the invasion, gas production is being carried out in the Uhnivska area of western Ukraine in accordance with a PSA with Well Co LLC, which is a part of the Lviv-based Zakhidnadraseris Group. Since April 2022, there has been continuous industrial gas production at this field, which strengthens Ukraine’s energy security. According to the PSA, the Zakhidnadraseris Group is obligated to drill 45 exploration wells and invest a total of \$65.7 million in the development of the oil and gas field within the first five years (Association of Gas Producers in Ukraine 2022, pg. 30).

7.7.4 Risk and Risk Mitigation

Volatile world market prices of critical raw materials could be a risk. The main export destination for critical raw materials before the invasion was EU and other international markets that would guarantee a high price. Price risk, specifically for lithium, could be

mitigated by forming joint ventures as promoted by the Critical Raw Materials Alliance¹³¹ and the European Battery Alliance, whose network participants include the Ukrainian Geological Survey and some private companies (EC “European Battery Alliance”).

Execution risk related to the post-invasion availability of a qualified labor force can be limited. The state entity Ukraine Geological Survey is keen to ensure employment in the extractives sector (Ukrainian Geological Survey 2023a). Private businesses can avail themselves of cooperation and/or contracting services of SOEs and geological research institutes.

EU accession will require that Ukraine transition to a low carbon economy, meaning that natural gas will need to be replaced by renewable gases of biological and non-biological origin. Companies engaged in the oil, gas, and coal sectors are often responsible for air pollution, GHG emissions, decreased quality of water resources and land degradation, and human health issues associated with environmental risk factors (OECD 2021b; World Bank 2016). Anticipated new European legislation, in particular the revised Directive on Renewable Energy and related delegated acts, would set requirements for using renewable gas and hydrogen in industry to replace natural gas (European Council and Council of the EU 2023a, b). Investments into gas transportation and gas distribution systems would be required to facilitate the entry of renewable gas, in particular biogas. Stronger demand and higher prices for renewable gas in Europe could enable export opportunities after the ban on export is lifted.

The European natural gas sector currently faces significant uncertainty regarding its future role in the energy mix. The medium- to long-term implications of the Paris Agreement’s (UNFCCC

2015) decarbonization targets, the European Green Deal (EC 2021), and the National Energy and Climate Plans (EU Member States 2023) point to a changing role for natural gas transmission networks up to 2050 and beyond amid the eventual permanent decline of demand for natural gas (Grote et al 2022). Two main regulatory options to mitigate stranding include changes to depreciation policy (frontloaded depreciation) and non-indexation of the RAB. Both approaches shift costs forward so that cost recovery is speed up.

They do not reduce the revenue recovered, but the pace at which it is recovered. The main assumption is that the natural gas network will be used by a larger number of network users in the short to mid-term, so that costs can be shared and recovered from a larger number of users than in the longer term when natural gas demand has declined (Grote et al. 2022).

7.7.5 Financial Flows and Projections

Table 7.9 shows the assumed share of the private sector with and without reforms and interventions. The non-reform scenario assumes that all RNDNA2 needs in the gas, oil, and coal sectors rely on public sector investment, and that potential additional investment opportunities beyond RDNA2 needs could be partly private, such as through e-auctions for investment in critical minerals (e.g., what the government has been holding) and the development of unconventional or tight gas potential and biomethane. By contrast, the reform and intervention scenario assumes partial private sector involvement, such as providing commercial financing to SOEs and participating in PPPs, to meet some of the RDNA2 needs (e.g., gas transportation and distribution, oil sector reconstruction, and closure of coal mines) and pursue additional investment opportunities (see details in the annex to Chapter 7).

¹³¹ <https://www.crmalliance.eu/>

Table 7.9 Extractives Industry Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	1.8	5.5	7.3
Private sector financing for reconstruction—Non-reform scenario	7.6	15.2	22.8
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	7.6	15.2	22.8
Private sector financing for reconstruction—Reform and intervention scenario	10.6	28.1	38.7
Addressing needs identified in RDNA2	0.0	4.0	4.0
Private sector financing as share of RDNA2 needs (%)	0.8	72.4	54.7
Other investment opportunities identified	10.6	24.1	34.7

Source: RDNA2 and IFC estimates.

Note: (a) The non-reform scenario assumes delays in reforms or poor implementation of reforms. (b) The reform and intervention scenario assumes further extractives sector digitalization, improved governance and transparency, and full alignment with the EU legislation and biomethane exports.

CHAPTER 8

Telecommunications, Postal, and Broadcasting Services

8.1 Overview

The chapter covers the telecommunications and digital, postal services, and broadcasting sector to assess potential private investment opportunities. The private sector could potentially finance about \$1.4 billion out of the RDNA2's total needs of \$4.5 billion and an additional \$1.2 billion for other opportunities identified in the no-reform scenario (Table 8.1). With reforms and interventions, private financing opportunities could rise to \$4.3 billion of the total RNDAs needs of \$4.5 billion, with an additional \$4.8 billion in other opportunities.

8.2 Telecommunications and the Digital Sector

8.2.1 Strategic Challenge

Despite the ongoing invasion, the telecommunications and digital sectors continue to grow as a strategic contributor to GDP, enabling high-salary employment, exports, investment, and economic diversification. The information and communications sector

accounted for 4.96 percent of GDP in 2020,¹³² represented 1.85 percent (289,000) of total national employment (15.61 million) in 2021 and accounted for 2.83 percent of total capital investments in Ukraine in 2021 (State Statistics Service of Ukraine 2022). In 2021, telecommunications, computer, and information services accounted for 8.7 percent of exports goods and services and 38.6 percent of services exports, and the exports of telecommunications, computer, and information services grew by 5.8 percent to \$7.5 billion in 2022, accounting for 13.2 percent of goods and services exports and 46.7 percent of services exports. Despite Russia's invasion, computer services exports grew by 5.8 percent to \$7.35 billion in nominal prices between 2021 and 2022 (NBU "External Sector Statistics"; NBU "Balance of Payment of Ukraine..."). The information and communications sector generated the highest average monthly wages in Ukraine in 2021 (State Statistics Service of Ukraine 2022). In 2020, women made up 25 percent of all information technology (IT) specialists and 32 percent of all IT management positions in Ukraine (IT Ukraine Association 2021). Ukraine has a high number

Table 8.1 Telecom, Postal, and Broadcasting Services Needs and Private-Sector Opportunities (\$, billions, 2023 prices)

	RDNA2	Private sector opportunities			
		Non-reform scenario		Reform and intervention scenario	
		Addressing RDNA2 needs	Other opportunities	Addressing RDNA2 needs	Other opportunities
Total	4.5	1.4	1.2	4.3	4.8
Telecommunications	2.3	0.2	1.1	2.0	3.4
Postal	2.1	1.2	0.1	2.1	0.6
Broadcasting	0.1	0.0	0.0	0.1	0.8

¹³² Ukraine aims to achieve a 10 percent share of IT in GDP by 2025 (National Council of Recovery of Ukraine from the Consequences of the War 2022).

of IT students and graduates per 100,000 population, ranking 7th and 4th, respectively, in the 23 emerging European countries, contributing to Ukraine's success in the TopCoder and Google Code Jam rankings, where it ranks 3rd and 5th, respectively, out of 23 emerging European countries (Emerging Europe 2023). The cost of data is low in Ukraine, ranking the 4th cheapest in the emerging European region (Emerging Europe 2023). Thus, the digital and telecommunications sector helps diversify the Ukrainian economy from low to higher value-added exports. Data on GHG emissions in the sector are not available and need to be assessed, but they are likely high-intensity emissions.

Ukraine's telecommunications sector has forward linkages to nearly all sectors, while the digital sector's forward linkages are rapidly growing. In 2021, 86.6 percent of enterprises in Ukraine had access to the internet, 35.3 percent had their own websites, and 10.2 percent purchased cloud computing services. E-commerce, banking, and fintech are the main IT client industries, followed by agriculture and food production as well as energy, to cite a few (IT Ukraine Association 2021; Bandura and Staguhn 2023). The Ukrainian IT sector is mainly focused on services exports, with information and communication technologies (ICT)-related services exports growing by 46 percent in nominal euro prices in 2017–21. Strong backward linkages exist in terms of talent and education in the service-oriented ICT industry, with 289,000 employees in information and communication (State Statistics Service of Ukraine 2022) and 118,544 ICT students (87 percent bachelor and short-term students and 13 percent master's and doctoral students) in 2021 (Emerging Europe 2023).

Russia's invasion has had a major impact on the telecommunications and digital sectors through relocations of personnel abroad and disruptions of electricity and internet connections. According to the RDNA2, total damages in Ukraine due

to the invasion were an estimated \$1.6 billion as of February 2023, with total recovery and reconstruction needs totaling \$2.27 billion for telecommunications (both fixed broadband and mobile) through 2033. As of February 24, 2023, the RDNA2 estimates accumulated losses of \$0.1 billion and \$0.3 billion for Ukrainian fixed broadband providers and mobile operators, respectively. Russia's invasion has posed challenges for the digital sector through the destruction of digital infrastructure, cyberattacks, and spread of disinformation and misinformation. Many IT companies are therefore hesitant to continue outsourcing to Ukraine. Much of Ukraine's highly skilled workforce has left the country, including at least 10 percent of its technology workers (Bandura and Staguhn 2023).

8.2.2 Sectoral Context

While the Ukrainian telecommunications sector offers a relatively low cost of internet services, internet service quality largely lags that of EU members. In 2020, the average cost of a broadband internet connection was 100–200 hryvnia (\$4–7) per month, and the average price for a mobile tariff with 5–10 gigabytes of 4G internet was 100–120 hryvnia (\$4–5) per month, partly due to high competition in the industry (UkraineWorld 2020). In terms of internet service quality, Ukraine ranked 67th out of 180 countries on fixed broadband speed in February 2023 and 61st on the Speed test global index in July 2022 (Speedtest Global Index. n.d). Moreover, it ranked 98th out of 131 countries on mobile broadband speed in February 2023, behind most EU countries and a deterioration from 79th place in July 2022. Nevertheless, Ukrainian mobile subscriptions (135.03 per 100 inhabitants) exceeded the European average (120.4) in 2021. Still, population coverage by internet (79.22) and mobile broadband subscriptions (80.12) in Ukraine is below the European average (86.8 and 104.4, respectively), while fixed broadband

subscriptions are significantly lower in Ukraine (18.27 per 100 inhabitants) than in Europe overall (34.4) (ITU 2023).

Private businesses are the major developers, owners, and operators in telecommunications, and they are competitive both domestically and internationally. In telecommunications, 4,760 businesses operate in well-developed retail and wholesale markets. The three largest private companies¹³³ cover 97 percent of the wireless market, with additional competition coming from private virtual network operators and wireless local loop operators.¹³⁴ Six large companies, including one whose majority shareholder is an oligarch, cover the fixed broadband domestic¹³⁵ and international market.¹³⁶ SOEs and some municipalities are also active in the wholesale market, mostly by providing access to their fixed optical fiber infrastructure.

In the digital sector, Ukraine ranked 2nd out of 35 European countries in the European Open Data Maturity 2022 (EU “Open Data in Europe 2022”) and 12th out of 23 emerging European countries in the IT Competitiveness Index 2023 (Emerging Europe 2023). The share of GDP generated by open data ranges from 0.8 to 1.3 percentage points in Ukraine. A 1 percentage point increase in the digitalization of the Ukrainian economy and society could increase the country’s GDP by 0.42 percentage points (Iavorskyi, et al. 2021).

The digital sector is fully private and has international outreach and partnerships. Individual entrepreneurs own 94.2 percent of business entities in the information and communications sector (State Statistics Service of

Ukraine 2022), and the 50 largest IT companies employed 86,300 IT specialists as of July 2023, lower than 100,000 in January 2022, with many of them having been relocated to the companies’ offices abroad (Dou.ua 2023a, b). The total amount financed under venture agreements was \$300–\$700 million in nominal prices between 2018 and 2020. Ukraine is home to an estimated 2,400 IT companies as of the end of November 2022, most of which are small (about 80 percent of them have up to 50 employees), and the estimated number of IT companies shrank after the 2022 invasion from an estimated more than 4,000 local companies and over 100 global companies (IT Ukraine Association 2022; Bandura and Staguhn 2023). Ukraine’s IT companies include product-oriented service companies (76.5 percent as of December 2022) and service-oriented companies (23.5 percent) (IT Ukraine Association 2022). Many Ukraine-based outsourcing companies specialize in cloud, artificial intelligence, and big data. Other areas of expertise in Ukraine are DevOps, blockchain, embedded/internet of things, robotics, and digital assurance (IT Ukraine Association 2021).

8.2.3 Obstacles to Private-Sector Participation

Ukraine should strengthen the independent regulatory authority to promote a competitive market in the telecommunications and digital sectors and ensure private businesses remain the key growth driver.¹³⁷ The government needs to update the regulatory framework for radio spectrum policy (to allocate additional frequency for mobile communications)¹³⁸ to implement measures to protect open internet access (EC 2023a), mandate infrastructure sharing among market participants,¹³⁹ and integrate Ukraine into

¹³³ Kyivstar (VEON), Vodafone Ukraine (NEQSOL), Lifecell (Turkcell).

¹³⁴ Such as Velton Telecom, Inernelecom, International Telecommunication Company/CDMA Ukraine, Telesystems of Ukraine/PEOPLEnet.

¹³⁵ Including Ukrtelecom (92.7 percent of shares belong to the Ukrainian national Rinat Akhmetov via SCM Group).

¹³⁶ Vodafone.

¹³⁷ In response to the invasion, telecommunications companies have demonstrated solidarity in sharing infrastructure and capacity to ensure uninterrupted services to customers across the country (internal displacement) and abroad (international displacement).

¹³⁸ The EC recommend the release of the 700 MHz band from TV broadcasting for mobile communications (EC 2023a).

¹³⁹ IFC Country Strategy, Ukraine, FY2020 to FY2024.

the EU roaming space, ensuring competition (e.g., in national roaming and spectrum reservation for new market participants). Expanding the use of 5G requires acceleration of permitting and broadband allocation. In the medium and long term, Ukraine needs to formalize a policy allowing for outsourcing e-government services to PPPs through a competitive process. Short-term regulatory challenges for private businesses in the telecommunications and digital sectors mostly relate to horizontal national policies in response to the invasion. The military mobilization of ICT employees has affected ICT businesses.¹⁴⁰ According to procedure No.76, approved by the Cabinet of Ministers of Ukraine on January 6, 2023 (Zakon Rada 2023g), ICT companies could register their employees as critically important for the functioning of the economy and securing the living conditions of the population, exempting them from conscription. However, only half of the registered employees could be eligible for such registration. Moreover, a majority of IT specialists have required military skills, and self-employed specialists who constitute a significant share of the employed in sector bear their own responsibility for registration (Focus 2023). The procedure itself is lengthy, taking 25 days, but the government envisages that e-registration will become available by the end of 2023 (Ukrainian Digital Digest 2023).

8.2.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

Population displacement caused by the invasion and potential EU accession have created further private investment opportunities in telecommunications. Growth in mobile and

internet connections are offsetting the decline in fixed telephone and fixed broadband use due to population dislocation. Sharing mobile networks and ensuring redundancies (i.e., increasing resilience by duplicating infrastructure) can create new ways for broadband companies to enter the market. An anticipated permanent solution for free roaming for Ukrainian subscriptions in Europe would help telecommunications companies maintain their client base (EC 2023g),¹⁴¹ and it would be a first step for these companies to benefit from Ukraine's integration into the EU telecommunications market in the medium to long term. The process of Ukraine's accession to the EU will solidify fair competition and investor protection in the sector by extending enforcement power of the European Court of Justice to Ukraine. A good regulatory environment and sufficient 5G spectrum, along with core network infrastructure such as backbone networks, internet exchange points, and submarine cables, would create opportunities for private investment and PPPs in the 5G market in the medium and long term.

In the digital sector, IT companies and data centers remain resilient by deploying coping strategies in Ukraine and abroad and attracting business partnerships. In Ukraine, the largest 50 IT companies relocated 5 percent of their personnel abroad and legalized them as employees in host countries between July and January 2023 (Dou.ua. 2023a). For example, potential business partnerships between Ukraine, Poland, and the UK have emerged as of April 2023, and IT service buyers in the UK are interested in lesser-known and small companies in Ukraine and other potential partner countries (Haas 2023). Ensuring

¹⁴⁰ Considering that a majority of owners in the digital sector are individual entrepreneurs, individuals and companies have difficulties in providing all the necessary documents to receive dispensations from conscription (Epravda.com 2023).

¹⁴¹ In February 2023, the EC proposed to the Council of the EU to incorporate free roaming into the EU-Ukraine Association Agreement. On July 9, 2023, the EC welcomed the twelve-month prolongation of the operators' agreement allowing displaced refugees from Ukraine to stay connected across borders, which was first signed in April 2022, to mutually lower the rates they must sustain to connect calls across borders. Links: https://ec.europa.eu/commission/presscorner/detail/en/ip_23_771; <https://digital-strategy.ec.europa.eu/en/news/roaming-ukraine-new-statement-signedensure-ukrainian-refugees-can-stay-connected>; https://neighbourhood-enlargement.ec.europa.eu/news/roaming-ukraine-operators-extend-agreementprovide-affordable-calls-and-ukraine-another-year-2023-07-10_en

data centers meet clean energy requirements, such as energy attribute certificates or guarantees of origin, represents another area of growing and greening opportunities. Preinvasion, 50 data centers and 40 data center/ICT service providers operated in Ukraine, with most of them located in central, southern, and western Ukraine (S&P Global Ratings 2022). Data centers has been resilient to the invasion impacts by securing back-up power supply, upgrading additional systems and power lines, augmenting additional optical fiber cables, and improving energy efficiency (Cityhost.ua 2022).

Ukraine aims to increase the use of cloud technologies in public services by 30 percent by 2025, and it considers creating a national cloud infrastructure, potentially through a PPP (National Council of Recovery of Ukraine from the Consequences of the War 2022). The cloud has already proved vital in keeping critical utility services such as electricity running during the invasion (CEE Multi-Country News Center 2022b). Ukraine also aspires to become a digital hub and the country that connects Europe with Asian markets. It needs to decide whether to rely on the physical fiber optical connection with Asian markets via Russia or fully replace it. Major IT infrastructure providers (e.g., Google and Microsoft) could help construct alternative infrastructure, which would require massive private financing backed up by guarantees from key international partners.

The mergers and acquisitions (M&A) market could present an opportunity for the Ukrainian digital sector to further expand its business in the EU market. Such M&A and general investment opportunities may be potentially challenging for the next two years (2023 to 2025) based on events in 2014 that started the hostilities. It took two years from 2013 to see an increase in the volume and number of transactions in Ukraine. However, given the digital sector's growth in 2022, there could be M&A opportunities in the sector. Ukrainian businesses are actively

looking for new opportunities on the EU market. A relatively easy way to enter the EU market is through M&A, which offers the prospect of acquiring, being acquired by, or merging with ready-made businesses with customers and staff, favorable conditions for rapid growth, and the possibility of attracting funds under European agreements (Biz.nv.ua 2023).

8.2.5 Risk and Risk Mitigation

Telecommunications and digital businesses face mostly commercial risks due to the invasion, with customers leaving the country and/or switching from fixed telephone and broadband subscriptions to mobile services. These customer changes have not, however, affected the high willingness of customers to pay for services. Achieving a permanent decision on free roaming for Ukrainian subscriptions, strengthening 4G services, and rolling out 5G infrastructure would mitigate losses due to a reduction in subscribers and provide opportunities for an improved range of services. In April 2023, an executive of a major IT company estimated a 10–15 percent decline in IT markets between 2021 or 2022 and 2023 (Epravda 2023). ICT companies with offices and/or business abroad can mitigate risks by expanding their foreign operations.

The invasion may increase data centers' exposures to data security and privacy risks. Keeping companies' data offshore can affect revenues for data centers in Ukraine. In the medium and long term, Ukraine aims to strengthen criteria on data sovereignty and create a sovereign data cloud that can mitigate losses due to the relocation of client data in the medium and long term. In doing so, the GoU will need to comply with EU requirements on general data protection and the free flow of non-personal data (EUR-Lex 2019).

The IT sector may face a shortage of labor in the medium and long term, until the Ukrainian government lifts restrictions on

labor migration.¹⁴² Considering that the share of women workers in the IT sector increased from 7 percent to 27 percent in 2012–2021 (Lvivtech. Com. 2021), the anticipated return of a certain number of women to Ukraine¹⁴³ could mitigate this risk.

Cybersecurity and data protection risks remain among the highest horizontal risks facing Ukraine that also affect other critical infrastructure such as energy, transportation, and e-governance. The Ukrainian regulatory framework, along with the country's associate status in the Digital Europe Programme,¹⁴⁴ supports advancing business opportunities that provide services and products aimed at enhancing cybersecurity and other data and privacy protections. In 2021, Ukraine established a national cybersecurity center to protect state information resources and cyberspace. Strengthening cybersecurity and the resilience of digital infrastructure is among the Ukrainian government's four strategic goals and key activities in the draft Ukraine Recovery Plan 2022–2032 (National Recovery Council of Ukraine 2022).

Martial law introduced following Russia's invasion restricts some hard currency transfers into and out of Ukraine. It does, however, allow for some exceptions for organizations such as development finance institutions. A high interest rate (e.g., 25 percent) limits incentives to borrow in hryvnia.

8.2.6 Financial Flow Projections

With reforms, the private sector will likely be able to meet most of the RDNA2's reconstruction needs of \$2.27 billion in the telecommunications sector between 2023 and 2033. The RDNA2's 2023 financing needs average \$0.2 billion each year for 2023–2023, compared with annual average capital investment in the telecommunications sector of \$0.54 billion in nominal prices in 2017–2021 (State Statistics Service of Ukraine 2022), or ICT services exports (excluding computer services) averaging \$0.2 billion each year during the same period (Emerging Europe 2023). Further reforms to align Ukraine with the EU and achieve EU accession could help lower financing costs and attract more investment.

The telecommunications and digital sectors could attract private investment worth \$5.5 billion (with reforms) or \$1.3 billion (without reforms) in 2023–2033 in 2023 prices (Table 8.2). Without changes to regulatory policy, the digital sector could absorb an annual average of \$100 million¹⁴⁵ in 2023–2033, totaling \$1.1 billion in 2023 prices. With the integration into the EU internal market, this indicative annual amount of \$100 million could increase to \$120 million in 2023 prices during 2027–2033.¹⁴⁶ The digitalization of public services represents another opportunity for businesses to engage as contractors or through PPPs. Moreover, the development of 5G could require private investment worth \$1.4 billion in 2023 prices.¹⁴⁷ In the short term, constructing three new public data centers

¹⁴² The report by the EU Joint Research Centre outlines three possible scenarios for population change in Ukraine, with the population decline ranging from 7.9 million people (worst case) to 4 million (best case) by 2027, due to both natural demographic reasons and the rate of returns of refugees. The scenarios include the expectation that men will join their families abroad. The forecasts account for pre-invasion labor migration trends, when most labor migrants from Ukraine were young men (Ueffing, et al. 2023).

¹⁴³ The EU Joint Research Centre estimates that the share of women who have left the country is high among women between 20 and 49 years of age, ranging from 31 percent in the age group 25-29 to 42 percent in the age group 35-39, and many women have their partners staying behind in Ukraine (Ueffing, et al. 2023).

¹⁴⁴ On March 24, 2023, the EC adopted two multiannual work programs for the Digital Europe Programme 2023–2024 that envisage €1.3 billion in funding, including a €375 million cybersecurity program in 2023–2024. Ukraine has been an associated country in the program since September 2022 (EC 2023f).

¹⁴⁵ This is an indicative estimate due to limited available data regarding Preply, which raised \$50 million in July 2022, and Horizon Capital, which raised \$125 million in September 2022 (Singh, Vishal 2022; Horizon Capital 2022).

¹⁴⁶ The indicative assessment assumes an economic recovery in the EU and Ukraine.

¹⁴⁷ A 2019 estimate puts 5G investment at \$1.2 billion (Thepage.ua 2019)

under current policies would cost an average of \$78 million in total in 2023 prices.¹⁴⁸ In case Ukraine adopts legislation to create a national cloud, investments could come through a PPP and amount to \$776 million by 2033 in 2023 prices.¹⁴⁹ In the reform and intervention scenario, since it would take time to implement reforms, the assessment assumes that no private investment in RDNA2 needs or investments that require reforms would be possible until 2024, at the earliest.

8.3 Postal Sector

8.3.1 Strategic Challenge

Ukraine's postal sector¹⁵⁰ contributes to GDP through its role in a growing e-commerce

market and includes a major tax-paying private company and a major SOE by value and employment. Data on the direct contribution of the postal sector to GDP are not available, and data on e-commerce vary by source but show a growing trend. According to the International Trade Administration of the US Department of Commerce (ITA, US Department of Commerce 2021), the e-commerce market grew by 41 percent in 2020, reaching \$4 billion, about 2.6 percent of Ukraine's GDP. EcommerceDB cites Ukraine as the 58th largest market for e-commerce and predicts its e-commerce revenue to reach \$2.8 billion by 2023, ahead of Hungary, with an expected compound annual growth rate of 13.8 percent in 2023–27, resulting in projected revenue of \$4.6 billion by 2027

Table 8.2 Telecoms and Digital Sector Needs and Private-Sector Financing (\$, billions, 2023 prices, unless otherwise indicated)

	2023–2026	2027–2033	2023–2033
RDNA2 needs	1.8	0.5	2.3
Private sector financing for reconstruction—Non-reform scenario	0.6	0.7	1.3
Addressing needs identified in RDNA2	0.2	0.05	0.2
Private-sector financing as share of RDNA2 needs (%)	10.0	10.0	10.0
Other investment opportunities identified	0.4	0.7	1.1
Private sector financing for reconstruction—Reform and intervention scenario	2.7	2.8	5.5
Addressing needs identified in RDNA2	1.6	0.5	2.0
Private-sector financing as share of RDNA2 needs (%)	86.9	100.0	89.7
Other investment opportunities identified	1.2	2.3	3.4

Source: RDNA2 and IFC estimates.

Note: (a) The non-reform scenario assumes delays in reforms or poor implementation of reforms. (b) The reform and intervention scenario assumes (i) e-government services under PPPs, (ii) rollout of 5G, (iii) update of the regulatory framework for the radio spectrum, (iv) measures for protection of open internet access, (v) mandated infrastructure sharing among market participants, (vi) integration of Ukraine into the EU roaming space, ensuring competition and (vii) EU accession and alignment.

¹⁴⁸ The cost of building a mid-size enterprise data center could range from \$11.5 million to \$38.3 million in overnight capital costs in 2022 prices (SiteId.co.uk “What does it cost...”). The National Council of Recovery of Ukraine from the Consequences of the War (2022) sets a target for at least three facilities of the National Backup Center to have been commissioned (mobile data centers and data centers abroad) by December 2022. It is unknown whether the Ukrainian government has achieved this target. This assessment uses the target of three indicatively

¹⁴⁹ For data centers, assuming that at least 50 percent of all official governmental data (e-government, DIIA) would have to be stored in Ukraine, the estimated cost is as an average of between \$11.5 million and \$38.3 million, multiplied by 30 (meaning 30 dedicated medium-sized data centers for the central and local governments, assuming one dedicated data center for each of the 27 regions and 3 dedicated data centers for the central government)

¹⁵⁰ The postal sector includes postal and courier activities following the State Statistics Service of Ukraine code number 53; no further disaggregated data separating postal and courier activities are available.

(ECDB “eCommerce market in Ukraine”). The SOE Ukrposhta was among the top 15 SOEs by value and employment in 2019, and the private company Nova Poshta was among the top 20 largest taxpayers (OECD 2021d; Nova Post Today). The Ukrainian postal sector employs over 102,500 people, or 0.7 percent of total employment in Ukraine.¹⁵¹

The postal sector, despite its modest trade and investment volumes, has forward and backward linkages with a range of sectors and is integrated into global value chains. In 2022, the sector accounted for \$60 million worth of exports, resulting in a trade surplus of \$31 million (NBU 2023c). In 2021, capital investment in the postal sector represented 0.17 percent of total capital investment (State Statistics Service of Ukraine 2022). The sector has backward linkages with the transport sector (e.g., road and railroad transportation) and the manufacturing sector (e.g., letters, envelopes, and packaging businesses). Nova Poshta’s Nova Poshta Global operates weekly flights for international express delivery services all over the world, having delivered more than 5.6 million international parcels in 2022. The postal sector has forward linkages with nearly all sectors, especially the expanding e-commerce sector. However, data on GHG emissions for the sector are not available.

According to the RDNA2, total financial needs for recovery and reconstruction between 2023 and 2033 amount to \$2.15 billion.¹⁵² From the start of the invasion through February 24, 2023, the accumulated damage and loss to postal service providers is an estimated \$0.2 billion and \$1.1 billion, respectively (World Bank, et al. 2023).

8.3.2 Sectoral Context

The country’s postal sector is digitalized, automated, and provides banking transfer services, and the quality of postal services in Ukraine is comparable to that in the EU (EIB n.d.; Nova Poshta “Група компаній...”). There are 166 economic entities registered as postal service operators (EC 2023a) in the country, with two companies, state-owned Ukrposhta and privately (Ukrainian) owned Nova Poshta, covering nearly all domestic and international deliveries. Smaller companies are mostly active at the regional level. Both Ukrposhta and Nova Poshta have maintained high quality services during the invasion, with additional support provided by donors to facilitate internet access and international deliveries (EIB 2022).

Nova Poshta has a 65 percent market share and Ukrposhta a 25 percent share. Domestic parcels account for 90 percent of the market, out of which 75 percent is driven by domestic Ukrainian e-commerce (World Bank, et al. 2022).

Nova Poshta and other private postal companies operate in a different regulatory environment from state-owned Ukrposhta. Ukrposhta is a member of the Universal Postal Union and provides postal as well as other services, including delivering pensions and social payments and providing financial services such as accepting payments for utilities and transferring money. Along with commercial activities, Ukrposhta fulfils certain PSOs, as regulated tariffs apply to universal postal services, payment and delivery of pensions, and subscriptions. Due to a lengthy process for approving tariffs, Ukrposhta may face revenue

¹⁵¹ Ukrposhta is the largest employer, with over 70,500 workers (Ministry of Infrastructure of Ukraine “Укрпошта загальна інформація”); Nova Poshta is the second largest employer, with over 32,000 employees (Nova Poshta). The total number of employees was 15.61 million in 2021 (State Statistics Service of Ukraine 2022).

¹⁵² According to RDNA2 data, total reconstruction needs amount to \$247.8 million in the short term (2023–26) and \$12.2 million in medium and long term (2027–33), and total service and delivery restoration needs amount to \$926.5 million in the short term (2023–26) and \$959.9 million in medium and long term (2027–33) (World Bank, et al. 2023).

shortfalls when providing some of its services in competitive markets. Like most of the top 15 SOEs, the company's dividends are set ex-post the prior year and fluctuate based on the needs of the government. This policy may not allow for efficient planning and investment in the renewal and modernization of Ukrposhta's fixed assets, which would help promote its sustainable development and competitiveness. Ukrposhta was the 10th largest SOE by asset value (8.07 billion hryvnia) and 8th largest by net revenue (8.06 billion hryvnia) in 2019 while remaining one of the country's largest employers. In 2020, Ukrposhta's revenues amounted to 9.2 billion hryvnia, although its profits remained low (184.5 million hryvnia), which has partly been attributed to low tariffs and PSOs (Boytsun, et al., 2021; OECD 2021d).

Privately-owned Nova Poshta's turnover, including VAT, for 2020 increased by 26 percent year-on-year, reaching 20.3 billion hryvnia. In the same year, Nova Poshta's net

revenues amounted to 16.9 billion hryvnia, earnings before interest, taxes, depreciation, and amortization (EBITDA) totaled 2.5 billion hryvnia, and its net profit was about 1 billion hryvnia. The company's total debt at the end of the year was 1.7 billion hryvnia (Share UA Potential 2021). In 2022, revenue increased by 13.6 percent, year-on-year, to 23.69 billion hryvnia, and EBITDA increased by 42.5 percent to 4.3 billion hryvnia, while net profit decreased by 17.9 percent to 2.14 billion hryvnia (Odessa Journal 2023) (Table 8.3).

8.3.3 Obstacles to Private-Sector Participation

Ukrainian legislation on postal services limits competition and is only partially aligned with the EU's harmonized legislation on the internal postal services market and cross-border parcel delivery services.¹⁵³ Ukraine's postal market is not fully open to competition. Ukrposhta has exclusive rights to provide universal postal services, including regular letters weighing up

Table 8.3 Financial Performance of Ukrposhta and Nova Poshta, 2018–20 (nominal million hryvnia)

	Ukrposhta		Nova Poshta		
	2018	2019	2018	2019	2020
Turnover (including VAT)	N/A	N/A	12,620	16,140	20,284
Net revenue	6,812	8,065	10,516	13,453	16,903
EBITDA	-346	929	625	1,700	2,469
EBITDA margin, percentage	-5.1%	11.5%	5.9 %	12.6%	14.6%
Net financial result	-504	496	N/A	N/A	N/A
Net profit	N/A	N/A	452	783	991
SOE dividends / profit share payable to the state budget	0	0	N/A	N/A	N/A
Total assets	6,100	8,077	N/A	N/A	N/A
Equity	2,294	2,764	N/A	N/A	N/A
Total payables	2,975	4,308	N/A	N/A	N/A
Long-term liabilities	72	254	N/A	N/A	N/A
Return on assets, %	-7.3%	7.0%	N/A	N/A	N/A
Return on equity, %	-19.8%	19.7%	N/A	N/A	N/A

Sources: OECD 2021; Share UA Potential 2021.

¹⁵³ Three Postal Services Directives of the EU, with latest update (Directive 2008/6/EC "Third Postal Services Directive") and the Regulation (EU) 2018/644 on crossborder delivery services.

to 50 grams and regular postcards (EC 2023a). The newly adopted law on postal services falls short of fully removing these limitations on competition; it also increases the power of the regulator beyond the requirements of the Third EU Postal Directive and includes additional limitations on private businesses operating across borders.¹⁵⁴ The government should remove these limitations on private-sector participation in the postal sector.

8.3.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

The private sector continues to demonstrate robust and resilient operations amid the invasion. Since October 2022, Nova Poshta has entered two new markets: Poland and Lithuania. It launched global delivery, modernized infrastructure and the branch network, and built automated logistics centers and sorting hub, saving costs and time and reducing CO₂e, PM2.5, NO_x, and other emissions.¹⁵⁵ Nova Poshta became the first issuer of corporate bonds in Ukraine during the full-scale invasion, completing the technical placement of Series C bonds worth 800 million hryvnia on the primary market in February 2023, and it placed these securities among institutional investors in March 2023. The bond issuance was to finance expansion and renewal of logistics infrastructure and development of IT infrastructure (News Ukraine 2023).

Other private postal and courier services companies, especially those located in western Ukraine, continue to grow.¹⁵⁶ The process of Ukraine's accession to the EU includes deadlines

to remove regulatory obstacles in the postal market (EC 2023a).¹⁵⁷ Prior to the invasion, the Ukrainian government was considering a partial privatization of Ukrposhta to cut operational and maintenance costs, increase budget revenues, and fund growth through private investment (Glavcom.ua 2019).

8.3.5 Risks and Risk Mitigation

Private businesses do not face serious commercial and execution risks in the postal sector. Demand for postal and courier services remains strong, catering to the needs of the internally and externally displaced population. Well-developed digital solutions facilitate payments (e.g., online banking transfers). Private businesses rely on in-house sorting and courier services to minimize risks related to the destruction of transport infrastructure. Operations continue in the eastern regions that are the most affected by the invasion, and the authorities expect business in these areas to recover once the invasion is over.

8.3.6 Financial Flows and Projections

Any suitable private sector involvement, such as IFI loans, commercial bank and capital market financing, PPPs, or partial or full privatization, in Ukrposhta could finance all RDNA2 needs, further modernize and expand logistics and IT infrastructure, and increase the company's role in global value chains. Full or partial privatization could generate additional income streams for the national budget to compensate for recovery and reconstruction costs. An indicative estimate based on the value of available assets in 2019 shows that

¹⁵⁴ Postal service providers are required to be registered with the Universal Postal Union to be able to submit international postal items customs inspection (Alekanina 2023).

¹⁵⁵ Nova Poshta entered the Polish postal market in October 2022 and the Lithuanian market in March 2023. In 2021, Nova Poshta founded the air cargo company Supernova Airlines, whose first flight between Riga, Latvia and Rzeszów, Poland took place in May 2023 (Nova Poshta "Група компаній...").

¹⁵⁶ For example, Meest Express courier services is in western Ukraine (Varianty.lviv.ua 2017).

¹⁵⁷ A screening of Ukrainian legislation is the first step to fully integrate Ukrainian postal services into the European market. The EC prepared a report that included the postal sector for the EU-Ukraine Summit on February 2, 2023

private investment in Ukrposhta could amount to \$499 million (Table 8.3). As Nova Poshta has been issuing bonds and modernizing and expanding its business, including infrastructure and e-commerce, in Ukraine and abroad, private sector investment through it is likely to continue (News Ukraine 2023; Ukraine Today 2023b). Based on an indicative estimate, private investment opportunities in the postal sector in 2023–2033 could be \$1.2 billion without reforms and \$2.7 billion with reforms, in 2023 prices (Table 8.4).

8.4 Broadcasting

8.4.1 Strategic Challenge

While it makes a modest direct contribution to Ukraine’s economy, the broadcasting sector, especially national television channels, has forward linkages as a major source of information for Ukrainians in 2021 (Democratic Initiatives Foundation 2022; Korbut 2021; US Agency for International Development [USAID] 2022). However, data on the sector’s contribution to GDP, employment, or GHG emissions are not available. According to a

December 2021 survey, traditional media remains the most common source of information for Ukrainians about events in Ukraine and the world. A total of 67 percent of survey respondents pointed to national television channels as the main source, followed by social networks (44 percent), Ukrainian online media (29 percent), personal connections (28 percent), messengers (16 percent), Ukrainian newspapers (6 percent), and radio (7 percent) (Democratic Initiatives Foundation 2022). The broadcasting sector’s forward linkages affect investment and business decisions, the economy, and society, while backward linkages include broadcasting equipment and infrastructure such as video, audio, computer systems, message processors, frequency modulation, amplitude modulation, and weather receivers. In 2021, publishing, audiovisual, and broadcasting activities accounted for 0.98 percent of capital investment in Ukraine (State Statistics Service of Ukraine 2022a)¹⁵⁸ and generated \$22 million of export revenues, with a trade surplus of \$13 million. In the same year, the sector contributed 0.76 percent to national value-added (NBU 2022d).

Table 8.4 Postal Services Needs and Private-Sector Financing (\$, billions, 2023 prices, unless otherwise indicated)

	2023–2026	2027–2033	2023–2033
RDNA2 needs	1.2	1.0	2.1
Private sector financing for reconstruction—Non-reform scenario	1.2	0.0	1.2
Addressing needs identified in RDNA2	1.2	0.0	1.2
Private sector financing as share of RDNA2 needs (%)	100.0	0.0	54.7
Other investment opportunities identified	0.02	0.04	0.1
Private sector financing for reconstruction—Reform and intervention scenario	1.2	1.5	2.7
Addressing needs identified in RDNA2	1.2	1.0	2.1
Private sector financing as share of RDNA2 needs (%)	100.0	100.0	100.0
Other investment opportunities identified	0.03	0.6	0.6

Source: RDNA2 and IFC estimates.

Note: (a) The non-reform scenario assumes delays in reforms or poor implementation of reforms. (b) The reform and intervention scenario assumes (i) privatization of or PPP for Ukrposhta, (ii) increase in competition, and (iii) EU accession and alignment.

¹⁵⁸ No further disaggregated data that exclude publishing are available.

The RND2 estimates recovery and reconstruction needs in the broadcasting sector at \$99.5 million between 2023 and 2033 (World Bank, et al. 2023). This includes \$72.2 million for reconstruction and \$27.3 million for service delivery and restoration of public broadcasters.¹⁵⁹ From the start of the full-scale invasion to February 24, 2023, broadcasters' accumulated damages and losses amounted to an estimated \$0.05 billion and \$0.02 billion, respectively. Despite damages to broadcasting infrastructure, many media outlets and journalists have continued working to ensure access to information, although many local media outlets are facing severe financial constraints after a significant drop in advertising revenues and income (World Bank, et al. 2023). Russia's targeted missile attacks have mostly affected television towers and substations.

8.4.2 Sectoral Context

Ukraine has made notable progress in improving the quality of broadcasting services to meet the prerequisites for EU accession. The establishment of a truly independent public broadcaster, the Public Broadcasting Company of Ukraine (Suspilne) in 2014, was a prerequisite for Ukraine's EU accession. Suspilne demonstrated the country's longstanding commitment to pursuing pro-European reforms, building a diverse and pluralistic media sector, and consolidating its democratic achievements. The public broadcaster continues to operate amid Russia's invasion, countering disinformation by providing the country's citizens with vital reporting on the invasion (USAID 2022). However, the broader media sector in Ukraine discriminates against quality journalism and independent outlets due to political and other factors (Korbut 2021).

Nevertheless, improved economic sustainability, competitiveness in content delivery, and better regulation may improve the media landscape (Korbut 2021).

The media environment in Ukraine is complex, diverse, competitive, and dynamic. Most of the country's outlets are privately owned by high-profile Ukrainians, who tend to use them for political influence. Nevertheless, a small number of media organizations uphold high standards of professionalism and integrity and are vital for shaping domestic political and social debate. They are mostly in print and online but also include some broadcasters, such as the national broadcasting company Suspilne, and international donor-funded multimedia platforms. Several developments are challenging the monopoly of conventional broadcasters, including the rise of online media and competition from over-the-top (OTT) streaming platforms, especially for entertainment (Korbut 2021). According to the December 2021 survey, the list of the most trusted television channels coincides with the list of the most popular commercial channels: 21 percent trust 1+1, 17 percent trust the Ukraine channel, 15 percent trust STB, and 13 percent trust ICTV. Despite the status of a public broadcaster, trust in UA: Pershyi is around 5 percent. Most Ukrainians watch TV channels whose programs combine newscasts with entertainment content, most popular of which are 1+1 (43 percent), the Ukraine channel (34 percent), STB (32 percent), and ICTV (31 percent). Less than 10 percent of respondents watch TV channels that mostly broadcast news and political talk shows (Democratic Initiatives Foundation 2022). The network's physical infrastructure is located on state property.¹⁶⁰ The top 10 channels, mostly owned by four media conglomerates, barely changed between 2009 and 2019 (Korbut

¹⁵⁹ In the short term (2023–2026), reconstructions needs amount to an estimated \$72.2 million, while service delivery and restoration needs amount to \$10.9 million. In the medium and long term (2027–2033), there are no reconstruction needs, while service delivery and restoration needs are estimated at \$16.6 million.

¹⁶⁰ Operated by the Radio Broadcasting, Radio Communication and Television Concert of Ukraine.

2021).¹⁶¹ Their owners are businesspeople with influence in politics, such as oligarchs, who own key assets in other sectors including metals, mining, oil and gas, electricity, communications, chemicals, and banking (Korbut 2021). Market composition could change in the post-invasion environment due to regulatory changes, acquisition of mobile TV providers by telecom companies, and shifts in consumer preferences.

8.4.3 Obstacles to Private-Sector Participation

The new Law of Ukraine on Media (Zakon Rada 2022g) may endanger press freedom and media pluralism in the country. The law, which entered into force in March 2023,¹⁶² widens the responsibilities of the media regulator (National Council on Television and Radiobroadcasting of Ukraine), creates five co-regulators to develop by-laws, extends regulatory monitoring and registration requirements to a broader group of entities, and regulates print and online media, internet, TV, and information-sharing platforms, such as YouTube and social networks (Nrada.gov.ua 2023). The implementation of this law should be aligned with EU legislation¹⁶³ to ensure clarity, transparency, and confidence for private business. Measures to counteract undue influence and threats to the country's sovereignty should not undermine the principles of pluralism and free media (IFJ 2023).

8.4.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

More opportunities for smaller or new innovative private companies may open in the post-invasion period. In response to the invasion, the four biggest broadcasters¹⁶⁴ and some other

channels switched to broadcasting a unified newscast, United News, in February 2022. Prior to the invasion, Ukraine enforced legislation that limited the participation of oligarchs in broadcasting and media. The combination of both resulted in large Ukrainian private business groups, qualified as oligarchs, withdrawing from the sector.¹⁶⁵ Those large established entities dominated Ukraine's advertising market and received the bulk of marketing revenues. In 2020, for example, the top four media groups in Ukraine accounted for over 95 percent of the TV advertising market. Their dominance restricted sources of income for smaller media companies looking to produce high-quality, professional, and informative content. As a result, these smaller companies struggled to invest in their own development and economic resilience (Korbut 2021). The post-invasion environment should provide more clarity for private business on growing and potentially lucrative niches of the broadcasting and audiovisual sector, especially in digital media with domestic creative content. The EU accession process will further strengthen the protection of intellectual property rights, ensuring, for example, that public broadcasting organizations pay royalties to performers or phonogram producers (EC 2023a). The growing niches of online broadcasting and content development and Ukraine's integration into the EU market may attract private investors.

Private businesses could participate as contractors in the reconstruction and restoration of state-owned broadcasting assets and services. However, such engagement may require donor support to ensure the process to engage private contractors is efficient and fair. To support fair competition in the market, donor support would

¹⁶¹ The four main conglomerates are StarLightMedia, owned by Viktor and Olena Pinchuk; 1+1 Media, owned by Ihor Kolomoisky; Inter Media, co-owned by Dmytro Firtash, Valeriy Khoroshkovsky and Serhiy Liovochkin; and Media Group Ukraine, founded and owned by Rinat Akhmetov (Korbut 2021).

¹⁶² Entered into force on March 31, 2023.

¹⁶³ Directive (EU) 2010/12/EC as amended by Directive (EU) 2018/1808.

¹⁶⁴ 1+1 Media, 2+2, 24 Kanal and TRC Ukraina (ITU 2022).

¹⁶⁵ Official statement of SCM (SCM 2022)

need to ensure open access to infrastructure following reconstruction.

8.4.5 Risk and Risk Mitigation

The continuing destruction of infrastructure, hardware, software and cybersecurity, and labor mobility are key risks. Quality of service, cost recovery, and payment discipline in broadcasting could decline. Efforts to mitigate these risks include self-organization and rapid response in restoring physical infrastructure and supply of services (broadcasting services have been highly resilient during the invasion). Qualified labor can work remotely.

The unification of TV broadcasting channels under martial law (United News broadcast) may have had an adverse impact on the quality of content, demand, and the availability of skilled workers. To mitigate this risk, the Ukrainian government should monitor demand trends and spectrum allocations between TV broadcasting and digital accordingly and fully liberalize television.

Lack of openness and transparency, media restrictions, and potential anti-competitive policies remain a risk to recovery and reconstruction efforts. To mitigate this regulatory risk, businesses, civil society, academia, and the EU and other international partners should monitor and object to regulations that go against the best interests of society and the economy.

8.4.6 Financial Flow Projections

With reforms and guarantees in 2023–2033, private businesses would likely be able to invest in reconstruction and service delivery related to public broadcasting infrastructure (Table 8.5). The government could divest some of its broadcasting assets or work with the private sector under PPPs to pursue reconstruction efforts as well as expand and modernize the infrastructure and services of broadcasting and other media. However, Ukraine would need support (e.g., guarantees) from international donors to lay the foundation for private-sector participation in public broadcasting. The adoption of reforms and EU accession could attract further investment.

Table 8.5 Broadcasting System Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023–2026	2027–2033	2023–2033
RDNA2 needs	0.1	0.02	0.1
Private sector financing for reconstruction—Non-reform scenario^a	0.0	0.0	0.0
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario^b	0.3	0.6	0.9
Addressing needs identified in RDNA2	0.1	0.02	0.1
Private sector financing as share of RDNA2 needs (%)	75.5	100.0	79.5
Other investment opportunities identified	0.2	0.5	0.8

Source: RDNA2 and IFC estimates.

Note: (a) The non-reform scenario assumes delays in reforms or poor implementation of reforms. (b) The reform and intervention scenario assumes (i) allowing PPP or divestiture of some of public broadcasting, with guarantees, (ii) ensuring media freedom, and (iii) EU accession and alignment.

CHAPTER 9

Water and Sanitation

9.1 Strategic Challenge

Prior to Russia's invasion, Ukraine's water supply and sanitation (WSS) sector was facing significant challenges, with negative implications for human health, the economy, and the environment. In 2021, around 65 percent of the population had access to centralized piped water supply and 50 percent had access to centralized wastewater collection and treatment, with significant disparities between urban and rural areas (Ministry for Community and Territorial Development of Ukraine 2022).¹⁶⁶ More than 10 million people lack access to safely managed water services, and more than 20 million do not have access to centralized wastewater collection and treatment services (State Statistics Service of Ukraine 2023g).

Years of underinvestment and poor maintenance have resulted in an urgent need to rebuild and expand Ukraine's WSS infrastructure. Before Russia's invasion, approximately 40 percent of the country's water supply networks were assessed as being in critical condition, 35 percent of water treatment facilities needed to be upgraded, and 23 percent of pumping stations required replacement (Ministry for Community and Territorial Development of Ukraine 2020). Wastewater collection and treatment infrastructure is deteriorating due to inadequate maintenance and lack of capital investment. The poor state of Ukraine's WSS infrastructure contributes to high energy consumption¹⁶⁷ and carbon emissions.

Russia's invasion has caused approximately \$2.2 billion in damage and \$7.5 billion in losses in Ukraine's WSS sector, and total reconstruction needs are estimated at \$7.1 billion (World Bank, et al. 2023).¹⁶⁸ Based on the RDNA2, the most-affected oblasts are Kharkiv, Luhansk, Chernihiv, Kyiv, and Donetsk. Most of the infrastructure-related damages (and most of the resulting reconstruction needs) have been to large physical infrastructure such as wastewater treatment plants, water supply and wastewater collection networks, and drinking water treatment plants and facilities. Economic losses are associated with WSS providers' loss of revenues (more than 40 percent of total losses), increased energy costs, lack of required repairs, tariff deficits, water losses, increased cost for chemical reagents, and the need for demolition and debris management. Total reconstruction needs in the sector amount to \$7.1 billion, a conservative estimate that does not capture additional investments that would be required to achieve compliance with United Nations Sustainable Development Goal (SDG) 6—clean water and sanitation—or the EU's drinking water and urban wastewater treatment directives.

9.2 Sectoral Context

The overall service delivery level in the WSS sector is assessed as largely inadequate, a situation exacerbated by climate change. Lack of proper treatment facilities in some parts of the country, as well as inadequate technologies for cleaning and disinfecting drinking water, have resulted in

¹⁶⁶ A total of 70 percent of Ukrainian villages lack access to the centralized water supply, and only 2 percent of villages are connected to centralized waste collection and treatment services.

¹⁶⁷ Energy costs typically account for 26 percent of total expenditures for water supply utilities and 22 percent for wastewater utilities (NEURC 2021), higher than in Bulgaria, where energy costs account for 19 percent of total operating costs of water/wastewater utilities, but lower than in Romania (40 percent). See, for example, the Danube Water Program for Romania (World Bank 2015b).

¹⁶⁸ The actual level of damage is likely higher, given incomplete or missing reports on damage to WSS infrastructure located in territories temporarily not under governmental control.

water quality and pollution discharge levels below national norms. In addition, there has been a gradual decrease in the volume of water in water bodies over the past decade due to climate change and evaporation, resulting in the concentration of pollutants (Ministry for Community and Territorial Development of Ukraine 2022).

Ukraine’s WSS sector is highly fragmented, with limited private participation, which is mainly done through concessions. In 2020, the WSS sector was comprised of about 2,600 registered enterprises, including 2,058 enterprises engaged in water capture, treatment, and supply, as well as another 595 enterprises providing wastewater collection and treatment services. While the water supply, sanitation, and wastewater service providers generate substantial public and economic benefits, they account for only 0.35 percent of GDP and 0.85 percent of total industrial output, according to official 2021 data (State Statistics Service of Ukraine 2023e). WSS assets are recorded on the balance sheet of municipally owned utilities operating as commercial entities, communal enterprises, or the state (World Bank 2021c). About 83 percent of utilities are communal enterprises, with state or private operators making up the remaining 17 percent.

Under Ukrainian law, private firms can participate in the WSS sector through concessions or PPPs. The Concession Law designates water supply, wastewater disposal, and water purification as subject to concessions (Zakon Rada 2022h). The Law of Ukraine on PPPs designates water collection, purification, and distribution as areas where PPPs can be developed (Zakon Rada 2023h). Under Ukrainian legislation, concession is a form of PPP, which applies in cases where the public partner transfers most operational risk, including demand and/or supply risk, to a private partner (Zakon Rada 2023h, Article 1 of the Law on Concession). The main difference between concession and

non-concession PPPs is in the way the private partner gets remunerated: concessions rely on user charges, while non-concession PPPs rely on payments from the public partner (Ministry of Economy of Ukraine 2021). Both concessions and non-concession PPPs are initiated using the same process.

9.3 Obstacles to Private-Sector Participation

Significant barriers and constraints prevent the private sector from participating in Ukraine’s WSS sector. These include fragmented WSS sector governance, incomplete legal and regulatory requirements, ineffective implementation monitoring, and lack of a long-term vision for the sector, with no strategy or road map on how to meet EU water and environmental standards consistent with SDG 6 by 2030 (National Recovery Council “A partial medium...; World Bank 2021d). In addition, the financial viability of WSS providers, which is an important pre-condition for meeting private investment needs, could be further strengthened by raising the level of tariffs. Furthermore, municipal authorities lack the capacity and incentives to facilitate and structure PPP projects. There is also a shortage of domestic private sector WSS providers with sufficient expertise and capacity. The majority of WSS operators are small, with limited capacity to invest and properly operate and maintain existing infrastructure. Incentives to deliver services in the most cost-effective way are also largely absent.

Fragmented governance and regulatory deficiencies in the WSS sector discourage private sector investment. At the national level, NEURC, which sets WSS tariffs and licenses operators, is not independent from political influence. Its work is not focused on optimizing performance or improving services (National Recovery Council “A partial medium...; World Bank 2021d). For utilities not regulated by NEURC (small municipalities with fewer

than 100,000 customers),¹⁶⁹ tariffs are set by municipal councils. They often follow an outdated tariff methodology, with no requirement for periodic tariff reviews. This allows for significant discretion, which often results in tariffs below cost recovery levels.

Ukraine's WSS sector needs a long-term vision with a focus on consolidation. While aggregation of utilities would allow for economies of scale and potentially better access to private financing, regulatory frameworks for enabling municipal cooperation (e.g., by inter-municipal grouping or co-operative agreements between municipalities) are currently lacking. In parallel, there is a need to solve ownership issues of WSS assets that are currently owned by individual municipalities and managed by the SOEs. The development of a long-term, actionable investment plan prioritizing PPP structures in the WSS sector would create incentives for prospective investors.

Although Ukrainian PPP legislation provides a solid base for implementing PPPs in WSS, it suffers from several shortcomings. The PPP Law is a framework law that refers parties to other laws for rules and regulations, which imposes an additional layer of regulation. As a result, potential investors usually need to refer to numerous legislative acts and various decisions of self-governing authorities that regulate PPPs on the local level. According to some experts, the complexity of Ukrainian legislation is one of the main obstacles for implementing PPPs, underscoring the need for a more consistent legal environment (EBRD Ukraine assessment of the quality...”).

9.4 Ongoing Developments, Emerging

Opportunities, and Private-Sector Strategies

Recognizing the importance of effective implementation of PPPs, the government has enacted changes to budget legislation for

financing long-term liabilities related to PPP projects. On February 15, 2022, the Verkhovna Rada adopted Bill No. 5090 on Making Amendments to the Budget Code of Ukraine on the Settlement of Budgetary Relations During the Implementation of Agreements that Regulate PPP, Including Concession Agreements (Zakon Rada Bill “No. 2035-IX”). The bill allows the government to make contributions to PPP projects, including WSS projects, primarily in the form of periodic payments (up to 30 percent of the general fund of municipal budgets). Prior to this bill, the government could not assume long-term liabilities under PPPs because of the principle of three-year budget planning.

There is no one-size-fits-all solution for private participation in WSS services in Ukraine, and various options should be considered, depending on timing, geography, and the enabling environment. For example, a private investor could take over an entire utility system (including the production, transmission, and distribution of services); alternatively, the utility's various segments could be split up (unbundled), with, for example, raw water supply and treatment or wastewater collection and treatment separated from bulk water supply and retail distribution. Where commercial risks are too high and initial investments are substantial, contracting a private operator for specific segments of the utilities value chain could be a preferred solution in the short run. A full-utility concession could have better chances of being successfully implemented once the system is financially and operationally viable.

Before moving to more advanced forms of PPPs, Ukraine could consider adopting a more gradual approach to private-sector participation, focusing on improving the capacity of existing utilities. For example, private expertise can be leveraged through operation contracts (focusing on management and service) to strengthen

¹⁶⁹ In 2020, 55 WSS utilities were regulated by NEURC. Together, they account for 75 percent of the national market of WSS services (NEURC 2021).

Box 9.1. Brief Overview of Private-Sector Participation in WSS in Armenia and Romania

Management Contracts in Armenia

- Armenia's whole urban population is served by private operators.
- All contracts are granted through competitive tenders.
- Capital investments are financed mostly by sovereign borrowing from IFIs and international grants and implemented by private operators.
- The Government of Armenia took a phased approach to PPP reform, gradually increasing the geographical scope of PPPs as well as the level of transfer of risks to private operators. This was initially done through a management contract in the capital city of Yerevan, which was replaced by to a 10-year lease contract whereby a private operator assumed all commercial and operating risks and was remunerated through the collection of tariff revenues.
- Management contracts have substantially improved performance in the WSS sector, although non-revenue water (water 'lost' before reaching customers) has increased.
- A step-by-step approach was followed to involve private operators (from simple arrangements like management contracts to arrangements that levy more risks such as lease agreements), with a focus on international operators.
- Comprehensive WSS sector reforms have created a favorable environment for private-sector participation.

A Full WSS Concession in Romania

- Through a competitive bidding process, Vivendi of France (now Veolia) won the tender to operate and maintain the WSS system for 25 years. Vivendi took 80 percent of the shares of the concession company, while the municipality retained 20 percent.
- IFC supported the municipality in structuring and implementing the project.
- Capital investment was financed by multilateral development banks and commercial banks, and Vivendi has invested more than €530 million since the start of the concession, without public subsidy, while keeping tariffs well below the Romanian average.
- The concession obtained 100 percent compliance with EU water quality standards, recorded an increase in overall customer satisfaction (from 46 percent in 2002 to 75 percent in 2009), expanded the coverage area to 92 percent of the city, and reduced leakage, non-revenue water, and commercial losses related to underbilling and theft.

Source: OECD 2010; Earhardt, et al. 2011; World Bank 2017.

domestic utility capacity. This approach has been followed by several countries, including Armenia (OECD 2010, box 9.1. above). Unlike a concession, lease, or full privatization, an operation or management contract has a shorter duration and enables the public authority to maintain ownership and greater control while providing performance bonuses to the operator

to successfully achieve priority improvements. Such a scheme also permits the utility to attract a concessionaire or lessee on more advantageous terms at the end of the contract, once performance and efficiency improvements have been achieved.

A full WSS concession could also be considered under the right circumstances. The water and sanitation project for Bucharest, Romania is an example of an effective PPP in the WSS sector (Earhardt, et al. 2011, box above). To address numerous challenges related to its WSS system, the municipality of Bucharest signed a concession contract for its water utility, with assistance from IFC as its transaction adviser. The concession significantly improved water services during the first 10 years of the contract while keeping the connection rate high and only moderately increasing tariffs. Various factors contributed to the success of the project, including a well-prepared concession contract, strong commitment to a PPP from the municipal leadership, and mechanisms for regulation, monitoring, and dispute resolution.

9.5 Risk and Risk Mitigation

Key risks and resulting risk mitigation mechanisms depend largely on the degree of private sector involvement in the WSS sector. The risk profile depends on whether there is private management or private investment and ownership. Unlike other infrastructure projects, many WSS projects have high capital intensity, large initial outlays, long payback periods, immobility and invisibility of assets, and low rates of return, features that entail considerable risk for private companies. While water-related PPPs are characterized by multiple risks, including risks related to the availability of land, access, location, social issues, environmental regulations, design, construction, operations, politics, and early termination, the assessment included in this study focuses on two major types of risks in WSS projects: (i) design, construction, and commissioning risks, and (ii) commercial risk.

Design, construction, and commissioning risks are risks that the construction of the assets required for the project will not be completed on time or within budget, or that the design or construction quality is inadequate to meet

project requirements. Output and performance measures are defined in the contract, while the means to achieve the output (design, construction, and maintenance) is usually left to the private contractor, which is accountable for deficiencies in design or delivery. One risk mitigation strategy for the contracting authority is the use of milestone payments. Milestone payments give the concessionaire the right to receive compensation for construction costs upon the successful completion of a project milestone.

Commercial risk is the risk that the cost of the service is different than what was expected, or that revenues are not collected as expected. In a full-utility concession model, the end users pay a tariff for consumed water, and the private provider bears the demand risk. Commercial risk can be mitigated with contractual provisions that specify a process and methodology for adjusting tariffs. In some circumstances, governments can introduce specific risk mitigation instruments to incentivize investment in WSS projects, such as a minimum revenue guarantee, credit guarantee fund, operation subsidy, availability payment, and/or offtake contract. Commercial risk can also be mitigated by minimizing project costs, which can be done by granting the concession for a WSS project to the bidder that requires the lowest net present value to cover its costs.

9.6 Financial Flows and Projections

Quantifying private participation in Ukraine's WSS sector is challenging because the investment needs to rebuild and upgrade the sector are unknown and the enabling conditions for wider private-sector participation have yet to be created. According to the RNDA2, total investment needs in the WSS sector are estimated at \$7.1 billion, including \$3.8 billion for 2023–26 and \$3.3 billion for 2027–33. There are opportunities for private investment in water and wastewater treatment facilities, water and sewage pumping stations, and water

supply and sewer networks, as well as in the direction of reuse and disposal of wastewater and laboratory research in water supply and drainage. In 2023–2026, private investments are projected at \$50 million and \$60 million for water treatment facilities and sewerage treatment plants, respectively.¹⁷⁰ Blended finance instruments will be needed to crowd-in these investments. Although the sector’s short- and medium-term needs are high, private investment is likely to be very limited initially. Over the medium term, a conservative estimate puts private investment at between 1 and 6 percent¹⁷¹ of total WSS infrastructure reconstruction needs, provided that the necessary policy framework and institutional arrangements are in place. In

the absence of significant sector reforms, private investment in WSS infrastructure will remain limited and opportunistic. Private investment in water and wastewater infrastructure will likely be concentrated in large municipalities, where the rehabilitation and reconstruction of centralized water provision and/or treatment of wastewater can no longer be postponed, including municipalities with high numbers of IDPs. Beyond the needs identified in the RDNA2, additional significant investments will be required to increase WSS service coverage and ensure compliance with the EU’s drinking water and urban wastewater treatment directives, although such projections are outside the scope of this analysis.

Table 9.1 Water and Sanitation Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023–2026	2027–2033	2023–2033
RDNA2 needs	3.9	3.3	7.1
Private sector financing for reconstruction—Non-reform scenario	0.1	0.1	0.2
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private sector financing as share of the RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.1	0.1	0.2
Private sector financing for reconstruction—Reform and intervention scenario(a)	0.1	0.2	0.3
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private sector financing as share of the RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.1	0.2	0.3

Note: (a) Reforms and policy actions include a comprehensive WSS sector strategy addressing regulatory issues. (b) Sector fragmentation and ownership of utilities addressed. (c) Tariff levels at cost recovery. Source: RDNA2 and author’s estimates.
Source: RDNA2 and author’s estimates.

¹⁷⁰ Calculations based on the RDNA2 analysis for WSS. The figures correspond to investments needed to rebuild two water treatment facilities (\$25 million per unit) and two sewage treatment plants (\$30 million per unit).

¹⁷¹ The share of private sector financing corresponds to an average share of commercial finance in water-related expenditures reported for EU member countries (OECD 2020).

CHAPTER 10

Irrigation

10.1 Sector Overview and Strategic Challenges

Ukraine's irrigation and drainage system was developed between the 1960s and 1980s, when the country was part of the Soviet Union. During the Soviet period, most farming was carried out by large state and collective farms. At its height, the system delivered irrigation to some 2.2 million hectares and supported drainage of over 3 million hectares of farmland. However, the breakup of the Soviet Union and Ukraine's rapid economic and political transition brought about the abrupt collapse of these large farm structures and created a vacuum with no clear responsibility for local irrigation systems. Widespread looting occurred, including theft of buried metal pipes, pump station equipment, and even some secondary canal infrastructure. Meanwhile, the development of new private farms occurred most rapidly in the south of the country, particularly in the Kherson, Mykolaiv, and Zaporizhzhia regions.

Prior to Russia's invasion, Ukraine's irrigation area was estimated to cover between 325,000 and 363,000 hectares (1.3 percent of all cropland area in the country),¹⁷² and was concentrated in six regions: Zaporizhzhia, Odesa, Mykolaiv, Kherson, Dnipropetrovsk, and Crimea, all of which are in the south of the country. Kherson is the region with the largest irrigated area, making up 71–79 percent of Ukraine's irrigated area, followed by Zaporizhzhia with 9–10.5 percent, and Dnipropetrovsk with 3.5–5 percent. Many of these southern regions have been affected by the invasion, and some are temporarily not under

governmental control, which has jeopardized the entire irrigation infrastructure. The rainfed crop area averages 25 million hectares and is more evenly distributed across regions (the region with the largest rainfed crop area was Dnipropetrovsk, with around 7.4 percent of the total).

Soybeans cover the most irrigated area and consume the most irrigation water among all crops, but maize is the most water intensive given the surface it covers. Soybeans cover an average of 38 percent of irrigated area and consume an average of 32 percent of total irrigation water. This is followed by maize, which covers 18 percent of irrigated area and consumes 30 percent of irrigation water, and sunflowers, which cover 17 percent of irrigated area and consume 18 percent of irrigation water. The remaining irrigated area is made up of wheat/barley, rapeseed, and other crops, which cover 16, 7, and 4 percent, respectively, of Ukraine's irrigated area (and consume 3, 3, and 14 percent, respectively, of its irrigation water).

An analysis of the 20 major irrigation systems between 2017 and 2021¹⁷³ shows that, depending on the planting scheme, the yield of irrigated crops is higher by a range of 6 to 52 percent compared to rainfed crops of the same type (WBG 2022). Irrigated maize, wheat or barley, soybeans, and sunflowers are the most common cultivated crops in all schemes. Among these crops, maize benefits most from irrigation, with a 54 percent average yield increase across all schemes, but it needs more water than many alternative crops. All crops benefit from more rainfall, but rainfed crops tend to show a

¹⁷² Estimates based on total irrigated crop area from 2017 to 2021. 415 Averages correspond to the 2017-2021 period.

¹⁷³ The irrigation systems were in Bilgorod-Dnistrovska, Bortnitska, Chaplynska, Dneipro-Kryvyi Rig, Inguletska, Kakhovka, Kilchinska (Frunzenska) and Dneiper-Donbass, Krasnoznamenska, Nizhne-Dnistrovska and Ovidiopol'ska, North Crimea, Pivdenno-Bug'ska, Pivnichno-Rogachinska, Priazov'ska, Sirogoz'ska, Tatarbunarska, Vilnyanska and Zhovtneva (Oktyabr'ska), and Yavkinska

higher rainfall dependency, making them more vulnerable to drought.¹⁷⁴ Depending on the year and irrigation scheme, cropping intensity varies between 100 percent (one harvest per year) and 122 percent (two harvests per year on 22 percent of the irrigated area). Cropping intensity can be increased across the board (only two schemes in Kherson and one in Zaporizhzhia region reach or nearly reach a target level of 120 percent) but is conditional on water availability. Regarding

Figure 10.1 Average Yield Gain from Irrigation (2017-2021)



Source: WBG, Hydrosolutions, Global Water Security & Sanitation Partnership and IBNIM.

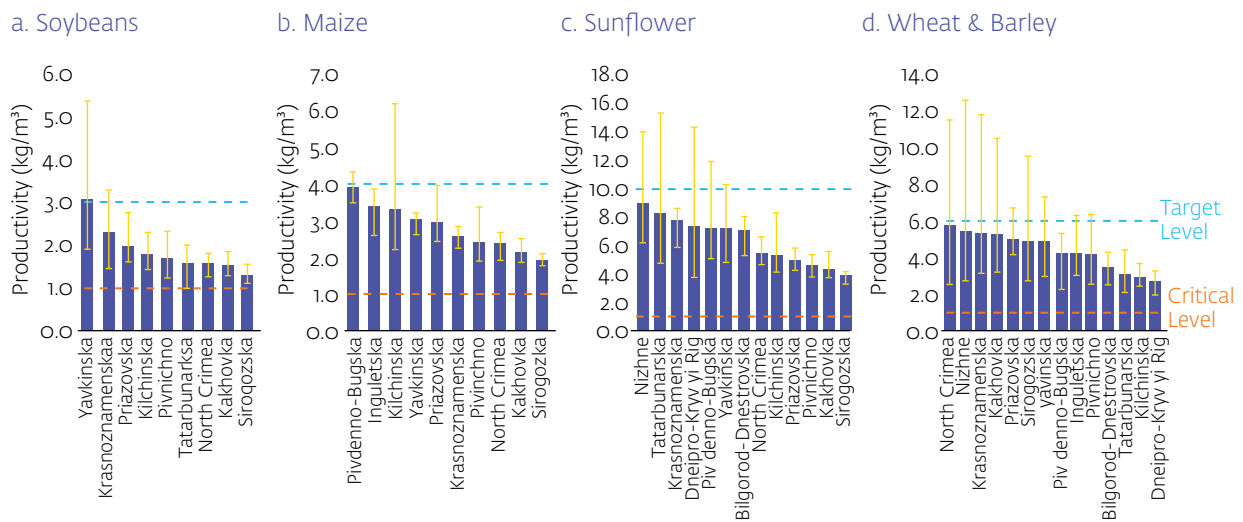
crop water productivity, crops show high spatial and temporal variability across and within the studied schemes.¹⁷⁵ There is no scheme where productivity is low for all four assessed crops, but some schemes in Odesa, Mykolaiv, and Kherson have higher crop water productivity. The water saving potential is also large, particularly in Kherson, as water resources are inefficiently used and the irrigation system needs to be modernized to reduce leakage.

Figure 10.2 Average Cropping Intensity (2017-2021)



Source: WBG, Hydrosolutions, Global Water Security & Sanitation Partnership and IBNIM.

Figure 10.3 Average Crop Yield Per Unit of Water Evaporated (2017-2021)



Source: WBG, Hydrosolutions, Global Water Security & Sanitation Partnership and IBNIM.

Note: The error bars indicate the full range of observed values, while the red dotted lines show the range of measures that provide the reference for calculating the benchmarking scores in the referenced study.

¹⁷⁴ Northern schemes have lower incremental yield values, likely associated with the lower summer temperatures and therefore lower irrigation requirements.

¹⁷⁵ Crop water productivity refers to the average crop yield per unit of water evaporated. Crop water productivity for Bortnitska, Chaplynska, and Vilnyanska/Zhovtneva (Oktyabrsk) is not available due to the small size of these schemes and the coarseness of the evapotranspiration product.

10.2 Impact of Russia’s Invasion on Ukraine’s Irrigation and Water Services (as of February 2023) ¹⁷⁶

Russia’s invasion of Ukraine inflicted an estimated \$380.5 million in damages to the irrigation and drainage sector. This includes damage to on-farm infrastructure, irrigation canals, embankments, buildings, and agency premises. However, it only represents damage to: (i) areas that were previously not under government control and have recently been brought back under the control of the Ukrainian authorities; (ii) areas that had damage due to bomb attacks; and (iii) areas that were flooded to protect against invasion.

In addition to the destruction of infrastructure, there have been substantial operational losses associated with reduced revenues, fees, and taxes. Initial aggregate losses are estimated at \$282.5 million. This estimate includes operational losses based on lost profit, as reported by the different operational entities in the Ukrainian water system and collected by the

State Agency of Water Resources. It does not, however, include reduced profit for irrigated areas, as agricultural losses are included in the agricultural sector assessment. Nevertheless, operational losses at the farm level are included. Factors contributing to losses include defense-related flooding and mining, damage to power, irrigation, and drainage infrastructure, and deterioration of farm systems.

Most irrigation systems are in territories temporarily not under governmental control or invasion-affected areas. ¹⁷⁷ The difference between the average irrigation area in 2017–2021 and the area in 2022 was -35,500 hectares, a reduction of 3.5 percent. The Kakhovka irrigation scheme in Kherson registered the largest drop in irrigation area. Provisional results from the January–September 2022 period show that the largest drop in total cropped area was in the Kharkiv and Mykolaiv regions. As of February 24, 2023, there was no decrease in irrigated areas further away from the immediate invasion zone.

Figure 10.4 Impact of Invasion on Irrigation Performance (2017-2021 average v. 2022)



Source: WBG, Hydrosolutions, Global Water Security & Sanitation Partnership and IBNIM.

Figure 10.5 Impact of Invasion on Cropped Areas (2017-2021 average v. 2022)



Source: WBG, Hydrosolutions, Global Water Security & Sanitation Partnership and IBNIM.

¹⁷⁶ See the RDNA2 for more details.

¹⁷⁷ The 20 irrigation schemes mentioned in this section are used as benchmarks to understand the impact of the invasion on irrigation performance and cropped area.

10.3 Obstacles to Private-Sector Participation

Even before Russia's invasion, the irrigation and drainage, flood protection, and water resource management sectors were in transition. Ukraine's delivery of irrigation and drainage services already faced persistent challenges,

as the irrigation sector had collapsed after independence and required deep structural change to overcome infrastructure barriers. The irrigation and drainage system was developed for state-run farms, but these large structures were broken up following the collapse of the Soviet Union, creating an ownership and funding vacuum and leading to widespread deterioration.

Box 10.1. Legislative and Institutional Changes Affecting Ukraine's Irrigation Sector

In 2020, the GoU approved the Irrigation and Drainage Strategy of 2030, a cross-sectoral policy document aimed at restoring the potential of irrigation and drainage systems. The scope of the strategy is to identify strategic policy directions for irrigation and drainage to enable sustainable, eco-balanced agriculture development in Ukraine. The strategy clarifies the need for an integrated package of institutional reforms in water management at the national, basin, and irrigation command area as well as the local farm level. It also sets out specific recommendations to improve bulk delivery of irrigation water supply and removal of excess water (drainage) from agricultural land.

A key reform recommended by the strategy was for the responsibilities of the Water Operations Division of the State Agency of Water Resources (SAWR) to be transferred to the new Regional Irrigation and Drainage Organizations (RIDOs), operators that were conceived as non-profit bodies of public law, established through amendment to the Law on Land Reclamation, and governed and increasingly funded by their users. The strategy recommended that each RIDO be based around a main canal or drainage system. Once the new Law on Land Reclamation is adopted, the strategy recommends that the transfer to RIDOs in the short term, after which the Water Operations Division of the SAWR would deal exclusively with operations in river basins (e.g., dredging, weirs, and flood defenses). State budget support for main canals and drainage systems would be redirected to RIDOs. The government would remain the owner of the canals and pump stations and supervise the operations of RIDOs to ensure that they operate in line with the law. The operation of secondary canals and tertiary systems would be progressively transferred to water users' organizations through another reform recommended by the strategy.

Recent steps by the Ministry of Agricultural Policy and Food and the Ministry of Environment (which controls the SAWR) to implement the reforms proposed in the strategy include:

- Development and implementation of the law on Water User Organizations (WUOs), including establishment of pilot WUOs; and
- Transfer of responsibilities on operation and maintenance of publicly owned irrigation and drainage infrastructure from the SAWR to a new agency within the Ministry of Agricultural Policy and Food (MAPF), the State Agency of Melioration and Fishery.

Source: WBG staff.

These changes also had a dramatic negative impact on the country's irrigated areas, as evidenced by the steep fall in total irrigated area from the Soviet era to today. Additionally, the irrigation sector has undergone and is going through major legislative and institutional reforms (Box 10.1).

Climate change poses a serious threat to water availability, with significant implications for southern Ukraine, the site of most irrigated areas. Irrigation water levels are low over large areas of southern Ukraine and green water scarcity is a concern.¹⁷⁸ Under current climatic conditions, parts of Crimea, Kherson and Odesa experience less rainfall than 60 percent of crop water demand. Future climate projections show that such water scarcity will expand to neighboring regions, including Mykolayiv, Zaporizhzhya, Dnipropetrovsk, and others, by 2050. This will exacerbate green water scarcity and increase risks to yields and incomes for farms growing rain-fed crops.

Existing irrigation infrastructure is highly exposed to damage from Russia's invasion. Leading regions for irrigation are targets of ongoing attacks. Irrigation infrastructure currently not under government control poses a risk to Ukraine's short term food security. Dams have also been damaged by the invasion. The Nova Kakhovka dam (on the Dnipro river upstream of Kherson), Pecheniyh dam (on the Siverskiy Donets River in northern Ukraine), and Karachunov reservoir dam (in central Ukraine) have all been damaged, jeopardizing water availability for existing and future irrigation systems. Additionally, existing large irrigation systems (e.g., Kakhovka) are water-, energy-, emissions- and cost-inefficient.

10.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

RDNA2 reconstruction and recovery needs in the public sector are estimated at \$8.9 billion and include expenditures for irrigation, drainage and flood protection. Some investments are needed to repair damaged systems, where possible under a build back better approach.¹⁷⁹ The most pressing investments involve restoration of destroyed hydraulic assets and water storage structures in areas that were recently brought back under government control. Other programs are compensatory— that is, designed to maintain and improve production levels through improved drainage and expanded irrigation in different parts of the country that have remained under government control.

Irrigation protects farmers from adverse weather and reduced rainfall. As green water scarcity is likely to continue in the coming years, sustainable irrigation expansion is worth exploring. Given the vulnerability of southern Ukraine to reduced rainfall, regions to consider for irrigation expansion projects include Odesa, Mykolaiv, Kirovohrad, Dnipropetrovsk, and Zaporizhzhia. A blended finance scheme may be applied in higher-risk areas.

There is an urgent need to improve seasonal availability and distribution of water within schemes to improve performance. A circular economy approach in the sector can provide an innovative solution to these problems. Given climate change and anticipated increased water scarcity, investment projects may combine water supply and sewage treatment (these are currently separated in Ukraine), allowing agriculture and industry to use treated water.

¹⁷⁸ Green water scarcity corresponds to a condition in which rainfall is unable to meet crop water requirements, and where irrigation is needed to prevent water-limited crop growth.

¹⁷⁹ According to the RDNA2, 'build back better' relates to the rehabilitation or reconstruction of damaged assets by, for example, improving their functionality, energy efficiency, and disaster and climate resilience, ensuring universal access to services, and implementing critical modernization measures, including right-sizing and right-siting of infrastructure and services.

Table 10.1 Possible Private Sector Roles to Support Irrigation

National level	Conveyance level	Distribution level	Farm level
<ul style="list-style-type: none"> • Outsourcing: MAPF contracts companies to maintain rivers and reservoirs (ideally, bidders are numerous enough for competitive bidding). 	<ul style="list-style-type: none"> • PPP: Concession to modernize and operate, keeping canals under public ownership. Subsidy likely needed. 	<ul style="list-style-type: none"> • External PPP: Concession to rehabilitate, modernize, maintain and operate. Subsidy likely needed. 	<ul style="list-style-type: none"> • Outsourcing: Large farm contracts company to design and build on-farm system.
	<ul style="list-style-type: none"> • Outsourcing: Operator contracts out operation and maintenance. 	<ul style="list-style-type: none"> • Farmer PPP: Farmers invest in and govern WUO. 	
		<ul style="list-style-type: none"> • Outsourcing: WUO contracts out operation and maintenance. 	

Note: MAPF – Ministry of Agricultural Policy and Food; MAPF = Ministry of Agricultural Policy and Food; WUO = water use organizations.
Source: Author's elaboration.

The private sector can support irrigation, and there is scope for PPPs. Private companies can play a role in the design, supply, and installation of on-farm irrigation systems. Similarly, the private sector can provide digital tools and services for farmers, such as irrigation scheduling apps and precision farming, and it provide tools for water resource monitoring and modelling for governments. For irrigation investment in large public systems, full privatization is complicated. Private sector participation in designing, building, maintaining, and operating such systems is possible, although this has proven to be challenging in other contexts.

10.5 Financial Flows and Projections

Projecting private financial flows for irrigation entails various caveats. Ensuring irrigation service provider profitability is a challenge, and there are very few global success stories of countries fully privatizing irrigation. Irrigation's

potential to generate a profit for a private company taking over the management of a scheme is low, especially without subsidies. Multipurpose use of infrastructure offers one way to increase the chances of profitability by allowing cross-subsidies between water uses (e.g., drinking water fees partly defraying the cost of irrigation). Providing irrigation water to a number of farmers in large territories is more than just a commercial activity. Irrigation water often plays a strategic role as an engine of rural development and food security while helping to improve integrated water resources management. These public services are hard to quantify and should not be financed solely by water users, as they are also the responsibility of the state.

Private participation in irrigation may be feasible in large commercial farms, such as those in the Kharkivska oblast. International experience shows that PPPs in irrigation are highly context-specific and varied, but there have been some

relative successes, such as in Morocco and Spain (World Bank 2022b). Reforms currently being implemented by the Ukrainian government could help spur private investment in the sector. Reforms and other interventions that may allow a private operator to assume control of a pilot project include: (a) approval of the Operator Law by the Verkhovna Rada and amendment of

the Water User Organization law; (b) efficient ownership transfer from SAWR to MAPF; and (c) effective coordination between SAWR and MAPF to implement reforms. A pilot project in a large commercial farm of the Kharkivska oblast¹⁸⁰ could spearhead efforts to attract greater private participation in the irrigation sector.¹⁸¹

Table 10.2 Irrigation and Water Resources Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	0.1	8.8	8.9
Private sector financing for reconstruction—Non-reform scenario	0.0	0.0	0.0
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.0	0.0	0.0

Source: RDNA2 and author's estimates.

¹⁸⁰ Kharkivska is one of the oblasts identified in the RDNA2 as top priority, and it also has large potential to develop a profitable pilot because it hosts large commercial landholdings, a key feature in attracting private sector participation in irrigation.

¹⁸¹ According to the RDNA2, Kharkivska's needs amount to \$1.34 million over 2023–2026 and \$180.4 million over 2027–2033. Private financing from a pilot could help alleviate these needs, assuming the suggested reforms are effectively implemented.

PART III: PRIVATE INVESTMENT OPPORTUNITIES IN THE SOCIAL SECTORS

CHAPTER 11

Housing

11.1 Strategic Challenge

Before Russia's invasion, around half of Ukraine's housing stock consisted of small units in multifamily buildings that were deteriorating from age and poor maintenance. About 80 percent of Ukraine's housing was built before 1980, with modest unit sizes typical of mass housing of that era (Hassler et al. 2021). The country's mass housing units, especially apartments built between 1956 and 1985,¹⁸² were originally designed with a limited lifespan, yet many continue to be used for decades beyond their expected lifespan. Older housing units are showing signs of structural deterioration, exacerbated by inadequate management and finance arrangements for maintenance, especially the common areas of privately co-owned multifamily apartment buildings. Around one-third of all apartments and two-thirds of those built before 1980 required major repairs and renovation and would not meet current seismic or energy-efficiency standards (Shcherbyna 2022, pp. 1-9.).

The rate of new construction and retrofitting was insufficient to replace the depreciating stock or improve the energy efficiency of existing units. Between 2000 and 2020, an average of 8.33 million m² of residential housing was constructed each year,¹⁸³ equivalent to around 185,000 units, with an average floor size of 45m². This was less than the amount needed to replace the existing dilapidated stock. Despite

the slow pace of new housing construction, some 230 million m² of residential floor space in new and renovated units was completed between 1991 and 2019, representing an annual increase in the total national housing stock of around 1 percent per year over the last 10 years (Fedoriv & Lomonosova 2019). A further 11.4 million m² of new residential floor space was built in 2021. Most of the new builds were in and around Kyiv,¹⁸⁴ matching the city's annual population growth rate of 0.71 percent over the period (United Nations 2018). Other urban areas with substantial new construction included Lviv, Odesa, Kharkiv, and Dnipro, but the housing market had stagnated in the rest of the country, with supply exceeding demand (Zapototskyi 2018).

Russia's invasion and the ongoing destruction of housing have triggered a housing crisis. The RDNA2 estimates the total cost of damage in the housing sector at over \$50 billion out of total direct damage of \$135 billion across all sectors. An estimated 1.5 million housing units, or 8 percent of the country's housing stock, have either been destroyed (499,056 units), moderately damaged (787,789 units), or sustained minor damage (285,257 units). Damage to the housing sector weakens the ability of households to shelter from the elements, work productively, and accumulate personal wealth.

¹⁸² For example, the prefabricated four and five floor housing blocks built between 1958 and 1985 (known as Khrushchevki) had a design life of 25 to 50 years.

¹⁸³ Author's calculations from housing construction in independent Ukraine (Table 1, Shcherbyna 2022).

¹⁸⁴ Between 2014 and 2019, annual capital investment averaged 46,092 million hryvnia, and the annual value of construction work performed was 22,654 million hryvnia (Shcherbyna 2022).

Almost 90 percent of the damage has been to 1.4 million multifamily apartment buildings, 9 percent has been to 135,000 single family houses, and 2.6 percent has been to dormitories. While the damage to housing and the internal displacement of people have affected the entire country, 82 percent of direct damage has been concentrated in the Donetsk, Luhansk, Kharkiv, and Kyiv regions. Losses in the sector are estimated at \$17 billion, including the costs of demolition and debris removal (\$3.8 billion), rental losses (\$11.4 billion), property tax losses by subnational governments (\$685 million), and bank losses related to mortgages (\$1.1 billion). The housing crisis differs region by region, depending on a different combination of damages and the movement of IDPs.

The invasion has disrupted the housing value chain—from physical risks and displaced populations to loss of income and increased cost of construction material and transport. Total reconstruction needs from direct damage is equivalent to approximately 8 years of preinvasion construction output by value. Imports of glass, which historically were from Belarus and Russia, have terminated, and damage to road and rail links has caused supply bottlenecks and severely strained domestic production and distribution of materials such as cement and steel. The invasion led to the loss of two of the five largest metallurgical plants, the Illyich and Azovstal Iron and Steel Works, resulting in a loss of 70 percent of supply, although plants in Zaporizhzhia, Kamianske, and Kryvyi Rih continue to operate. A significant share of the production capacities of the main dry mixture producers are in territories temporarily not under governmental control, are in the invasion zone, or have been partially destroyed. The second largest manufacturer of thermal insulation materials, with a 25 percent market share, has been partly destroyed (IFC 2023). By December 2022, most developers had resumed construction work but were concentrating on completing projects that were

already underway rather than launching new projects. In 2022, the supply of new housing was approximately 7.1 million m², or 92,593 housing units, down 38 percent from 2021 due to the immediate shortage of materials and uncertain demand in regions that had experienced widespread out-migration (IFC 2023).

The marked increase in poverty caused by the invasion has further undermined housing affordability and weakened demand. The number of households with annual incomes between \$1,000 and \$5,000 increased by 16 percentage points between 2021 to 2022, resulting in this segment representing an estimated 27 percent of all households. The number of high-income households, defined as those earning more than \$10,000 per year, fell by 21 percentage points to 27 percent of all households in 2022. Housing demand has fallen along with income levels. In 2022, demand for newly built apartments in western Ukraine was only 30 percent of the level recorded in 2021, and total demand in Kyiv was only 10–20 percent of pre-invasion levels. The secondary market showed a similar downward trend, with the total number of transactions falling from 325,000 in 2021 to 101,000 in 2022, a 69 percent year-on-year decline (NBU 2022a).

11.2 Sectoral Context

About 95 percent of Ukraine's housing stock is privately owned and largely debt-free, following the privatization of the early 1990s (State Statistics Service of Ukraine). Government co-financing programs have further incentivized housing purchases, and a favorable tax regime caused residential properties to be seen as a comparatively safe asset class. In 2021, Ukraine had a population of around 16.8 million households (43.8 million people) 441 and a housing stock of 18.6 million units (State Statistics Service of Ukraine). As of January 1, 2021, the housing stock comprised over 9 million residential dwellings, of which 178,921

were multifamily buildings¹⁸⁵. Social rental housing for vulnerable groups has suffered from decades of underinvestment, and the floorspace fell from 30 million m² in 1991 to 20 million m² in 2019 as units were sold to tenants.¹⁸⁶

Inefficient regulation of rental housing has led to a lack of protection for both tenants and landlords. In 2021, 6 percent of households were registered as renters and an estimated 13 percent lived in private rentals under informal occupancy arrangements. By 2022, following Russia's invasion, a significant number of IDPs needed temporary housing, with approximately 19 percent of households renting accommodation. Among IDPs, 60 percent were living in rented accommodation (Cedos 2019; IOM 2023b). In some regions, rental prices have doubled or even tripled, and 38 percent of IDPs report not having sufficient funds to pay for housing for the next six months (IOM 2023b). Relations between landlords and tenants, including their respective rights and obligations, price adjustments, and sanctions for nonpayment, need greater legal clarity to balance the needs of an increasingly vulnerable displaced population and the risks of damage and payment default faced by landlords and potential developers.

Low housing affordability and obsolete housing legislation are the result of policy gaps and a legacy of outdated regulations. The 1983 Housing Code of Ukraine provides a framework for the housing sector and has been amended, reformulated, and supplemented through several social protection laws over the years. These include the Laws on the Social and Legal Protection of Military Servants and their Families (1991), on the Status and Social Protection of Citizens Affected by the Chornobyl Catastrophe (1991), on the Protection of

Childhood (2001), on the Social Status of War Children (2005), and regulations concerning displaced people, people living with disabilities, and other vulnerable groups (Hassler et al. 2021). Despite multiple amendments, both the structure and main provisions of the Housing Code remain outdated and unsuited to a modern market economy.

Housing management reforms aimed at promoting co-ownership rights for common property in apartment blocks to stimulate housing improvements and energy efficient upgrades have yielded mixed results. Ukraine inherited a system of ill-defined multifamily building management arrangements based on the principles of the formerly centrally planned economy. The transition to a market economy required a new legislative environment. The 2015 Law No. 417 on Peculiarities of Exercising Ownership Rights in Multi Family Building laid the foundation for co-owners to exercise ownership rights to common property in multifamily buildings and set out owners' responsibilities for building management. In 2017, the Law on Housing and Communal Services allowed co-owners to nominate residential building managers and set the terms of payment for maintenance costs by agreement. By January 2020, 37 percent of multifamily building co-owners had independently decided on some form of management for their buildings, either by forming homeowner associations (around 20 percent of all multifamily buildings), self-management, hired management, or housing cooperatives (IFC 2020).

Developer finance is limited, leaving housing production and purchase burdensome and risky for developers and buyers. In 2018-2019, 98.9 percent of household savings went toward housing investment and comprised 0.9

¹⁸⁵ State Statistics Service of Ukraine; and data of the State Oblast Administrations collected by the Ministry of Regional Development (data for territories under Ukraine's control).

¹⁸⁶ Article 10 of Law No. 3334-4 on the Housing Stock of Social Purpose (2006) sets out eligibility criteria to register for social/subsidized public housing (Fedoriv & Lomonosova 2019).

percent of GDP. In 2022, household net bank deposits—a proxy for savings—amounted to \$7 billion or 3.5 percent of GDP.¹⁸⁷ Other sources of investment financing in the sector over the same period included the financial sector, investors, private company housing, and cross-border flows.

Fifty-five percent of the housing stock is either owner-built or multifamily apartment buildings built on an incremental basis by one of the country's 1,000 construction companies and developers.¹⁸⁸ These developers typically lack working capital and are financed by prospective homeowners who purchase the units off-plan with a 3-5 year offtake. The risks of such arrangements largely fall on buyers with respect to issues such as the date of transfer of title, developer insolvency before completion, and double sales or early termination risks, which are exacerbated in cases in which land ownership is open to dispute.

End-user mortgage finance is not well developed, even for higher income earners. In 2021, banks issued 10,800 mortgages at a total value of 8.9 billion hryvnia (\$325 million, compared to \$23 billion in Poland in the same year). A total of 35 percent of mortgages were issued in Kyiv, 19 percent in the Kyiv region, 8 percent in the Kharkiv region, and 6 and 5 percent in the Lviv and Dnipropetrovsk regions, respectively (NBU 2022e). Residential mortgages represented only 0.6 percent of GDP in 2021 and the ratio of mortgage loans to housing sales was low at 5 percent in the same year (NBU 2022a). Nearly 90 percent of new loans are issued by five banks, with most going to purchases of existing units on the secondary market. In 2021, the high mortgage interest rate (16.9 percent) effectively doubled the price of a housing unit on typical

lending terms. The average size of a mortgage to purchase a house on the primary market was 893,000 hryvnia, requiring monthly repayments affordable only by households in the highest 27 percent of incomes.

The housing value chain plays an important role in the economy, and housing reconstruction has the potential to be an engine of economic growth. The real estate sector in Ukraine – including housing, accounted for 5.8 percent of GDP in 2021. A study found a close, direct relationship between the volume of housing construction and national GDP: a 1 percent increase in the volume of housing construction result in a 0.814 percent rise in GDP, holding other conditions constant (Bochko et al. 2022). The legacy challenges in the housing sector—an aging and deteriorating physical stock, decades of underinvestment by central or subnational governments in social housing, and a growing but unregulated rental sector—offers opportunities but will also require financing and expertise from the profit and not-for-profit private sector to meet the required scale of reconstruction, with the aim of fostering a green and resilient housing sector.

11.3 Obstacles to Private-Sector Participation

Several key regulatory barriers limit private sector participation in the construction of mass-market housing and financing developments on a scale that meets post-invasion reconstruction needs.

Despite ongoing reforms, there are shortcomings in the registration of property rights needed to underwrite large scale, long-term development. An illustrative example is land plot registration, for which 54 documents and up to two years are

¹⁸⁷ Ukrainian households also hold savings outside the banking system, which are not reflected in bank deposits data. In 2022, the foreign cash holdings of households amounted to an estimated \$11 billion.

¹⁸⁸ Gaps in the property registration and cadastral system have worsened, with the destruction of paper-based records in invasion-affected locations and in the temporarily or formerly not under government control territories of Donbas and Crimea. The registry was only fully functional from between 2013 and 2014 (Bogonos et al. 2022)

required for processing (EU and OECD 2018).

There is insufficient protection of creditors' rights, which limits lenders' appetite for housing market and mortgage financing. In 2009, Law No. 1533-VI on Introducing Changes to Some Laws of Ukraine to Overcome the Negative Consequences of the Financial Crisis imposed a moratorium on banks evicting mortgage defaulters and protects delinquent borrowers, allowing them to remain in their homes. Problems with residential foreclosure originate in inconsistent provisions of the Housing, Civil and Family Codes of Ukraine. Under current law, registration of residential property equates to ownership, and there are no provisions for more limited registration of residency or occupancy rights.

Scaling up developer activities is challenging. The main limitations are difficulties in purchasing large, consolidated blocks of suitably zoned land with infrastructure located close to employment nodes; the time and cost associated with land transfers and permitting; unclear and variable cost-sharing agreements with municipalities on infrastructure provision for greenfield development; and difficulties in evaluating the risks of development when a proportion of buyers have undeclared income. Developers could mitigate these limitations by providing equity and debt finance for greenfield or redevelopment projects. Transparent legislation on simplified land value capture planning mechanisms such as betterment fees, and inclusionary zoning provisions could open a pathway for private-sector investment in income-based, affordable rental, and rent-to-buy apartments and greenfield low-cost housing reconstruction.

The demand for new housing in areas where IDPs and job seekers have relocated should be matched by partnerships between municipalities and profit and not-for-profit developers to ensure matching levels of supply. These might include municipal governments making equity or

debt contributions in the form of well-located, consolidated parcels of developable and flexible zoned land and bridging finance (guaranteed by central government or external support partners) for off-site or city-wide infrastructure networks. Profit and not-for-profit developers would be responsible for the construction of mass social housing (publicly subsidized through availability payments targeting low-income earners) and mass unsubsidized rental or rent-to-buy housing affordable by lower-middle and middle-income earners who may not be eligible for or may not want to take up formal mortgage finance to purchase the housing units.

Legislation is needed to accommodate the growing rental market and open pathways for new financing instruments, such as rent-to-buy contracts that may be attractive for the dislocated population. Incentives for developers to finance, construct, and manage build-to-rent and rent-to-own schemes could include streamlined land leases, registered title, property tax, and materials tax subsidies or concessions, and inclusionary zoning provisions. It is also necessary to improve the pre-trial release mechanism for rented apartments by target end-users in case of substantial breach of lease agreements. Property management companies can act as intermediaries between owners and tenants.

There is no national housing agency responsible for research and development and policy formulation. Such an agency is needed to monitor the impact of sector reforms and prepare evidence-based policy advice for the government.

11.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

The RDNA2 summarizes the total reconstruction and recovery needs of the housing sector, which are estimated at \$68.6 billion over the next

10 years, with expenditure of \$31.5 billion required in the next four years. Individual homeowners and small and medium domestic contractors will require policy support and legislative guardrails, as well as financing from external partners, larger regional developers, and financial institutions to provide design and supervision services, access to large-scale construction and manufacturing firms, and the ability to raise finance. As a result, there are opportunities for partnerships of private and public sectors along the entire housing value chain.

An estimated \$4 billion will be required to sort debris for reuse, recycling, or removal to sanitary landfills.¹⁸⁹ Ongoing piloted approaches for construction with recycled debris such as the Hostomel pilot project (450 apartments, €30 million), co-funded by the French government, and the pilot project on debris recycling in Kyiv region, funded by the Japan International Cooperation Agency with support from the Government of Japan, provide practical examples of how this could be done. Scaling this experience appears feasible with relevant funding, as demand is growing. For example, there has been demand for similar initiatives in Chernihiv, Odesa, Mykolaiv, Kharkiv, and Kryvyi Rih (Neo-Eco website).¹⁹⁰ It will be important to carefully monitor these initiatives to ensure that housing unit design and construction costs match the affordability levels of lower- and middle-income households. City strategic planning on a comprehensive scale must be sustained in the western and southwestern cities and towns that are host to large populations of IDPs, and it will be needed after the invasion in the devastated eastern cities. Preparation of comprehensive recovery plans is underway, with additional support

needed to supplement the resources of the smaller hromadas. The purpose of the plans, which could be contracted out on a paid-services basis by the local and regional authorities to supplement local human resources capacity, is to provide spatial coordination for reconstruction efforts and guide land development options for new settlements based on strong public consultations with residents in the area.¹⁹¹

Repairing moderately damaged buildings¹⁹² and retrofitting them to meet higher energy-efficiency standards will cost an estimated \$25.7 billion over the short term. This process is already underway among individual households, homeowner associations, and in some cases with support from community-based nongovernmental organizations or through grants from international development institutions. More could be done by municipal authorities to provide technical assistance (through contracts with architects, structural engineers, specialized trades, and surveyors) and advise households and homeowner associations on standards for durable materials and measures to improve energy efficiency, along with repairs and retrofitting.

In the medium to longer term, as detailed structural investigations are completed, major repairs or total reconstruction of apartment blocks in cities or single-family houses in smaller settlements will commence through the initiatives of private sector developers as well as not-for-profit and community groups and households. Still, public-sector support will be needed in several key areas. The success and speed with which private initiatives can succeed will depend on public-sector commitments to implement timely, clear, and uncontested

¹⁸⁹ Cost estimates are drawn from the February 2023 RDNA2 report.

¹⁹⁰ <https://www.neo-eco.com.ua/en/home-en/>, Neo-Eco 'Hostomel pilot' presentation materials.

¹⁹¹ In 2019, less than half of hromadas had an approved general plan or development strategy, and only one-third had an approved land use scheme (Anisimov et al. 2023). Relatively low-cost, rapid, but comprehensively and consultatively prepared city strategic development options and plans could be used to set down the gray-green city form (transportation routes and open space) and major residential typologies (representing 40–70 percent of land use).

¹⁹² In the RDNA2 methodology, 'moderate' damage is non-structural and reduces the value of the building by 10 to 40 percent

land title/registration; updated and common infrastructure, building, and worksite health and safety standards to ensure a level playing field between developers and protect eventual home renters or buyers; transparent and publicly agreed cost-sharing and cost-recovery policies, including the level of public subsidy for infrastructure construction; and enabling legislation for offtake through rent-to-buy contracts and common title/ condominium mortgages.

An assured supply of key basic construction materials (cement, steel, and glass) will require the expansion and upgrading of existing domestic production facilities for construction materials and components, as well as the entry of regional suppliers. There is a strong opportunity for new entrants to the market to replace former supply chains from Russia and Belarus (e.g., in the glass industry). According to a USAID survey, the Ukrainian construction sector has the capacity to produce nearly 90 percent of the materials needed to rebuild the country (USAID 2023). Sustaining and continuing enabling reforms in the construction sector, including improving access to finance, digitization, and harmonization of construction norms with the EU to ensure adherence to ‘build back better’ principles, are important to grow domestic producers’ capacity and attract new players.

Developing and modernizing the construction sector to ensure an adequate supply of green and resilient construction materials and processes will require attracting FDI in new production facilities.

Investment needs estimated by UkraineInvest include a modern manufacturing plant with an annual capacity of 18 million m² of float glass (approximately a \$200 million investment); cement plant(s) with capacity of more than 2 million tons of cement per year

(approximately a \$150 million investment); ceramic tile production plant(s) (approximately a \$50 million investment per factory to produce 15 million m² of ceramic tiles per year); and brick/block manufacturing plant(s) (approximately a \$100 million investment per factory to produce 120 million bricks/porous blocks/clinker bricks per year). Creating a favorable investment environment, including clear and effective investor protections, and ensuring fair and transparent access to land and infrastructure will be critical for investment decisions by strategic investors. Further investments in developing (eco) industrial parks may stimulate FDI inflows.

11.5 Risk and Risk Mitigation

The housing sector is severely constrained by rising prices and low household incomes. In the west and southwest regions, sale prices increased by 10–40 percent and rents rose by 10–20 percent between 2021 and 2022. Over the same period, average monthly salaries decreased by 12.4 percent (\$433 per month). The price-to-income ratio rose from 10.8 in 2021 to 12.2 in 2023. There are large variations in the market, but general household affordability has been negatively impacted by the invasion. To the extent possible, it would be more cost-effective and less socially disruptive for existing housing to be retrofitted and repaired in areas where families have managed to remain in their original homes.

The massive internal displacement of the population has doubled the share of households living in rental accommodations. The NBU has reported that demand for housing remains weak and unstable, and that the invasion is changing the appetite of buyers, “who now prefer safer and autonomous residential property.”¹⁹³ In February 2021, the median annual salary was \$4,434, which would be sufficient for middle-

¹⁹³ NBU, 2022, p.13

income earners to take on a mortgage for a 45 m² housing unit (14 percent, 20 years, LTV 70 percent). However, this apparent affordability hides large and increasing regional disparities due to the invasion. In the case of new mass-housing reconstruction to meet the needs of lower income earners and IDPs with no savings—whether single family houses or apartment blocks—rental and rent-to-buy accommodations could be offered as a share of all new units constructed.

To develop and maintain affordable rental housing for lower- and middle-income households, domestic and international developers will need to access large and flexible bridge loans on terms that are not typically available in Ukraine’s commercial market. Moreover, some of these borrowers may not have sufficient collateral and creditworthiness to secure such loans under normal circumstances. Developers and commercial lenders could be incentivized to join design-build-finance or design-build-finance-operate-maintain ventures by catalytic capital offered by IFIs.¹⁹⁴ Catalytic capital offerings could be provided on a site-by-site basis or—as may be needed for the scale required in Ukraine—through a special purpose vehicle like a housing fund, of which there are

several successful examples in the affordable housing market.¹⁹⁵

11.6 Financial Flows and Projections

Housing reconstruction and recovery needs are estimated at \$68.6 billion. Housing represents 17 percent of total reconstruction and recovery needs, making it among the sectors with the highest needs.

To encourage private-sector confidence and enable investment, the government will need to implement several key policy and procedural reforms. Developing a housing policy framework is essential for improving housing quality, ensuring access to affordable housing, and increasing the housing supply. Further strengthening and streamlining urban planning and land administration systems will be vital to the efficiency, consistency, and transparency of land allocation decision-making. Simplification and alignment of construction regulations and materials standards with EU standards would encourage the entry of regional contractors and strengthen the ability of the public sector to ensure green and resilient reconstruction of the housing sector.

¹⁹⁴ Catalytic capital offered by, for example, IFIs is typically debt, equity, or guarantees that accept disproportionate risk and/or concessionary returns as compared to the market to achieve a positive impact and bring in third-party investment that would otherwise not happen.

¹⁹⁵ The failure of national housing funds that are fully financed through state equity or loans to either scale or sustain their operations is well recorded. However, models that have strong private sector involvement bring in the volume of funds and commercial operations and lending discipline required for sustainability. For example, a fund might be established with first loss capital from the national government and/or a large external support partner and topped up with subordinated, low-cost debt from several other (smaller) external support partners, including private philanthropies. This would lay the foundations for senior loans from commercial financial institutions. By blending financing from several sources, the national fund (or several sub-national funds by geographic area) would be able to take on greater risk and offer below-market interest rates and repayment terms for domestic and regional commercial developers and nonprofits to begin to meet reconstruction needs.

Table 11.1 Housing Sector Needs and Private Financing (\$, billions, 2023 prices, unless otherwise indicated)

	2023–2026	2023–2026	2023–2026
RDNA2 needs	31.5	37.1	68.6
Private sector financing for reconstruction—Non-reform scenario(a)	21.0	46.6	67.6
Addressing needs identified in RDNA2	7.0	15.5	22.5
Private sector financing as share of RDNA2 needs (%)	22.3	41.8	32.8
Other investment opportunities identified (a)	14.0	31.0	45.1
Private sector financing for reconstruction—Reform and intervention scenario (b)	27.4	63.2	90.6
Addressing needs identified in RDNA2	9.1	21.0	30.2
Private sector financing as share of RDNA2 needs (%)	29.0	56.7	44.0
Other investment opportunities identified	18.3	42.1	60.4

Source: RDNA2 and author's estimates.

Note: (a) In the baseline (no reform) scenario: (i) Ukraine would invest the average of its peer group's expenditures for 2018–2021 on housing during 2023–2033.¹⁹⁶ That is 3.3 percent of GDP and totals \$67.6 billion in 2023 prices. The projection includes all forms of private financing, such as household savings, mortgage and not-for-profit investment. (ii) However, the share of private housing expenditure allocated to reconstruction is assumed to be equal to the share of displaced people. As a result, \$22.5 billion will be spent on reconstruction, equivalent to about one third of total needs. (b) In the reform and intervention scenario: (i) Ukraine would invest the average of its peer group's expenditures for 2018–2021 (3.3 percent of GDP) on housing during 2023–2033. Further modest development of the middle-income mortgage market and investments by not-for-profits on social (subsidized) and affordable (income-linked) housing, in which the private sector could play a strong role, would further boost investment in the housing sector by an additional one percentage point to 4.3 percent of GDP. Assuming the higher growth of the IMF upside scenario over the 2023–2033 period, this would yield \$90.6 billion in constant prices. (ii) Maintaining the assumption that the share of house expenditures allocated is equal to the share of displaced people, one third of housing expenditures will be spent on reconstruction, \$30.2 billion at constant prices, less than half of the needs. Projections for investment opportunities in housing are constrained by total available resources for private investment and the need to invest in opportunities that contribute to expanding the productive capacity to achieve the projected GDP growth rate.

¹⁹⁶ Ukraine's peer group countries are Czechia, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, and Slovakia

CHAPTER 12

Municipal Services ¹⁹⁷

12.1 Sector Overview and Strategic Challenges

Following several decades of underinvestment across all tiers of government, the coverage, quality, and maintenance of basic local services in Ukraine was lacking even before the invasion. In 2020, Ukraine's subnational governments were spending an average of \$1,398 (at purchasing power parity) per inhabitant within their jurisdictions. This was less than subnational government expenditure of \$1,830 per person in Bulgaria, \$1,999 per person in Serbia, and less than half of \$3,040 per person in Romania. Nevertheless, total spending by Ukraine's subnational governments was significant at 11.3 percent of GDP, higher than in Bulgaria (7.4 percent of GDP), Serbia (10.3 percent), and Romania (9.5 percent). Subnational expenditure constituted 25 percent of all public expenditure. The data reflect: (i) low levels of investment by the central government in municipal infrastructure and services, and (ii) the types of services that have been devolved to subnational governments (IFC 2023f; OECD and UCLG 2022). Subnational expenditures accounted for 57.4 percent of all public capital expenditure, but only 20 percent of subnational budgets went toward non-recurrent expenditure, and a low 1.3 percent of GDP (equivalent to \$164 per inhabitant) went to direct investment in gross fixed capital formation (OECD and UCLG 2022). In Ukraine's second largest city, Kharkiv, between 61 percent of the city's annual budget of 13.93 billion hryvnia was spent on delegated social responsibilities for education, health care, and social protection and social welfare (Nippon Koei Co Ltd. et al. 2018). Nearly half of all spending by subnational governments (44 percent) was on payroll—

mainly for staff responsible for the delegated social-sector functions. This share is higher than levels in Romania (37.6 percent) and Serbia (38.7 percent) (OECD and UCLG 2022).

As a result of low total expenditure and low capital expenditure, the coverage and quality of basic municipal services in Ukraine fell short on several measures. 21 percent of households did not have solid waste collection services, and of the 10 million tons of household waste generated annually, only 7 percent was recycled, and less than 2 percent was incinerated. Of the 6,000 municipal landfills in the country (excluding the 33,000 illegal dump sites), 14 percent (824 in number) did not meet national environmental standards, 6 percent (371 sites) required complete reclamation, and 99 percent would not be able to meet the EU environmental acquis (Nippon Koei Co Ltd. et al. 2018; Kovalenko et al. 2022). Similarly, there was poor service for streetlighting and sidewalks (60 percent coverage), there was a shortfall of 500 urban cemeteries, approximately 10 million people lacked access to potable water supplies, and around half the population (20 million people) lacked access to managed sanitation services and central heating and hot water supply (World Bank et al. 2022).

Indicators of operations and maintenance of subnational assets were similarly weak. Municipal-owned enterprises responsible for services such as transportation, heating, solid waste, and water and sewerage are dependent on central grants and subsidies, capital injections, and direct debt repayments made by municipalities, and they have little incentive to plan for and fund routine (preventative) maintenance (OECD 2020b). In turn, low levels of coverage, combined with poor

¹⁹⁷ The chapter on municipal services excludes local transport, district heating systems, and water and sanitation services, which are covered elsewhere.

operating efficiencies and lack of maintenance, disincentivize household user payments and give rise to an ongoing cycle of deterioration. In January 2021, household debt for waste removal services increased from 1.1 billion hryvnia in January 2021 to 1.29 billion hryvnia by December 2021 (Energy Map “Population debts...”).

The ability of municipal governments to take on debt to meet the backlog in service standards and expand future coverage is weak and, in the case of smaller municipalities, largely absent. Subnational governments are permitted to borrow for investment projects, but this requires authorization from the central government (Ministry of Finance of Ukraine 2019). Therefore, borrowing carries an implicit sovereign guarantee, unless specifically excluded in loan agreements or bond issuances. Most subnational loans are contracted with the national government, although regional councils and city councils do have powers to borrow on domestic capital markets, subject to strict supervision by the central government.¹⁹⁸ All local councils are permitted to seek loans from IFIs. In 2019, for example, the city of Mariupol was approved for a €12.5 million (\$14.62 million) loan from IFC to improve urban transportation.¹⁹⁹ In 2021, IFC approved a €19 million blended finance loan to the Lviv municipal enterprise Lvivelektrotrans as part of a €32 million project for acquiring rolling stock and refurbishing the city’s catenary tram line. However, with only five larger cities holding a credit rating, and all of them have below investment grade, market debt financing of municipal services is still at a nascent stage (Fitch Ratings 2023c). In 2020, total outstanding debt

by subnational governments stood at \$83 per inhabitant and constituted less than 1 percent of GDP. Ukraine’s subnational debt is low relative to comparator countries such as Bulgaria (\$609 per inhabitant), Serbia (\$230 per inhabitant), and Romania (\$2,718 per inhabitant) (OECD and UCLG 2022; OECD 2023c).

Russia’s invasion has placed enormous stress on the already stretched municipal services sector. The RDNA2 recorded damage of \$2.3 billion across five categories of municipal assets, namely solid waste management (4.1 percent of damage in the sector), public spaces and public facilities (28.5 percent), administrative buildings (24.0 percent), local mobility sidewalks and streetlights (39.0 percent), and sports facilities (4.4 percent) (World Bank et al. 2023). Many municipal services are crucial in preserving public health. While total damage in solid waste management (\$99.9 million as of February 2023) appears small in comparison to other sectors, it constitutes a large part of already strained basic services and poses an inordinate risk to public health. Five percent of all existing collection trucks, 17 percent of all biogas plants, and 9 percent of sorting lines have been destroyed or damaged, resulting in a near-collapse of the service network, especially in the Donetsk and Luhansk oblasts, where 75 percent of damage in the waste sector was localized. Similarly, damage to local administrative buildings and centers (damage valued at \$204 million, not including education and health facilities) has severely impacted municipal service functions and operations that are crucial to providing support to the 3.6 million registered IDPs and an estimated 5.4 million unregistered IDPs. The

¹⁹⁸ Under Budget Code and Resolution No. 110 of the Cabinet of Ministers on Approving the Regulation on Local Borrowings Implementation and subject to approval by the Ministry of Finance, subnational governments can borrow locally to fund investment projects under the following conditions: (i) the amount of borrowed funds must not exceed the deficit of the special fund of the local budget; (ii) debt service spending cannot exceed 10 percent of the local budget during any year of debt servicing; and (iii) the overall amount of direct debt and guaranteed debt by the territorial community must not exceed 200 percent (400 percent in the case of the city of Kyiv) of the average annual forecast special fund’s revenue.

¹⁹⁹ IFC Advisory Services Loan 40540 funded the procurement of 64 large capacity buses, bus depot, maintenance and repair workshop reconstruction, traffic planning expansion and dispatch center management, and advisory services to support the city of Mariupol to strengthen its fleet planning, urban transport modeling and planning, and environmental and social risk management

RDNA2 estimates that damage has been highest in the Luhansk, Donetsk, Kharkiv, Kherson, and Zaporizhzhia regions.

Subnational governments and their public enterprises are caught between increasing expenditure needs and imploding revenues.

Total losses in the municipal services sector were estimated at \$2.9 billion as of February 2023.

These losses are expected to continue to climb because of increasing expenditure needs such as demolition and debris removal (\$3.8 billion), as well as due to large invasion-related revenue losses from personal income taxes ²⁰⁰ and own-source revenues such as property taxes (\$685 million) ²⁰¹ that are unlikely to be fully compensated by transfers from the national budget. Revenue losses by household waste

management entities (both public utilities and private companies) were estimated at \$32 million between March 2022 and February 2023, and many private waste collection companies have been unable to recover destroyed equipment or offset lost revenues and so have closed.

The invasion has undercut the largest cities' nascent abilities to access the capital markets for debt financing to reconstruct and expand coverage of municipal infrastructure and services. Among the five largest cities, liquidity has deteriorated, together with the ability to service new debt or support indebted municipal enterprises. On April 21, 2023, Fitch Ratings rated Dnipro, Kharkiv, Kyiv, Lviv and Odesa Long-Term Foreign-Currency Issuer Default Ratings at CC, Long-Term Local-Currency

Table 12.1 Ukrainian Cities with Credit Ratings and Combined Loan Debt and Loan Guarantees

City	EUR millions	US\$ millions
Regional center with credit rating ⁽¹⁾	131.6	327.7
<i>Kyiv</i>		190
<i>Lviv</i>	92.5	16.2
<i>Odesa</i>	8	74.8
<i>Dnipro</i>	18.6	18.4
<i>Zaporizhzhia</i>		28.4
<i>Mariupol (not a regional center)</i>	12.5	
Regional center but no credit rating ⁽²⁾	112.3	15.2
Smaller center and no credit rating ⁽³⁾	31.896	10.4

Note:

(1) Excludes regional centers with credit rating but no debt for the period (Kharkiv and Mykolaiv).

(2) Ternopil, Ivano-Frankivsk, Lutsk, Chernivtsi, Zhytomyr, Vinnytsia, Khmelnytsky, Sumy, Rivne, Chernihiv, and Uzhhorod, Kropyvnytskyi.

(3) Twenty-seven centers with average debt or guarantees of \$0.4 million.

Guarantees and debts are shown in the currency they were made (€, \$). Loans in hryvnia are converted into \$ equivalent by applying the NBU's annual average exchange rate.

Source: Fitch Ratings 2023c; Ministry of Finance of Ukraine 2019.

²⁰⁰ The RDNA2 identifies that the personal income tax component of local revenues in 20 oblasts (regions) increased between March and December 2022, possibly as a result of increases in enrollments and salaries in the defense and ITC sectors. However, this trend will plateau and is likely to be offset in future months by rising costs and increasing expenditure demands on subnational governments.

²⁰¹ Ukraine's subnational government budgets come from three main sources: (i) the General Fund for current expenditure: personal income tax (15 percent goes to oblasts, 64 percent to *bromadas*, and the remaining 21 percent to the national budget), corporate profit tax, environmental taxes, and rents for the use of natural resources, and property taxes; (ii) the Special Fund for non-tax revenue and capital grants tied to capital expenditure, debt repayment, and an environmental fund; and (iii) sectoral funds: for delegated responsibilities including social protection, education, utilities, and health grants.

Issuer Default Ratings at CCC- and Risk Profiles as Vulnerable,²⁰² which will require targeted measures for these cities to access market equity or debt finance in the future (OECD and UCLG 2022; OECD 2023c; World Bank 2023). In the case of smaller *bromadas* with limited own-source revenues and eastern *bromadas* that are most affected by the invasion, loss of revenue from the personal income tax and corporate profit tax is not comprehensively monitored but is likely large. The risk of default by smaller subnational governments, either on existing debt or to service future debt for reconstruction activities, will be elevated and require a case-by-case assessment.

In addition to the five asset categories, damage to municipal assets that are covered under other chapters are not included here. Such damage includes the destruction or degradation of 7,619 kilometers of oblast and village roads (\$3.8 billion), communal roads (\$4.78 billion), 428,470 square meters of bridges on local roads (\$0.3 billion), and district heating systems and locally administered WSS services.

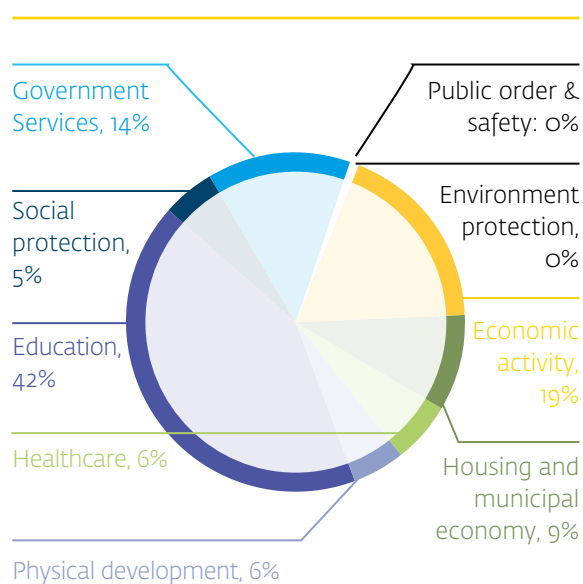
12.2 Sector Context

Ukraine's municipal sector is characterized by the small size of its subnational governments. In 2021, only five cities had populations close to or above 1 million people. The median municipal size was 9,269 people, and one-third of *bromadas* had less than 5,000 people. There were also considerable territorial inequality, reflecting stronger economic and population growth in the central and southeast industrial

regions and urban-rural differentials. For example, the gross regional product per capita in Kyiv was \$12,699 in 2020, much higher than \$5,039 in Kyiv oblast, and both were considerably higher than the \$753 gross regional product per capita in the poorest oblast of Luhansk in the east of the country.

Between 2015 and 2020, the GoU implemented a series of wide-ranging administrative and fiscal decentralization measures and public governance reforms.²⁰³ These measures included the amalgamation of the 11,250 local government areas that existed at the time, and the ongoing delegation of expenditure mandates and decentralization of some revenue sources to subnational governments. In 2021, the country was under 24 oblast administrations, the Autonomous Republic of Crimea and

Figure 12.1 Composition of Expenditures by Subnational Governments



²⁰² The RDNA2 identifies that the personal income tax component of local revenues in 20 oblasts (regions) increased between March and December 2022, possibly as a result of increases in enrollments and salaries in the defense and ITC sectors. However, this trend will plateau and is likely to be offset in future months by rising costs and increasing expenditure demands on subnational governments.

Ukraine's subnational government budgets are through three main sources: (i) General Fund for current expenditure: personal income tax (15 percent goes to the oblasts, 64 percent to hromadas and the remaining 21 percent to the national budget), corporate profit tax, environmental taxes and rents for the use of natural resources, property taxes; (ii) Special Fund for non-tax revenue and capital grants tied to capital expenditure, debt repayment and an environmental fund; and (iii) Sectoral Funds: for delegated responsibilities including social protection grants, education grants, utilities grants and health grants.

²⁰³ Ukraine's Public Financial Management Strategy and Action Plan 2022-2025 and Public Administration and Reform Strategy 2022-2025 and associated Action Plan set down three priorities for the tiers of government: (i) deliver high-quality public services to citizens and businesses; (ii) build a professional and politically neutral public service; and (iii) build effective and accountable public institutions.

the two special status city administrations of Kyiv and Sevastopol. Beneath the regional level were 136 districts (*raions*), including 24 cities formerly termed as being “of regional significance.”²⁰⁴ The 1,469 municipalities were at the lowest administrative level. The amalgamation of boundaries is ongoing, and there is at times a lack of clarity in the division of responsibilities between *raions* and *bromadas*, such as in the area of public transport and roads, which could potentially affect spatial planning, zoning, and other decisions where jurisdiction is disputed (World Bank 2023).

As a result of the reforms, the subnational regulatory environment has been strengthened,²⁰⁵ but it remains complex and spread across several pieces of legislation and with variable uptake across the country. Ukrainian municipal responsibilities are broad ranging and set out in the Constitution, the Law on Regional State Administrations, and the Law on Local Self-Government in Ukraine (Chapter 3, Art. 27-41). Expenditure mandates can be summarized as either:

- Delegated competencies, namely, education (preschool, primary, and secondary education and specialized institutions), health (outpatient clinics, polyclinics, hospitals, maternity and primary care centers, and emergency aid centers), and social welfare (support for children and low-income earners); or
- Exclusive competencies that include economic affairs and construction and maintenance of local roads and bridges and transportation services; environmental protection (waste collection and sanitation); housing and community amenities (local land use planning,

local programs for housing development, municipal utilities, heating, and water management); culture and recreation (libraries, museums, and sport centers); and general public administration, including licensing and registration (OECD and UCLG 2022).

As part of Ukraine’s ongoing decentralization reforms, local governments have been given greater authority to manage their own finances and enter into PPPs for public services and local infrastructure.²⁰⁶ PPP-related legislation is extensive, with one law, three Cabinet resolutions, and one order covering non-concession PPPs and four laws and one Cabinet resolution covering concession PPPs, although in some cases these laws are overlapping or contradictory (OECD 2018). To date, the PPP model used by subnational governments has been limited and typically used by private companies to invest in and operate public assets and services under performance-based arrangements, while the subnational authority

Table 12.2 Composition of Expenditures by Subnational Governments

SNG expenditures by function	2021	2022
General government services	86.3	67.2
Public order and safety	1.7	11.1
Environment protection	2.4	0.5
Economic activity	112.4	61.1
Housing and municipal economy	56.7	40.6
Healthcare	33.1	31
Physical development	27.4	22.6
Education	249.1	232.3
Social protection	28.1	29.2
Total (hryvnia, billions)	597.2	495.6

Source: National authorities.

²⁰⁴ The term was abolished in 2020 as part of the subnational reforms that integrated city municipalities into the raion (district administration) structure.

²⁰⁵ The OECD/UCLG World Observatory on Subnational Government Finance and Investment highlights the ongoing good governance reforms underway at the subnational level in Ukraine with respect to decentralization of expenditure mandates and accompanying revenue enhancement sources to the elected subnational tiers of government.

²⁰⁶ The Law of Ukraine on Public Private Partnership 2018 (Article 1).

has retained ownership of the asset and oversight. In other cases, the private sector has provided goods and services such as construction materials, equipment, and consulting services through supplier contracts, which in turn can stimulate local economic development and create jobs, or it has operated municipal services such as landfill sites through availability payment contracts. Overall, the private sector does not directly own a significant share of Ukraine's subnational government assets and operations, but it could and will need to play an important role in supporting the efficiency and supplementing the coverage and quality of local government service delivery (OECD 2020b).

12.3 Obstacles to Private-Sector Participation

Burdensome and opaque procedures for allocating land and building permits, lack of practical experience with different PPP models by subnational governments, and comparatively small market size all hinder private-sector participation in local service provision. Administrative constraints can be addressed by reforms that were already underway before the invasion, while lack of practical experience and small market size can be addressed by careful project identification and preparation.

Administrative constraints on securing property rights, the time and costs for obtaining land use and building permits, and the need for competitive and transparent procurement undermine private-sector participation and discourage private equity or debt financing for municipal infrastructure and service delivery. The two key secure databases—the State Registry of Rights for Real Estate and the State Land Cadaster—were only approximately 40 percent and 71 percent complete, respectively, prior to the invasion,²⁰⁷ and these gaps have worsened by the destruction

of paper-based records in invasion-affected areas. Notwithstanding these challenges, in 2016 the public and private sector land and real estate markets demonstrated their capacity to successfully process around 2.1 million land transactions, with only 8 percent (170,000) needing resolution in the courts (Bogonos et al. 2022). The government has shown ongoing commitment to strengthening and protecting property rights. For example, in April 2022, the Verkhovna Rada adopted the first reading of Proposed Law No. 7198 on Compensation for Damage and Destruction of Certain Categories of Real Estate as a Result of Military Actions, Terrorist Acts, and Sabotage Caused by the Military Aggression of the Russian Federation, setting out compensation procedures for residents whose property has been damaged or destroyed as a result of the invasion. In October 2022, Law No. 2518-X on Guaranteeing Property Rights to Real Estate to be Constructed in the Future came into effect, aimed at protecting real estate investors. The World Bank provided \$2.3 billion to support public budget and investment projects during the COVID-19 pandemic, including to support land reform and promote public investment in land. Such ongoing support from external partners, strengthened legislation, and renewed efforts to implement wide-ranging public administration reforms and anti-corruption measures (e.g., *the Strategy for Public Administration Reform in Ukraine for 2022-2025*), including at subnational government levels, are consistent with EU principles and will ensure stronger and more transparent property rights, permitting systems, and procurement and contract award procedures (Cabinet Ministers of Ukraine 2022). Ukraine's well-recognized ProZorro public procurement system should be leveraged to ensure that domestic and regional companies can access tenders and contract award data in a timely and transparent way.

²⁰⁷ In the temporarily not under governmental control territories of Donbas and Crimea, the registry was only functional from 2013 to 2014 (Nizalov, et al. 2022).

The PPP legislative framework needs further strengthening.²⁰⁸ According to a 2017-2018 concession/PPP assessment for Ukraine, the PPP legislative framework is comprehensive but lacks clarity in some areas (e.g., regarding ‘user pays’ concession PPPs and which party bears the cost of meeting ‘public benefits,’ such as environmental standards or social commitments for vulnerable groups. As part of the National Economic Strategy 2030, the Ukrainian government has shown its commitment to significantly develop PPPs to finance infrastructure investment. In 2018, the State Organization Agency on Support Public-Private Partnership was established in the Ministry of Economy to support the implementation of PPP contracts at both the central and subnational government level (OECD and UCLG 2022). The IMF approved a \$700 million disbursement in November 2021 (extended to June 2022) for reforms, including a better regulatory framework for private investment. Among the reforms available for the government to review were options for commercializing (reducing subsidies) and, where feasible, privatizing the ownership and operations of municipal government-related entities (GREs) to put them on a level playing field with private companies.

The small market size of Ukrainian cities is a constraint to the development of municipal infrastructure and services (most cities have less than 1 million people), leading to higher perceived risks and transaction costs for PPP projects. While the market size is comparatively small, there may be opportunities to scale and/or bundle PPP projects accordingly. There are also opportunities to foster partnerships between domestic contractors with deep local knowledge and expertise and international businesses with more specialized expertise, logistics experience, and access to finance. For example, subnational

PPP requests for proposals above a certain size and potential investment opportunities and risk allocation could be promoted on reputable, open-source platforms such as the PPP pipeline maintained by the State Organization Agency on Support for Public-Private Partnership.²⁰⁹

12.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

The RDNA2 estimates the total reconstruction and recovery needs of the municipal services sector at \$5.73 billion over 10 years, with \$1.72 billion required in the next four years to restore basic service delivery and lay the foundation for large-scale reconstruction. Engaging the private sector will be critical for leveraging financing, technical, and logistical expertise and efficiency to supplement subnational governments’ recovery and reconstruction efforts.

To overcome the obstacles to private-sector participation, policymakers must address several key issues, including gaining clarity on the key performance indicators to be met, how often these are reviewed, which party bears the consequences of design decisions, and what changes are needed related to new technologies or the regulatory environment. It will also be necessary to assess subnational governments’ creditworthiness and readiness to participate in terms of their history of default and internal capacity for PPPs. Finally, it may be necessary to consider alternative financing models for PPP projects. For example, the use of blended finance or risk mitigation instruments, such as credit enhancements from the government or IFIs could help to reduce risks.

Opportunities for PPPs exist in key reconstruction and service delivery restoration

²⁰⁸ As discussed in the next section, the PPP legislative environment at subnational levels is expanding over time but there are some overlaps and contradiction between the laws that require further strengthening.

²⁰⁹ See for example, the request for proposals for the BDOM concession for a \$10 million underground multi-level parking construction on Sq. E. Petrushevyh in Lviv.

activities. In the short term (2023–2026), local reconstruction and recovery strategies and action plans will need to be updated or prepared by all affected municipalities, based on technical assessments and data collection, and investment sequencing and priorities need to be determined. Preparing these plans, using participatory planning techniques, and strengthening local government revenue collection and billing systems could be efficiently carried out by transparently procured service contracts. Improved land cadaster systems are also crucial for improving revenue collection and expanding revenue sources by, for example, leveraging land value capture opportunities in partnership with the private sector.

Clearing debris—site-by-site debris sorting for reuse, recycling, or removal to sanitary landfills— will require an estimated \$45.8 million.²¹⁰ Local governments and small and medium contractors will need concessional loans and grants to procure collection trucks and container bins to restore and expand household waste and debris collection and removal. Landfills are a major emitter of methane, a GHG that is 30 times more harmful than carbon dioxide. Large-scale reclamation and commissioning of new sanitary landfills to EU standards, especially in frontline regions that host large IDP populations, lend themselves to concession or DBO arrangements. For example, this could be relevant for the Kyiv city administration, which sorts and recycles 10 percent of waste and incinerates 27 percent through the Energia waste incinerator plant.

Repairs and retrofitting to more energy efficient and environmentally safe standards of critical assets such as cemeteries, streetlights and sidewalks, and moderately damaged administrative service centers and other public

buildings²¹¹ need to be urgently undertaken. Municipal authorities will need to supplement their own staff and GREs by contracting experts (e.g., architects, structural engineers, professionals from specialized trades, and building surveyors) to undertake structural assessments, prepare detailed engineering and structural designs to improve energy efficiency, and supervise all works to ensure standards are met. Compensation grants or soft loans to subnationals (e.g., blended finance between external support partners and retail banks) could be efficiently managed through existing retail banking networks. Financial support to subnational governments should be linked to their commitment to meet performance-based green and energy efficiency standards (e.g., EDGE certification) and select private contractors for renovations and ongoing maintenance of reconstructed public buildings and assets. These could be awarded as leases (affermage) of public buildings and/or by offering commercial value capture to private partners. For example, the private partner could invest in the asset to be rebuilt, taking on some of the financial risk. In return, the private party would receive a portion of the increase in land and property value resulting from the rebuild.²¹²

In the medium to long term, as detailed structural investigations are completed, major repair or total reconstruction of heavily and moderately damaged public buildings such as libraries, museums, tourism centers, and administrative service centers (\$3.26 billion) would need to commence. The success and speed with which large private sector developers would participate in this effort would require public sector commitment to implementing clear and uncontested land title/registration; the adoption of updated infrastructure, building, and worksite health and safety standards (for

²¹⁰ Cost estimates are drawn from the RDNA2

²¹¹ Moderate damage in the RDNA2 methodology is non-structural, with a level of damage between 10 and 40 percent of the structure

²¹² For example, the revitalization of the Budapest city core made use of commercial value capture to finance the development of new infrastructure and public spaces in the city center, such as parks, pedestrian zones, and cultural facilities.

a level playing field between contractors); and transparent procurement procedures. PPPs for public buildings could be done: (i) on commercial land value capture or joint venture basis (e.g., subnational equity in the land and supporting infrastructure to jumpstart the greenfield development of industrial parks and technology development zones); (ii) through simple performance-based and annually monitored management contracts (e.g., for local roads and transportation services); or (iii) through DPSs (e.g., for larger projects).

12.5 Risk and Risk Mitigation

Recovery and reconstruction efforts in the municipal services sector with private sector participation face several main areas of risk that can be mitigated.

Subnational governments are responsible for preparing local recovery plans with key priorities, financial strategies, and budgets to ensure service delivery functions are not negatively affected by invasion risks (e.g., large negative shocks and ongoing damage to critical infrastructure and supply chains). Invasion risks can be mitigated by rapid responses in debris removal and local roads/streetlights repair for economic and social connectivity, and by the rapid restoration and maintenance of key physical facilities, making use of lease agreements, concessions, and commercial value capture, to maintain services and shore up households and businesses' willingness to pay user fees, property taxes, and local levies.

Subnational governments have shown that own-account revenue bases are holding in the short term (as the personal income tax component of local revenues has increased), but 90 percent of sector losses are in municipal revenues, which will face stress in the medium term. Fiscal risks are elevated, with liquidity insufficient to service debt. Subnational governments will for several years be heavily dependent on ongoing

fiscal transfers from the central government for delegated responsibilities (health, education, and social welfare). Consideration should be given to means of defraying fiscal risks: direct service subsidies, capital injections, debt waivers, or direct debt repayments to mitigate the risk of insufficient liquidity to service existing or new subnational debt required for reconstruction.

Forty-two percent of Ukraine's households have exhausted all their savings, and the willingness and ability to pay for municipal services such as solid waste management was already soft before 2022. Many private waste collection companies have temporarily ceased operations due to losses of capital and revenue, while the additional service delivery burden on subnational governments climbed by \$74.6 million in 2022. Mitigation of such market risks includes short-term, soft capital injections for the replacement of equipment and vehicles and bundling user charges for public benefit services into property taxes. Cash-short but asset-rich subnational governments could be encouraged to provide land and bulk infrastructure (water, local roads, and streetlighting) as shared equity for new and scaled up reconstruction at agreed IDP locales. Market risks can also be mitigated with DBO or BOT cost recovery through commercial and/or land value capture.

Asset-maintenance risks are also a problem, with weak operations and maintenance of subnational government assets undermining their ability to act as reliable counterparts in a PPP. These risks could be offset by including budget allocations for maintenance as a precondition of loan approvals. Subnationals could also be encouraged to partner with external support partners for long-term technical assistance to put in place asset management systems. Three-to-five-year performance-based DBO and BOT contracts could be used for waste collection and local road maintenance, including the removal of debris and unexploded ordnances.

12.6 Financial Flows and Projections

Municipal services reconstruction and recovery needs total \$5.7 billion.²¹³ This sector is critical to household welfare across the country.

Through careful planning and use of PPPs that are tailored to each type of asset and focus on the largest cities, it will be feasible to access new sources of private financing that were previously untapped (Table 12.3).

Reforms in three priority areas would provide a pathway to greater private-sector participation in the municipal services sector. First, the authorities will need to mandate the use of standard public sector e-procurement guidelines—including public advertising on city/e-government platforms of pipeline, bid documents, and contract awards—

by subnational governments while providing capacity-building support and enforcing sanctions for noncompliance. Second, the authorities should undertake a comprehensive review of the efficiency, economic sustainability, and environmental and social safeguards imposed by public enterprises owned by subnational governments, before implementing a program to commercialize those enterprises, starting in the largest cities and in sectors with active private market interest and capabilities. Finally, legislative reforms are needed to allocate the value generated by land rezoning and enable the transfer of land development rights, which will ensure more transparent and predictable government decision-making when rezoning land for development by the private sector or through PPPs

Table 12.3 Municipal Services Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023–2026	2027–2033	2023–2033
RDNA2 needs	1.7	4.0	5.7
Private sector financing for reconstruction—Non-reform scenario (a)	0.1	0.0	0.2
Addressing needs identified in RDNA2	0.1	0.0	0.2
Private sector financing as share of RDNA2 needs (%)	6.6	1.1	2.8
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario (b)	0.2	0.6	0.8
Addressing needs identified in RDNA2	0.2	0.6	0.8
Private sector financing as share of RDNA2 needs (%)	12.7	14.8	14.1
Other investment opportunities identified	0.0	0.0	0.0

Note: (a) The no reform scenario includes the following measures that address RDNA2 needs: private engagement on solid waste totaling \$15 million for 2023–2026 and \$45 million for 2027–2033; local mobility infrastructure totaling \$92 million for 2023–2026, as part of immediate post-invasion reconstruction, and no funding for 2027–2033; and philanthropic support for sports facilities totaling \$9.4 million for 2023–2026, as part of immediate post-invasion reconstruction, and no funding for 2027–2033. (b) The reform scenario assumes support for subnational authorities to prepare financing proposals that may attract private-sector financing. It includes the following measures that address RDNA2 needs: private engagement on solid waste totaling \$15 million for 2023–2026 and \$225 million for 2027–2033; local mobility infrastructure totaling \$184 million for 2023–2026 and \$368 million for 2027–2033; and philanthropic support for sports facilities totaling \$18.8 million for 2023–2026 and no funding for 2027–2033. Source: RDNA2 and author's estimates.

²¹³ The costs consider inflation, market conditions, surge pricing in construction, high insurance premiums, and a shift toward lower energy intensity and more resilient, inclusive, and modern designs.

CHAPTER 13

Health

13.1 Strategic Challenges

Ukraine has one of the worst health profiles in Europe, with high rates of mortality, morbidity, and disability, and its poor health outcomes and the consequent loss of productivity are contributing factors to the country's subpar economic performance. Life expectancy at birth was 71 years in 2020, 9 years below the EU average. In the same year, mortality from cardiovascular and chronic respiratory diseases, cancer, or diabetes for people aged 30–70 was 25 percent among men and 16 percent among women, both around twice the EU average. The prevalence of HIV and tuberculosis was among the highest in Europe in 2021 (World Bank 2023c; World Bank “Prevalence of HIV...”; World Bank “Incidence of tuberculosis...”). Health emerges as a very robust and sizeable predictor of subsequent economic growth in virtually all studies that have sought to explain differences in economic growth between rich and poor countries. A healthy population and a productive labor force are imperative to Ukraine's economic recovery. Health matters for several economic outcomes: wages, earnings, number of hours worked, labor force participation, early retirement, and the labor supply of those caring for ill household members (Suhrccke et al. 2005).²¹⁴

Russia's invasion has caused approximately \$2.5 billion in damage to the health sector, and total losses are conservatively estimated at \$16.5 billion. According to Ukraine's Ministry of Health, damage or destruction was reported in 15.9 percent of all public healthcare

facilities (1,574 facilities), as of February 2023, with affected facilities concentrated in the northeastern part of the country, such as the Donetsk, Kharkiv, and Chernihiv oblasts. Of all damaged facilities, 596 are pharmacies, 297 are primary health care centers (equivalent to 4.3 percent of all registered primary health care centers), and 295 are general hospitals (equivalent to 20.3 percent of all general hospitals registered). The actual level of damage is likely higher, given incomplete or missing reports on private facilities and those located in territories temporarily not under governmental control.

13.2 Sectoral Context

Failure to implement structural reform and inadequate investment over the last several decades have resulted in a healthcare system with important shortcomings that contribute to poor health outcomes. Despite large hospital capacity (Ukraine had 7.5 hospital beds per 1,000 population in 2015, higher than the EU average of 4.6 in 2018) (World Bank 2023g), the healthcare system fails to deliver quality services to the population due to, among other things, scant investment in modernizing Soviet-era infrastructure, inefficient management, underdeveloped primary care, poor availability of up-to-date therapies, outdated diagnostic equipment, lack of quality assurance systems, inefficient service delivery characterized by long hospital stays and little coordination between service providers, and outdated treatment protocols.

²¹⁴ The total conservative loss estimate includes the removal of debris and demolition of destroyed facilities, loss of income of private providers, losses from the financing of facilities, and additional losses associated with reduced health due to forgone care and increased public health threats.

The current system is organized and funded to prioritize curative over preventive services, hospitals over ambulatory services, and specialists over primary care. Having too many hospitals (and often too many buildings per hospital) drains resources that could be used for more cost-effective forms of care and leads to service duplication, high operating costs, and aging infrastructure due to inability to adequately refurbish and maintain existing hospitals. Suboptimal workflows negatively affect quality of care. Public financing is oriented around capacity (e.g., number of beds) rather than demand or quality of service, and there is little incentive to control costs or increase efficient use of resources. Private-sector participation in the health sector is highly fragmented, with a few large corporations, primarily based in and around Kyiv, dominating the market. The private sector in the Ukrainian health system consists of private hospitals, pharmacies, inpatient and outpatient diagnostic facilities, and physician networks. These facilities and networks are primarily financed through direct payments by patients (Goroshko 2018). While Ukraine has more than 10,000 licensed providers, mainly physician-owned clinics, there are only 21 large corporate players in the private health care market, of which the top 10 hold 40 percent of the market.

13.3 Obstacles to Private-Sector Participation

The private sector faces several financial barriers that constrain its participation in the health sector. These include limited access to financing, with unattractive interest rates and a very shallow pool of equity financing, and the limited use of private medical insurance. Private medical insurance, which is an important enabler of access to private medical services in other countries, represents just 1.1 percent of total spending on healthcare and around 2.0 percent of private healthcare spending (IFC 2021a). Progress on overcoming these constraints is held

back by lack of effective engagement between the private and public sector.

Regulations for quality assurance are often ineffective, sanitary standards imposed on providers are opaque and overly complex, and e-health legislation is underdeveloped. The overall approach to quality is fragmented rather than a systemwide effort to promote and monitor performance of service outcomes. Following a reform in March 2018, Soviet-era regulations on sanitary rules and standards are being revised to match international norms, but there is still a need for a comprehensive review and dissemination of new standards, as stakeholders seem largely unaware of current updates. There are also important regulatory and policy gaps that limit the adoption of e-health technologies, including regulation of telehealth services and EU-standard data-sharing protocols for electronic medical records systems, and regulations governing the use of big data in the health sector (WHO 2015).

Weak governance was repeatedly brought up by stakeholders as an important issue during an assessment conducted by IFC in 2021. Stakeholder consultations raise concerns about transparency in obtaining licenses, rules around state inspections, and the award of academic and professional qualifications. Although Ukraine improved its Transparency International Corruption Perceptions Index from a score of 26 in 2012 to 33 in 2022, it remains below the average of 35 for Europe and Central Asia (ECA) and well below the global average of 43 (Transparency International 2022).

The environment for implementing healthcare PPPs is weak. Ukraine has enabling legislation for PPPs, yet implementation is at risk because of a range of unresolved challenges that especially concern PPPs in the health sector. Healthcare PPPs, especially relating to hospitals, tend to be complex arrangements that require careful management of risk as they evolve. With the

need for rolling performance oversight, Ukraine's capacity to manage PPP contracts suffers from various constraints. For example, Ukraine established its first PPP agency in 2019 to support the implementation of PPP contracts, but the agency is at a very early stage of development. It has yet to define its responsibilities, governance, or risk mitigation mechanisms to address risks as they evolve over a project life cycle. Progress and completion of construction works under PPP contracts is not centrally tracked; given the complex nature of healthcare PPPs and their performance markers, this poses serious implementation risks (IFC 2021a).

13.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

In 2018, Ukraine embarked on a comprehensive health sector reform program that aligns with many modern health practices and represents an opportunity to modernize and transform healthcare, including through private-sector participation. Reforms include transitioning from a hospital-centric treatment model to an efficient decentralized system, with renewed focus on primary and preventive healthcare; from input-based to output-based financing, while ensuring outcomes; from a free-care-for-all system that imposes significant informal payments to a transparent benefits package; and from a heavily curative approach to a functional, integrated healthcare system. A national purchasing entity—the National Health Service of Ukraine—has been established to ensure a level playing field between the private and public sector (WHO et al. 2022). The transformation from an input- to an output-based system has gained momentum with the reorganization of primary healthcare: funding is now based on capitation payments per patient registered, instead of on fixed salaries.

Before the invasion, there was strong political support for healthcare PPPs. The Decree

of the President of Ukraine No. 261/2021 instructed cabinet ministers to ensure the effective application of PPPs in the health sector and implement a number of complementary reforms, including creating a 'capable hospitals' designation, providing a focus for investments, and establishing financial and operational autonomy for hospital organizations and other providers (WHO 2021, p. 8).

The GoU/Ministry of Health has been working on the optimization of the network of its public hospitals through the consolidation and restructuring of existing healthcare facilities. The Resolution on Capable Network, developed by the Ministry of Health and approved by the Cabinet of Ministers of Ukraine in 2023, is aimed at rationalizing public hospitals, increasing the efficiency of public resources, improving the quality of healthcare services delivered to the population.

Healthcare facility PPPs could assist with reconstruction and restructuring Ukraine's outsized hospital network impacted by the invasion, while diagnostic services PPPs could improve the provision of imaging and laboratory services essential for successful medical treatment. Under healthcare facility PPPs, private investors can finance, design, build, equip, and maintain new multidisciplinary hospitals that would replace existing outdated public hospitals under a national strategic consolidation program. Additionally, private partners can be responsible for operating some or all nonclinical services such as security, housekeeping, cleaning, maintenance, kitchen, laundry, waste disposal, and sterilization services. Diagnostic services PPPs are vehicles for private investors to finance, equip, maintain, and operate networks of radiology and laboratory diagnostic centers. Under such PPPs, private investors could provide state-of-the-art services while avoiding duplication, and they could benefit from economies of scale through hub- and-spoke organizational models, in which not all facilities

need to operate all equipment (e.g., using telemedicine to remotely interpret radiology scans).

13.5 Risk and Risk Mitigation

Perhaps the single most influential factor in determining whether a PPP will be successful is to accurately define a problem and its satisfactory solution before a PPP is proposed. This is particularly relevant for healthcare facility PPPs, given Ukraine's outsized hospital sector. Instead of simply replacing infrastructure damaged during the invasion or adding new capacity, PPPs should be used as a tool to consolidate the hospital network, with the aim of providing hospital services more efficiently. This must be clearly communicated to the government, and an overall hospital masterplan should be developed before new hospitals are planned.

The GoU may be too financially constrained to finance diagnostic services PPPs, and demand for diagnostic tests could be higher than expected. During due diligence, project teams will need to assess the government's potential financial contributions and their impact on public finances. Contractual arrangements need to ensure efficient mechanisms to monitor and control expenditures as well as to promote and ensure evidence-based prescribing of diagnostic tests.

The government may not have the capacity to act as a strong partner in the planning and implementation of PPP projects, especially if many projects start at the same time. There is a risk that projects may be delayed or mismanaged due to inadequate staffing, lack of experience, time constraints, etc. The PPP teams should mitigate this risk by engaging with dedicated steering committees for all initiated PPPs. There should also be capacity building in the GoU for PPP planning and implementation.

13.6 Financial Flow Projections

Quantifying possible private-sector financing in the health sector is difficult because the total needs to restructure Ukraine's hospital network are unknown and because the extent to which diagnostic services PPPs would be used is unclear. Before the invasion, the World Bank was engaged in discussions with the government about restructuring the hospital network, and it estimated in 2018 that the full implementation of a proposed hospital masterplan for the Lviv oblast would require capital investment amounting to around €2.3 billion (World Bank 2018b). Under the assumptions that other oblasts would require similar investments relative to the number of inhabitants, and that costs have not changed over time, the reconstruction of the entire national hospital network would require around €41 billion in capital investment. This estimate could increase to account for damage to hospitals.

Between 10 and 15 percent of the estimated investment needs could be financed through PPPs, given the government's implementation capacity. The level of capital investment that will go through diagnostic services PPPs will depend on the number of hospitals included and the level of services to be provided. Key issues will be the government's implementation capacity and ability to finance these services. In 2021, IFC estimated the cost of replacing 7 hospital laboratories in Lviv through a PPP at 31 million hryvnia (€771,000), while using a diagnostic imaging PPP to replace radiology departments in two of Lviv's major multi-profile hospitals would require 191 million hryvnia (€4.8 million) in capital investment. The level of capital investment required for a hospital PPP (infrastructure, equipment, and maintenance) has been estimated for similar projects to be around €100 million for a 300-bed hospital.

Table 13.1 Health Sector Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	3.6	12.7	16.4
Private sector financing for reconstruction—Non-reform scenario	0.0	0.0	0.0
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario	0.0	0.2	0.2
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified ^(a)	0.0	0.2	0.2

Source: RDNA2 and IFC estimates.

Note: includes a hospital PPP (\$200 million), Diagnostic imaging PPP (\$10 million) and diagnostic laboratory PPP (\$2 million). Assumptions: (i) donor funding is available to offset project capital expenses; (ii) blended finance are made available; (iii) suitable land plots have been identified and confirmed; (iv) There are at least 2 hospital PPPs for 100-bed hospitals, 2 labs and 2 imaging diagnostics projects. Reform and intervention includes: (i) for hospital PPPs, a health sector analysis of demand and supply is performed, and projects are developed to consolidate existing facilities; (ii) for diagnostics projects, a viability gap is performed to assess the fiscal impact of payment for services; and (iii) tariffs for services paid by the National Health Insurance Fund are updated.

CHAPTER 14

Education

14.1 Strategic Challenges

The private sector has the potential to play a critical role in rebuilding Ukraine’s education system by providing funding, innovation, and expertise. While there is a legislative framework for private-sector participation in education, bylaws are not adapted to encourage private-sector participation. Simplifying and streamlining regulations could enable private operators to implement education projects, expand the education network, and contribute to ensuring continuity of education services in partnership with public authorities. However, this will require greater cooperation between public authorities, especially the Ministry of Education and Science of Ukraine (MoES), and the private sector.

14.2 Sector Context

Prior to the invasion, Ukraine had an extensive education system with relatively high learning outcomes. It had a large network of education institutions, and enrollment was high across education levels. In 2021, there were 6.9 million students in Ukraine, from preschool to higher education, with 58 percent of people aged 30–34 having completed tertiary education (Eurostat 2023b). Moreover, Ukrainian students performed on par with their regional neighbors and better than the average for ECA, according to Harmonized Learning Outcomes data collected by the World Bank in 2018 (Angrist et al. 2021).

The private sector has a limited role in the provision of education in Ukraine. Before the

invasion, only about 3 percent of preschools and schools were private, with most working as for-profit institutions (State Statistics Service of Ukraine 2022d). The demand for private preschools and schools is relatively low, as public institutions enjoy a good reputation and are free (Institute for Education Analytics 2022). The situation is different in professional pre-higher and higher education, where private providers make up almost 20 percent of all education institutions, although their quality of education is, on average, lower than that of their public counterparts. There are also a multitude of private providers of adult training, but participation in these programs is low, with only 0.5 percent of adults participating in continuing education (European Training Foundation 2022).

The role of the private sector in education is regulated by the authorities. The government allows public funds to finance (to some extent) private schools (Zakon Rada 2023i) and higher education institutions.²¹⁵ It also introduced education subsidies under the ‘money follows the students’ principle for preschools (Osvita Nova 2020) and reskilling (Ukrinform 2023c), which means that private education providers can benefit from public funding based on a variety of factors such as enrollment and licensing. While PPPs are not widespread in education, they are recognized under Ukrainian law (MoES 2023), and the MoES is committed to expanding their use (Zakon Rada 2023j). This includes the creation of vocational programs with the participation of employers (MoES 2022), large-scale teacher training, and the establishment of technology parks (Parpan 2020).

²¹⁵ Students in private higher education institutions can benefit from social scholarships paid by the MoES (Zakon Rada 2022i)

14.3 Barriers to Private-Sector Involvement

All education institutions, including private, need to be equipped with a bomb shelter as well as an alarm system and additional security measures to welcome students for in-person classes, and teachers must have received first aid training. Moreover, private education institutions need to provide mental health and psychological support to their students.

While Ukraine has the legislative framework to allow for PPPs in education and the financing of private education providers, PPPs remain underutilized across the education sector, and limitations prevent the private sector from contributing as much as it could (Osvita Nova 2020). For instance, regulatory standards related to the creation of private preschools are difficult to meet, especially for home-based providers (Center for Economic Strategy 2020), and there is a lack of incentives for private providers to participate in the construction of educational institutions (Palazhchenko 2021).

Around 4.6 million children have been displaced both inside and outside of Ukraine, severely disrupting not only education providers' long-term planning but also enrollment and tuition collection.²¹⁶ In addition, many teachers have been displaced, with almost 13,000 teachers currently being located abroad. While many of them can work online, education institutions' routines have been gravely affected.²¹⁷

The invasion has pushed many households into poverty, reducing overall private spending on education and consumers' ability to pay for private education services. This could lead families to opt for public education, especially free public preschools and schools. This shift may

cause a decline in the quality of private education and limit the capacity of private providers to pay for staff salaries, which could ultimately lead some of them to cease operations. While the invasion has disrupted internet connectivity, online classes have provided a sense of stability across the education system. However, there is limited adoption of the latest approaches to learning and skills development pioneered by local and global educational technology (EdTech) innovators (UNICEF 2022). Digitalizing the education system in Ukraine will be key to address bottlenecks in access and quality.

Cooperation between public authorities and private education providers is minimal at the national level. In fact, the MoES does not strategically engage with private education institutions to solve the various challenges that exist across the education system, and it does not exploit the potential of the private sector.²¹⁸

14.4 Ongoing Developments and Emerging Opportunities

The invasion has had a deep impact on the Ukrainian education sector. The public sector will not be able to address all the challenges facing the education system alone. The private sector will therefore need to step in to support the recovery, not only through the direct provision of education services but also in partnership with the authorities. The private sector can support:

Infrastructure reconstruction: With more than 3,200 education institutions damaged since February 24, 2022, and their reconstruction costs estimated at \$7.8 billion (World Bank 2023e), the private sector can be mobilized to repair damaged infrastructure and build modern, safe, and energy-efficient facilities, in line with

²¹⁶ According to IOM and UNICEF estimates, around 4.6 million Ukrainian children have been displaced, either within or outside of the country

²¹⁷ According to the MoES, 12,585 of the country's teachers are located abroad.

²¹⁸ In November 2022, the MoES established a working group dedicated to private preschool and school education, which will gather representatives of the MoES, the public sector, and private education institutions (Osvita.ua 2022)

anticipated network optimization efforts. Thus, despite some shortcomings with the existing framework, PPPs could be leveraged to construct or renovate education infrastructure (Zakon Rada 2022j; Parpan 2020; Demina 2021). The private sector could also help further mainstream the use of prefabricated education buildings to replace destroyed infrastructure. While PPPs are not widely used to provide ancillary services, they could be mainstreamed for the organization of key services such as transportation or canteens.

Preschool education: The Ukrainian preschool system had already before the invasion been struggling with long queues and lack of schools, especially in urban areas. The invasion worsened this situation: many municipalities closed their preschools because of lack of funds, and the number of children enrolled in preschool decreased by more than 40 percent compared to pre-invasion estimates (MoES 2023b). There is an opportunity to use private providers, along with public financial support, to meet the demand for quality preschool services close to parents and communities, supporting parents to return to work and providing quality education for children.

Skilling and reskilling: The post-invasion recovery is expected to require specific skillsets in a variety of domains, from construction and science, technology, engineering, and math to agriculture and financial services (Institute for Education Analytics 2022b). To guarantee strong linkages with the needs of the labor market, many of these skills would be acquired through a dual education system (combining apprenticeships and vocational education) and private upskilling programs established through PPPs as well as by applying the ‘money follows the student’ principle. This would help ensure the relevance of the curriculum and could support the integration of IDPs into their communities. The private sector can also provide innovative approaches to upskilling, including online platforms and learning apps that can make the learning experience more affordable, cost-effective, engaging, and outcome driven.

Innovation in education: The private sector can offer EdTech solutions to help the government improve access and quality of education at all levels. In basic and secondary education, mobile learning apps and adaptive platforms can enhance learning and help tackle learning gaps that have grown exponentially during the invasion. EdTech can also support teachers and school leaders with tools for creating engaging lessons, new content, and assessments. Online learning platforms and alternative credentials can expand access to higher education and upskilling opportunities in an engaging, affordable, and cost-effective way. Finally, EdTech's data analytics capabilities can help manage school networks and resources and provide targeted support to teachers and parents.

14.5 Risk and Mitigation

Funding can come from both PPPs, which can assist with the reconstruction of education infrastructure, and public sources, which can financially support families enrolling in private services. Given the weak financial position of both the government and families, mitigation efforts include financial support from the (public and private) donor community, which could provide a dedicated stream of resources to ensure the financial sustainability and development of Ukraine’s education system. There are multiple funding mechanisms that the authorities can use, such as trust funds or multi-donor vehicles (World Bank 2023f), to support the government’s ability to provide education services through PPPs or concessions.

A share of Ukraine’s teaching force has migrated externally or is internally displaced, and many teachers suffer from low morale, compromising the availability of adequate human resources to sustain or improve the education system. Mitigation efforts include having the private sector partner with local education institutions to provide training on effective pedagogies and new education approaches, leveraging new educational technologies, as well as offer mentorship for

teachers and young people interested in entering the profession.

Mobilizing the private sector will require a minimum level of stability to ensure the safety of personnel and the sustainability of education investments. Mitigation efforts include having development partners, along with the Ukrainian authorities, closely monitor the situation to determine the appropriate timing of programs and reforms.

14.6 Financial Flows and Projections

IFC has experience in preparing PPP projects for the construction of schools using the private finance initiative (PFI) model. The PFI model has been used to attract private operators to finance, construct, and design a series of new schools over the term of a contract (15+ years) while the public sector delivers education services and maintains facilities. Under the PFI model, the private partner is compensated for the cost of financing and capital through availability payments. IFC has implemented these types of projects in Jordan, Uzbekistan, and Kosovo and throughout Latin America, with positive results. Under current conditions and given the existence of a PPP framework in Ukrainian legislation, a PFI model, supported by IFC, could be used in Ukraine to construct preschools as well as primary and secondary schools. However, to mainstream this practice and increase impact, the PPP framework for the construction of education

assets would need to be revised to create stronger incentives for private-sector involvement.

Based on precedent projects, IFC estimates that a minimum project size of ten schools of 1,300 student seats would cost approximately \$60–80 million in CAPEX, including new construction and equipment.²¹⁹ School PPPs as well as other infrastructure PPPs have a high potential for replication, which means that a successful pilot could be replicated in other regions, given high overall demand. Meeting unmet demand for preschools would also benefit from private-sector investments to address but not fully satisfy unmet demand. However, given existing limitations of the PPP framework in education, the launch of a pilot program for PPPs in education infrastructure would require a clear step-by-step implementation, with initial project preparation taking between 24 and 36 months (Table 14.1). Actual financial closing and mobilization would be likely taking place after 2026, in both the no reform and reform and intervention scenarios. In addition, these PPPs would most likely cover mainly the construction of new facilities, rather than the rehabilitation of those that were damaged or destroyed, due to high structural risks. Nevertheless, the adoption of a comprehensive framework for PPPs, coupled with a sector strategy for reconstruction of school and preschool institutions, considering demographic dynamics, would help streamline and facilitate this process over the long run.

²¹⁹ This is an indicative estimate. The actual cost will depend on the sizes of schools, local construction standards and costs, and supporting infrastructure and utilities.

Table 14.1 Education Sector Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)

	2023-2026	2027-2033	2023-2033
RDNA2 needs	4.3	6.4	10.7
Private sector financing for reconstruction—Non-reform scenario	0.0	0.0	0.0
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified	0.0	0.0	0.0
Private sector financing for reconstruction—Reform and intervention scenario	0.0	0.3	0.3
Addressing needs identified in RDNA2	0.0	0.0	0.0
Private sector financing as share of RDNA2 needs (%)	0.0	0.0	0.0
Other investment opportunities identified (a)	0.0	0.3	0.3

Source: RDNA2 and author's estimates.

Note: (a) Early childhood facilities, early childhood/preschools (\$100 million), and primary, lower secondary and upper secondary schools (\$160 million). Assumptions: donor funding is available to buy down project capital expenses; blended finance instruments are made available (e.g., guarantees, credit enhancement, credit lines, etc.) as no user payments are envisioned; suitable land plots have been identified and confirmed; at least two school PPP projects are implemented in 10 schools each; early childhood/preschool models may be less capital intensive.

PART IV: DOMESTIC PRIVATE FINANCE RESOURCE MOBILIZATION

CHAPTER 15

Finance and Banking

15.1 Strategic Challenge

Ukraine's financial sector remains small and dominated by banks, with small nonbank financial institutions (NBFIs) and shallow capital markets.²²⁰ Assets held by institutions regulated by the NBU amounted to \$85.9 billion, or 43 percent of GDP, in 2021, low relative to peer countries such as Poland (95.1 percent), Romania (63.6 percent), and Türkiye (112.7 percent) (NBU 2023b; World Bank 2020b).

Banks hold 88 percent of these financial assets, representing \$75 billion, a larger share than in Poland (76 percent), Romania (61 percent), and Türkiye (82 percent) (NBU 2023b; World Bank 2020b). SOBs composed just over half of the banking sector in 2022 (NBU 2023b). Capital markets are underdeveloped, with a total market capitalization of just \$2.5 billion in 2022 (Fitch Solutions 2023). In 2021, Ukraine's financial sector employed 205,442 people, representing 2.3 percent of total employment. Banks accounted for roughly half of the sector's workforce (State Statistics Service of Ukraine 2023f).²²¹

The small size of the financial sector inhibits savings and investment, weakens competition, and limits access to credit. In 2021, the financial sector mobilized 27.3 percent of GDP in deposits in Ukraine, lower than in Poland (62.2 percent),

Romania (39.6 percent), and Türkiye (68.6 percent) (World Bank 2020b).²²² This ratio dropped significantly from 45.5 percent of GDP in 2013, reflecting the post-2014 financial crisis transformation in the banking system because of unhealthy lending practices, together with insufficient supervision and the ensuing rise in distrust of the financial system in the aftermath of Russia's actions with respect to Crimea (World Bank 2020b).²²³ The banking sector lent 20.9 percent of GDP to the private sector in 2020, well below the average of 55.5 percent for low and middle-income countries in the ECA region. In 2019, 46.3 percent of private firms identified access to finance as a major constraint, far above the ECA average of 14.5 percent (World Bank 2019). Only 22.1 percent of firms have bank loans, much lower than the ECA average of 41.2 percent. Although Ukraine is close to achieving gender parity in top management positions and in firm ownership, women-led companies face bigger constraints in accessing finance. Only 7.9 percent of women-led companies in Ukraine report having a bank loan, much lower than an average of 37 percent in ECA (World Bank 2019).

Combined with the impact of Russia's invasion, these structural challenges weaken financial intermediation. As a result, the financial sector fails to channel needed resources for investments and private-sector growth. Banking

²²⁰ NBFIs comprise insurance companies, leasing companies, factoring companies, credit unions, and pawnshops.

²²¹ The number of the staff employed by the banking sector dropped from 98,615 at the end of 2021 to 81,562 as of October 2022.

²²² Financial system deposits to GDP (%). The low level of savings through the banking sector repressed total domestic savings to 13.2 percent of GDP in 2021, well below the ECA (excluding high-income countries) average of 30.7 percent (World Bank 2023g).

²²³ In Ukraine, 54 percent of unbanked adults listed distrust in the financial system as one of the reasons for their lack of an account, while globally it was cited by 23 percent of unbanked adults (World Bank 2021b).

sector metrics have further deteriorated amid the fallout from the invasion, as overall risk appetite in the sector has declined, leading to muted credit growth and higher liquidity with worsening asset quality. Addressing legacy problems and the impact of the invasion on the sector will be crucial to enable a healthy flow of finance to productive investments in the real sector and support a green and inclusive recovery.

15.2 Sector Context

The financial sector has been going through a turbulent transformation since the 2014-15 financial crisis. Having grown from a mere 12.2 percent of GDP in 2000 to 93 percent in 2014, financial assets sharply declined during the post-2014 banking sector restructuring period, reaching 43 percent in 2021 (NBU 2023b; World Bank 2020b).²²⁴ NPLs climbed from 3.9 percent in 2008 to a historic high of 56.1 percent in 2017, due to the 2014-15 crisis and widespread related-party lending (that started even before the crisis), especially in PrivatBank, which was transferred to state ownership at end-2016 (NBU “Loan Portfolio Quality (NPLs)”).²²⁵ The rise in NPLs has weakened banks’ capital, leading to decline in the capital adequacy ratio (CAR) from 18.3 percent in 2013 to 12.7 percent in 2016, limiting the sector’s ability to lend (IMF 2023d). Thanks to the recapitalization of SOBs and the gradual decline in NPLs after 2017, the CAR recovered to 22 percent in 2020. As of end-2022, the sector-level CAR was 19.7 percent (NBU 2023c).²²⁶ Although currently above the regulatory minimum of 10 percent, the true level of the CAR might be higher due to potentially higher losses from the invasion. The completion of an independent asset quality review will be

needed to clarify the health and adequacy of the banking sector capital base and understand the true level of the CAR.²²⁷

The dominant role of SOBs limits the market share of private banks. The government’s seizure of failed banks has increased the share of SOBs. With the nationalization of PrivatBank in 2016, SOB assets expanded from 28.1 percent to 51.3 percent of total assets in the sector. The market share of SOBs started declining in 2018 and reached 46.7 percent at end-2021. With the onset of the invasion, large retail deposit inflows into four SOBs drove the combined market share of SOBs to 50.6 percent (NBU 2023c).²²⁸

Ukrainian privately owned banks are largely fragmented. Forty-seven small Ukrainian privately-owned banks remain active, with a combined share of 19.9 percent of total banking sector assets (NBU 2023c). Only four of them have more than 1 percent market share. This fragmented structure creates significant scope for consolidation in the sector.

Foreign owned banks tend to be larger than their domestic private peers. As of end-2022, 16 foreign-owned banks accounted for 29.5 percent of the sector's assets (NBU 2023c). The largest foreign bank, Raiffeisen Bank JSC, ranks 4th in the sector in terms of asset size. There are also eight small foreign banks with less than 1 percent market share.

Banking sector metrics have deteriorated amid the fallout from the invasion, albeit to varying degrees among different banking groups. During the invasion, the share of corporate loans in total assets decreased both in private and foreign-owned banks, despite state-

²²⁴ The sector was significantly cleaned up as a result of the measures taken by the NBU in response to the 2014 crisis.

²²⁵ As of end-2022, PrivatBank accounts for 67.5 percent of legacy SOB losses (NBU 2023d).

²²⁶ As of September 2023, sector-level CAR was 25 percent.

²²⁷ The asset quality review was not yet completed at the time of publishing this report. However, according to the NBU, the preliminary results indicated adequate capital position of banks.

²²⁸ After the nationalization of Sense Bank on 20 July 2023, the number of SOBs increased to five and their market share to 53.2 percent

supported programs to encourage lending to corporates. Corporate and retail lending has been affected by the invasion amid suppressed demand, increased provisions, and decreased overall risk appetite in the sector, declining from 44 percent of total assets in 2021 to 37 percent in 2022 (NBU 2023c). NPLs increased in 2022 for all bank categories: from 47.1 to 53.1 percent among SOBs; from 10.5 to 23.6 percent among private banks; and from 5.8 to 18.8 percent among foreign-owned banks.²²⁹ Total deposits increased from 86.0 percent of total liabilities in 2021 to 90.2 percent in 2022. Foreign currency denominated deposits accounted for 35 percent of total deposits in 2022, up from 33 percent from in 2021 (NBU 2023c). Foreign currency denominated loans declined from 33.8 percent of total loans in 2021 to 31.1 percent in 2022 (NBU).

Overall liquidity in the system has increased thanks to international assistance and declining financial intermediation during the invasion. The loan-to-deposit ratio declined sharply from 66 percent in 2021 to 52 percent in 2022. Overall liquidity, measured as liquid assets to total assets, increased from 44 percent in 2021 to 52 percent in 2022. Excess liquidity can also be observed in the increase in NBU Certificates of Deposits and correspondent-account balances, which rose from 18 percent to 31 percent of total assets during the same period (NBU). As a result, the share of high-quality liquid assets and the liquidity coverage ratio increased across the banking sector.

NBFIs in Ukraine remain small, and they were brought under NBU supervision in July 2020.²³⁰ After more than 420 institutions lost their licenses in 2022, 1,331 NBFIs remain active, representing a 12 percent share in the NBU-regulated financial sector. In 2022, the total

share of NBFIs in the financial sector decreased slightly, while insurers and finance companies' assets grew by 10 percent and 13 percent, respectively (NBU 2023b).

The Ukrainian capital market remains underdeveloped. It is not a major source of finance for investments and is unable to provide local-currency financing to companies. The equity market remains insignificant, with the total market capitalization of the two largest stock exchanges (the PFTS Stock Exchange and the Ukrainian Exchange) being around \$2.5 billion as of December 2022. Fewer than 60 companies are listed on the Ukrainian Exchange. More than 80 percent of securities trading at Ukrainian exchanges consist of transactions in government bonds, with less than 10 percent in corporate bonds (Fitch Solutions 2023).

15.3 Obstacles to Private-Sector Participation

The large footprint of SOBs distorts private-sector participation and competition. While SOBs no longer provide (preferential) loans to politically connected business groups, the historical practice continues to impact their balance sheet, notably the share of NPLs in total loans (World Bank 2019c). Recent reforms have significantly improved transparency and governance. SOBs are also active participants of state support programs with foreign banks.²³¹ Loans granted under these programs accounted for 18 percent of net hryvnia corporate loans in 2021. Since the invasion, lending took place almost exclusively through these programs, and as of December 2022, loans granted under the program reached 26 percent of net hryvnia corporate loans. SOBs account for 40 percent of all publicly supported approved loans (NBU

²²⁹ At the end of November 2023, the NPL ratio for SOBs was 48.8 percent, for private banks is 18.5 percent, for foreign-owned banks is 16.7 percent (NBU "Stability").

²³⁰ Before July 2020, they were under the supervision/regulation of the National Commission for State Regulation of Financial Services Markets.

²³¹ SOBs have also a significant share in domestic government securities, mainly provided during recapitalization periods.

2022a). In 2022, retail deposits held at SOBs rose to more than 60 percent because of large inflows of government payments to SOBs' current accounts (NBU 2023c, 2023d).²³² The NBU increased the key policy rate on June 3, 2022, and has been changing the reserve requirement ratios, aiming to increase the share of long-term retail deposits to strengthen its liquidity position (NBU 2022b; NBU 2023e). Weak insolvency and the poor debt resolution framework that suffers from lack of enforcement have reduced lending by otherwise well-managed banks. Inefficiencies in debt resolution and recovery processes and procedures affect the risk appetite of lenders, leaving most firms unable to access loans. Although the time to enforce contracts (378 days) was lower than in most peer countries (685 days in Poland, 512 days in Romania, and 623 days in Türkiye), the cost of claims (46.3 percent) was significantly higher than in peers as of 2020 (25.8 percent in Romania, 19.4 percent in Poland, and 24.9 percent in Türkiye). Also, the recovery rate was low compared to peers at just 9 cents on the dollar (34.4 cents in Romania, 60.9 cents in Poland, and 10.5 cents in Türkiye) (World Bank 2020c). Combined with a lack of professional asset managers and weaknesses in the legislative framework, these challenges discourage banks from lending. Poor enforcement of creditor rights widens the risk premium (the interest rate spread was 8.6 percent in 2021, much higher than the ECA [excluding high-income] average of 4 percent) (World Bank 2023g).²³³ The high interest rate owing to high-risk premia reduces incentives for accessing banking services. As a response, the government has adopted a program to support access to finance (Box 15.1).

Lack of alignment of the regulatory framework and supervision with internationally accepted standards reduces the attractiveness of the sector to foreign investors. Key areas where reform efforts need to concentrate include, inter alia:

- i. Insolvency and debt resolution mechanisms: Effective enforcement measures, such as foreclosure and sales of collateral²³⁴ as well as an NPL resolution mechanism, will be critical to strengthen creditor right.
- ii. Corporate governance: In addition to recent efforts to strengthen corporate governance, further improvements are needed such as aligning the procedures of mergers, acquisitions, divisions, and spin-offs of joint stock companies with international standards.²³⁵
- iii. The non-bank financial sector (NBFS) and capital markets development: Market infrastructure should be modernized to meet EU requirements, in line with the previously approved Concept of Capital Market Infrastructure Reforms.²³⁶ Expanding the NBFS will help diversify sources of finance, which will require improving sector frameworks and supervision as well as increasing financial literacy on the demand side. In the insurance segment, capacity improvements are critical, as the sector has struggled to gauge the claims arising from Russia's invasion. Aligning with EU regulations will require increasing consumer protection and implementing the EU solvency regime requirements.

²³² The Herfindahl–Hirschman index (HHI) is calculated at 1,759 for retail deposits, indicating a high level of concentration (NBU 2023c).

²³³ These ratios were 11.2 percent and 3.9 percent for Ukraine and ECA (excluding high income), respectively, in 2022.

²³⁴ Recent efforts include the creation of a mechanism for the voluntary financial restructuring of company debt, tax exemptions for banks and retail borrowers for the restructuring and cancellation of foreign exchange loans, and the establishment of an institution to manage the bankruptcy of individuals.

²³⁵ The corporate governance structure of joint stock companies was strengthened in areas such as preventing self-dealing by directors and simplifying the procedures for electronic shareholders by a law that came into force in January 2023. Some of the provisions will become effective in 2024.

²³⁶ The full deployment of the modern depository, settlement, and clearing infrastructure of capital markets needs to be finalized.

Box 15.1 The Affordable Loans 5-7-9 Program

The Affordable Loans 5-7-9 Program was created in February 2020 to facilitate access to finance for sole proprietors and small/micro enterprises, with the aim to enable them to implement investment projects. The program provides an interest rate subsidy that reduces interest rates paid by the borrower to 5, 7, or 9 percent, depending on the sector, and reimburses banks for the differential to the market rate. The subsidy is structured based on the type of lending and purpose:

- up to 5, 7, or 9 percent per annum for loans provided for investment purposes;
- up to 7 or 9 percent per annum for loans provided to finance working capital; and
- up to 15 percent per annum for loans provided to individual entrepreneurs.

As of December 2022, the program accounted for 26 percent of the net corporate bank loan portfolio, dominated by agriculture (53 percent), followed by retail (24 percent) and industry (14 percent). At that time, 45 banks participated in the program, and 40 percent of the approved loans were issued by SOBs (NBU 2022a).

To maintain access to the program, debtors have to remain current on their debt service. Prior to Russia's invasion of Ukraine, the NPL ratio on the loans was 1 percent, which has since the invasion increased to 8 percent, as of November 2022, compared to an average NPL ratio of 30.27 percent. The prevalence of zero-rate loans, rising market interest rates, and rapid portfolio growth have increased the required subsidies, from a budget of 3 billion hryvnia (\$1 billion) to 9 billion hryvnia (\$2.5 billion). To understand the impact of the program, the authorities could undertake a cost-benefit analysis.

The program provides small and micro enterprises and farmers with access to finance, which they would otherwise not have, at substantial economic cost. In addition to the fiscal cost, the program does not solve the fundamental imbalances in Ukraine's financial sector. While banks continue to accumulate the liquidity and are subject to tight monetary policy, the program incentivizes moral hazard. Administrative decisions for allocating loans distort the business landscape. Combining the program with incentives to develop markets could over time provide access to credit to the target groups while strengthening the banking sector.

15.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

While Russia's invasion has resulted in only modest damage to the physical infrastructure of the financial system, its indirect impact has been very large, with rising NPLs and losses estimated at \$6.8 billion (RDNA2).²³⁷ Bank lending has

contracted by 7.6 percent as of March 2023. NPLs increased sharply from 26.6 percent in February 2022 to 38.8 percent in March 2023 (NBU 2023f).²³⁸ In the same period, NPL provisions increased by \$1.9 billion, limiting banks' ability to lend (NBU). Furthermore, banks' placements into government securities declined from 30 percent at end-2021 to 23 percent at end-2022, before starting to edge

²³⁷ NPLs have increased across all lending portfolio categories, including retail and individual entrepreneurs (16 percent, \$1.9 billion); micro, small, and medium-sized enterprises (36 percent, \$4.3 billion), and corporate loans (47 percent, \$5.6 billion).

²³⁸ At end-November 2023, the sector-level NPL ratio was 37 percent.

up in 2023 as banks leveraged these securities to meet the NBU reserve requirements (NBU 2022a, 2023g).

The NBU has revoked the licenses of six banks that have been declared insolvent. Following the invasion, the NBU revoked the licenses of two small Russian banks, Sberbank and Vneshekonombank.²³⁹ A new law has been put in force to take control of assets owned by sanctioned individuals.²⁴⁰ Considering the potential closure of privately-owned banks that are at risk of insolvency, this may lead to the reprivatization of these assets.

The NBFS offers significant growth potential over the long term, even though its growth has slowed down in recent years due to stricter regulatory and supervisory measures. The NBFS grew by 36 percent during 2018-2019 and 23 percent during 2020-2021. The NBU assumed the responsibility for the supervision of NBFIs in July 2020 and enforced tighter measures such as strengthened requirements to reporting, compliance with ratios, disclosure of ownership structure, protection of consumer rights, disclosure of the full cost of loans,²⁴¹ and the extension of anti-money laundering/combating the financing of terrorism laws to the NBFS. These requirements led to the closure of 422 NBFIs in 2022, leaving 331 NBFIs left in operation (NBU 2023b).

Despite a scaled-down physical network in the banking sector (number of branches, points of service, etc.), the payment system has continued functioning, thanks to increased use of digital financial services (DFS). DFS is estimated to have

mitigated the effect of a 20 percent reduction in the number of branches and 16 percent in the number of points of service (NBU 2023c; S&P Global Ratings 2023). The number of people who use digital payments (the largest segment of the market) rose from 10.62 million in 2017 to 20.38 million in 2022. The total value of digital payment transactions was an estimated \$10.6 billion in 2023, nearly 5 times the value in 2017 (\$2.2 billion) (Statista “FinTech – Ukraine”).

During the invasion, more Ukrainian companies started to expand their business to Europe and the US, and 12 and 9 percent of Ukrainian fintech companies (FCs) are active in these markets, respectively. However, funding from owners and private investors continues to be the main sources of capital that drive these companies’ growth, as alternative sources of funding remain very limited.

Deepening and expanding DFS contribute to the broadening of financial inclusion. FCs started to operate in Ukraine in 2017 and have grown since the adoption of the Law on Financial Services in 2020. The Payment Services Law came into force in 2022. FCs outperformed banks during both the pandemic and the ongoing invasion. The unprecedented growth of financial inclusion, from 53 percent in 2014 to 84 percent in 2021, is due the deepening and expansion of DFS, FCs, and payment service providers (World Bank 2021b). Following the initial shock of the invasion, the industry started to recover in July 2022. With eight new players that entered the market during 2022, the total number of FCs has reached over 300, and their assets are valued

²³⁹ Decree of the President of Ukraine on the Forced Seizure in Ukraine of Objects of Property Rights of the Russian Federation and its Residents, approved in May 2022. This decree provided the legal basis for assuming control of the Ukrainian subsidiaries of the Russian Sberbank and Vneshekonombank.

²⁴⁰ In April 2023, the Verkhovna Rada passed Bill No. 9107-1, which lays down the grounds to nationalize private banks owned by sanctioned individuals. The bill authorizes the NBU to ban a sanctioned person from acquiring or increasing bank ownership, or to withdraw a systemically important bank from the market (nationalization) in the absence of signs of insolvency. Following the president of Ukraine signing the bill on June 16, 2023, Sense Bank, which was defined by the NBU as a systemically important bank in March 2023, was nationalized on July 20, 2023.

²⁴¹ Regulation on Supervision of Compliance with Consumer Rights Protection Legislation was enforced on July 14, 2021. The effective interest rate on NBFIs’ lending products was above 400 percent per year.

at about \$1 billion. FCs that focus on technology and infrastructure account for about 25 percent of the total market share, followed by payment/money transfers (14 percent) and personal and consumer lending (12 percent) (UAFIC 2023).²⁴²

Ukraine's well-functioning credit reporting system offers an opportunity to expand banking services to SMEs. Ukraine has one of the oldest credit reporting systems among peer countries in the region, covering almost 100 percent of retail and SME loans. It includes a credit register of the NBU and seven credit history bureaus that store and share information about more than 90 percent of individual borrowers and SMEs.²⁴³ The country's mature credit reporting system facilitates effective risk analysis and supports the continued expansion of financial access.²⁴⁴ The system has operated without interruption during the invasion. Starting in Q4 2022, the credit information of Ukrainian individuals and SMEs has been made available to the nine EU countries that host the largest shares of Ukrainian refugees, including Poland, Moldova, and Georgia (IFC 2022).²⁴⁵ Among Ukrainian migrants abroad, the share of those working or learning a profession has increased (NBU 2023h). Ukrainians who return after the end of the invasion will be able to leverage improvements in their credit history abroad.²⁴⁶ Emerging demand for long-term financing of infrastructure offers a market opportunity as Ukraine's growing private pension system seeks long-term investment options. (Chapter 16).

15.5 Risk and Risk Mitigation

Russia's invasion of Ukraine substantially increased the operational risks of banks amid deteriorating macroeconomic conditions. Timely action from the NBU taken under martial law provided banks with guidance on how to manage sudden rises in operational risks. Initially, the NBU provided ample liquidity that allowed banks to honor all cash withdrawals, including those from Ukrainian refugees residing abroad. An imminent increase in money supply fueled inflation, which rose from 10.7 percent in February 2022 to a peak of 26.6 percent in October 2022. In response, the NBU increased the policy rate from 10 percent to 25 percent in June 2022 (NBU 2022b)²⁴⁷ while devaluing the hryvnia by 25 percent to 36.57 hryvnia per US dollar in July 2022 (NBU 2022c). Initially, martial law allowed debtors to defer loan repayments to banks. This forbearance was later revised and wound down.²⁴⁸ As debt service obligations were gradually reinforced during 2022, the reported level of NPLs started to pick up, increasing from 27.1 percent in March 2022 to 38.8 percent in March 2023 (NBU 2023f). In the current context with reduced loan monitoring and bank oversight, the creditworthiness of loans remains difficult to assess until a comprehensive asset quality review is conducted.

Banks tightened risk management after interest rates were increased in June 2022, and loan volumes have contracted since July 2022. As

²⁴² Others are engaged in legal tech, insure-tech, wealth management, analytical systems, cybersecurity, neo banking, blockchains, embedded finance, etc.

²⁴³ There are seven credit bureaus, and three of them represent the largest share of the markets, with the UBCH keeping more than 80 percent of market information, while the remaining four cover non-significant market data or are dormant.

²⁴⁴ Private credit bureaus are not licensed. NBU regulated financial institutions are mandated to share data with at least one private credit bureau based on borrowers' consent. In the meantime, private credit bureaus are not limited in processing data from non-regulated institutions (like MNOs) based on bilateral agreements and consumers' consent.

²⁴⁵ This was supported by IFC's Digital Data Corridors initiative.

²⁴⁶ As of March 2023, out of 8.2 million refugees, 5 million were registered for temporary status in the EU (UNHCR 2023), while 77 percent of Ukrainian refugees plan to return after the invasion (UNHCR 2023b).

²⁴⁷ The decision to keep the key policy rate at 25 percent per annum was approved by the NBU on March 16, 2023, and came into effect on March 17, 2023. The NBU cut the rate to 22 percent at the beginning of the monetary policy easing cycle on July 28, 2023 (NBU "Key Policy Rate"). In December 2023 the policy rate was further reduced to 15 percent.

²⁴⁸ After a temporary restriction introduced following the launch of Russia's invasion, the NBU, starting in July 2022, has been gradually restoring the list of reports submitted by banks for the purpose of performing its regulatory and other functions.

of June 2023 (latest available data), deposit dollarization is 36 percent (compared to 45 percent in 2015), comparable to foreign currency denominated loans that also fell during the same period, from 56 to 27 percent of loans (NBU 2023i). Managing foreign exchange risk is complicated by the absence of a futures market,²⁴⁹ which is both a cause and an effect of small foreign participation in the government bond market. Only 5 percent of local currency debt is held by non-residents, while 55 percent is held by the NBU and 32 percent by the banking sector (Fitch Ratings 2023). In the absence of market-based instruments to manage risks, banks and other creditors have resorted to over-collateralizing (the value of collateral needed for loans is 173.6 percent, higher than the ECA average of 164.2 percent) (World Bank 2019). Overcollateralization has limited the flow of credit into the economy, affecting the growth of the private sector and SMEs, which must rely on internal resources to fund investments.

The development of a market for distressed assets could facilitate banks' risk management of corporate debt. Distressed assets are currently considered as discounted receivables, which are treated as factoring assets by entities with factoring licenses. Legislation to allow the establishment of asset resolution companies is being considered to limit bank NPL losses and improve recovery of distressed assets, contributing to bank lending. In addition, banks can explore alternative loan guarantee mechanisms to allow SMEs with financing problems to access loans without collateral.

Banks' liquidity risk can be managed by obtaining liquidity from non-depository sources. While banks are currently liquid, capital structures could limit the risk of an erosion of bank balance sheets. Subordinated bonds are

considered part of regulatory capital and could help to protect the capital adequacy ratio as bank lending increases.

15.6 Financial Flows and Projections

The potential of Ukraine's financial sector to attract private capital will depend largely on the quality of the regulatory framework and demand for credit. In collaboration with the IMF, WBG, and EC, the authorities are addressing regulatory issues related to the banking system and the enforcement of creditor rights. The impact of these changes on demand for credit will vary depending on developments in other sectors, some of which require regulatory changes, and if the authorities pursue reforms and interventions.

- **No reform scenario:** This scenario assumes that no significant reforms take place and follows the IMF baseline projections for both GDP and credit growth. Credit to the economy is projected to increase from 16.1 percent of GDP in 2022 to 25.8 percent in 2033, under the assumption of an average annual bank credit flow to the economy of 1.5 percent of GDP (IMF 2023b). Despite a moderate increase, this is below the ECA average of 55.5 percent in 2020 (World bank 2023g).
- **Reform and intervention scenario:** This scenario follows the IMF upside scenario and projects the average growth rate to be 0.7 percentage points higher than under the baseline scenario. It also expects higher growth that boosts demand for credit, increasing the credit-to-GDP ratio to 56 percent of GDP. Higher GDP growth, combined with a rising share of credit in the economy, is projected to boost average credit flow to GDP to 5.2 percent.

²⁴⁹ There are no data available for the forward market, but the total amount of financial commitments (off-balance sheet) is \$16.4 billion. This number may include derivatives plus other commitments. The fair value of derivatives on the balance sheet is \$0.1 billion. Both figures are dated February 2023. As a result, the derivative market/hedging instruments are insignificant.

Table 15.1 Finance and Banking Needs and Private-Sector Financing
(\$, billions, 2023 prices, unless otherwise indicated)⁵⁸¹

	2023-2026	2027-2033	2023-2033
RDNA2 needs	6.5	0.3	6.8
Private sector financing for reconstruction—Non-reform scenario	7.8	7.3	15.1
Addressing needs identified in RDNA2	4.1	0.2	4.3
Private sector financing as share of the RDNA2 needs (%)	63.1	66.6	63.3
Other investment opportunities identified	3.7	7.1	10.8
Private sector financing for reconstruction—Reform and intervention scenario(a, b)	12.1	14.9	27
Addressing needs identified in RDNA2	4.1	0.2	4.3
Private-sector financing as share of the RDNA2 needs (%)	63.1	66.6	63.3
Other investment opportunities identified	8.0	14.7	22.7

Source: RDNA2 and author's estimates.

Note: (a) Assumes that economic growth will follow the IMF's (2023) upside scenario and that there will be a steady increase in the non-government-credit-to-GDP ratio from 16.2 percent in 2022 to 56 percent in 2033. (b) Reforms include strengthening creditor rights and bolstering solvency and debt resolution mechanisms.

²⁵⁰ The results presented here can differ depending on the impact of the invasion, which could be revealed by an asset quality review to be done by the NBU. The sources and mechanisms to finance the needs are not covered by this report.

CHAPTER 16

Pensions

16.1 Strategic Challenges

After 18 years of operation, Ukraine's pension funds remain extremely small. At end-2022, the total value of assets held by non-government pension funds amounted to 4.1 billion hryvnia (\$113.4 million) (National Securities and Stock Market Commission 2023), representing an insignificant share of GDP (0.078 percent), much lower than in peer countries such as Poland (7.3 percent), Romania (7.8 percent), and Türkiye (3.3 percent) (OECD 2021f). The level of contribution to pension funds is also quite low, reaching 201 million hryvnia in 2022, down from 240 million hryvnia in 2021 (National Securities and Stock Market Commission 2023). The total number of participants in the pension system was 887,800 at end-2022, which is only 8.2 percent of the country's working population. Household bank deposits were \$28.6 billion (1,045.7 billion hryvnia) at end-2022 (NBU), 252 times larger than total pension fund assets, further illustrating the underdevelopment of Ukraine's pension funds.

The limited footprint of Ukraine's pension funds is due in part to the voluntary nature of its pension schemes. Other countries in the region, such as Poland in 1999, Romania in 2008, and Türkiye in 2017, have established mandatory pension schemes and accumulated substantial assets over time. Being voluntary, Ukraine's pension system is not widely popular. Most employees are not willing to pay contributions, while companies (on behalf of their employees) represent 81.6 percent of contributions paid since the system's inception. As a result, the voluntary pension system in Ukraine is smaller in size than it could be with a mandatory system.

16.2 Sectoral Context

The country's pension funds have gradually increased since the voluntary private pension scheme (3rd pension pillar) was introduced in 2004. Total pension assets peaked at 0.16 percent of GDP in 2014. After Russia's actions with respect to Crimea, Donetsk, and Lugansk in 2014 and the ensuing financial crisis, the value of pension assets dropped to 0.10 percent of GDP in 2015, before falling further to 0.08 percent of GDP in 2017. Between 2018 and end-2022, the value of Ukraine's pension assets fluctuated between 0.07 and 0.08 percent of GDP (National Securities and Stock Market Commission).

There were 58 pension funds operating in Ukraine as of end-2022, and most of them (69 percent) were concentrated in Kyiv. By law, pension funds cannot be involved with asset management and payment administration. In total, there are about 300 asset management companies in Ukraine, with 32 companies providing asset management services to pension funds, while 19 companies are licensed to administer non-state pension funds and provide such service.²⁵¹

A significant share of the pension sector is owned by state organizations. The pension funds of the NBU and the SOB Ukreximbank are the biggest in the country. The NBU provides asset management, administration, and custody services for its pension fund, which has total assets worth 1.779 billion hryvnia (\$48.6 million). Ukreximbank's pension fund represents 8.6 percent of total pension assets, with assets worth 348.5 million hryvnia (\$9.5 million). Unlike the NBU, Ukreximbank

²⁵¹ These are often the same companies that have asset management licenses (UAIB 2023).

does not provide its own pension-related asset management services. Instead, it has contracted an asset management company to provide asset management and administration services. Together, the value of these two funds amounts to 2.127 billion hryvnia (\$58 million), representing 51.3 percent of total pension assets.

There is limited foreign participation in Ukraine's pension funds. OTP Capital (a member of the Hungarian OTP Group) is the only foreign company in the country's pension fund market, with funds totaling 383 million hryvnia (\$10.5 million), representing a market share of 9.2 percent. Thanks to its close cooperation with OTP Bank, this fund is the second largest in the country. Following the financial crises of 2008 and 2014, subsidiaries of foreign financial groups such as BNP Paribas, Raiffeisen, SEB, and Sberbank Russia closed their asset management businesses in Ukraine.

Privately owned pension funds are largely fragmented. One private asset management company provides services to five pension funds, accounting for 18 percent of total pension assets. Other private companies represent an insignificant share of the market.

Oligarchs' influence on the industry is limited. No oligarch holds significant influence over the country's pension funds. Only one pension fund is owned by oligarchs, with total assets worth 346 million hryvnia (\$9.5 million), representing a market share of 8.4 percent.

Since July 2020, pension funds and pension fund administrators have been supervised by a single regulator, the National Securities and Stock Market Commission (NSSMC) (NSSMC "Information guide...").²⁵² The number of pension funds and administrators has remained

unchanged following the involvement of the NSSMC.

Ukraine's capital markets remain underdeveloped, affecting pension fund assets and investment returns. In 2022, the total volume of trading in financial instruments on the three stock exchanges in Ukraine was 160.6 billion hryvnia (\$4.393 billion),²⁵³ 97 percent of which comprised transactions for government bonds (both local and Eurobonds). Pension funds are allowed to invest in the following assets in the domestic capital market: government and municipal bonds, corporate bonds, mortgage bonds, equities, bank deposits, and precious metals. Since pension funds are limited by law to invest no more than 50 percent in government bonds, the aggregated portfolio of pension funds consists of: government bonds (45 percent of assets); cash (bank deposits) (40.2 percent); corporate bonds (9 percent); real estate (2.6 percent); equities (1 percent); precious metals (0.4 percent of assets); municipal bonds (0.3 percent); and other assets (1.5 percent).

There are limited opportunities for pension funds to invest in foreign securities. Pension funds are permitted to invest not more than 20 percent of assets in foreign assets, including government bonds, IFI bonds, corporate bonds, and equities (The law of Ukraine on non-state pension provision #1957-IV dated 9.07.2003). The process of investing abroad is tightly regulated by the NBU. Currently, it is not possible to transfer cash abroad for the purpose of such investments.

Investment returns for the country's pension funds were relatively low last year. The average rate of return for the country's pension funds in 2022 was 6.66 percent, while inflation peaked at 26.6 percent in the same year (State Statistics Service of Ukraine). By contrast, the five largest

²⁵² Before July 2022, they were under the supervision/regulation of the National Commission on Financial Markets.

²⁵³ These regulations are in line with standard international practice. Poland, for example, initially restricted pension assets invested abroad but eventually relaxed this requirement. Georgia (2nd pillar established in 2019) established a limit of 20 percent of assets invested abroad, while Romania has an overall limit for investments in EU.

pension funds demonstrated rates of return equal to or higher than inflation over the past five years. Larger pension funds are able to generate better returns due to more professional management and economies of scale.

16.3 Obstacles to Private-Sector Participation

Several important obstacles hinder the private sector’s involvement in Ukraine’s pension fund market, including: (i) mistrust in financial institutions and long-term investments; (ii) weak regulation of capital markets; (iii) high inflation rates, averaging 15 percent over the last 10 years; (iv) limited investment opportunities; and (v) failure to finalize the funded pension scheme (2nd pension pillar), which is still under discussion.

Due to a long list of unsuccessful financial institutions, ranging from depreciation of deposits in the former Soviet Savings Bank to bank failures in 2015-16, Ukraine’s citizens lack trust in long-term investments. This mistrust is partly a consequence of weak regulation by the NSSMC, which lacks sufficient authority compared to that of the NBU. Many Ukrainians do not have access to a wide array of financial investment instruments that can be used to offset the high level of inflation.

Furthermore, despite its potential as a powerful financial resource, implementation of the 2nd pension pillar remains subject to ongoing political discussions.

The authorities can improve the country’s pension sector by adopting significant reforms that are currently being discussed. First, they should consider addressing longstanding gaps in the authority of the NSSMC relative to international standards set by the International Organization of Securities Commissions, as

highlighted in recent IMF country reports.²⁵⁴ This would significantly enhance the NSSMC’s powers, independence, institutional capacity, and mandate for cross-border and domestic cooperation. Second, the limitations imposed by the NBU regarding investments abroad should be lifted or conceptually reviewed. Similarly, the limitations in the special pension law, which restricts investments in foreign securities to no more than 20 percent of pension assets, should be reconsidered. Finally, the long-awaited law to introduce the 2nd pension pillar should be passed and implemented.

16.4 Ongoing Developments, Emerging Opportunities, and Private-Sector Strategies

The invasion had a significant impact on Ukraine’s capital markets, including the value of pension assets. On June 2, 2022, the NBU raised its key policy rate by 15 percentage points, bringing it to 25 percent per annum. This was a response to accelerated inflation, which reached 26.6 percent by end-2022 (State Statistics Service of Ukraine). As a result, interest rates for government bonds and other instruments increased sharply. None of the pension funds’ rates of return were able to surpass the inflation rate, and 19 funds experienced losses in 2022. The stock market infrastructure—including the stock exchanges, National Depository, and Settlement Center — has continued to function thanks to the expansion of digitalization.

Under the EU Association Agreement, Ukraine is required to implement directives to regulate asset management and pension funds. Despite the recent implementation of MiFID II (ESMA 2014) and its integration into Ukrainian legislation, the market is still awaiting the introduction of new regulations for the pension sector, including EU Directive 2009/65/ EC on the coordination of

²⁵⁴ Section 67, International Monetary Fund, “Ukraine: Request for an Extended Arrangement Under the Extended Fund Facility and Review of Program Monitoring with Board Involvement-Press Release; Staff Report; and Statement by the Executive Director for Ukraine,” IMF Country Report 2023, No. 132 (March 1, 2023); <https://doi.org/10.5089/9798400240270.002>.

laws, regulations, and administrative provisions related to undertakings for the collective investment in transferable securities (UCITS), as well as Directive 2011/61/EU on alternative investment fund managers and amending directives (AIFMD). Additionally, special regulations for pension funds should be implemented in accordance with EU Directive 2016/2341 on the activities and supervision of institutions for occupational retirement provision (IORPs). These new regulations would make the Ukrainian pension fund industry more transparent and understandable for foreign investors.

Pension fund administrators utilize specialized ICT solutions for accounting purposes. These solutions concern participant information, pension contributions, profits and losses, retirement cash balances, and pension payments. Some of these already exist and are in use but need to be updated to facilitate remote client servicing, digital client signatures, mobile applications, and more. Since no pension fund has more than 500,000 participants, plans to implement a mandatory pension system need to consider the limited capacity of existing infrastructure.

Several legal initiatives focusing on the pension sector are under consideration by the Verkhovna Rada. These include: (i) Draft Law 5865 on Amendments to the Law of Ukraine on State Regulation of Capital Markets and Organized Commodity Markets; and (ii) Draft Law 9212 on the Accumulative Pension Provision. These draft laws, if passed, would improve Ukraine's capital markets, opening up a significant volume of assets to be invested in a wide range of financial instruments, as well as numerous opportunities for the private sector to offer new services for pension assets.

16.5 Risk and Risk Mitigation

Ukraine's pension funds face significant risks and challenges, including operational, commercial,

currency, personnel, ICT, and political risks. Russia's invasion has increased operational risks. The invasion led to the suspension of financial transactions involving securities, except for government bonds issued since February 2022. This resulted in restrictions and losses for pension funds. The NBU also increased its policy interest rate, further impacting the investment environment. While some of these restrictions were later lifted, it remains difficult to anticipate and protect against future operational risks.

Commercial risks in the Ukrainian pension funds industry continue to grow. In 2023, the NSSMC implemented new requirements for the liquidity of assets of asset management companies to remove unreliable asset managers from the market. Gross assets under management fell by 0.3 percent to 537 billion hryvnia at end-2022, in contrast to the growth in gross assets under management observed in 2021 (UAIB "Annual review"). Stagnation in the asset management business in 2022 may have led to some companies exiting the market in 2023, potentially impacting the pension fund landscape. In this context, it is crucial for pension funds to conduct thorough due diligence and ensure they are partnering with reliable and stable companies to safeguard their assets under investment.

Currency and inflation risks are significant concerns due to Ukraine's history of devaluations. To protect pension fund assets from depreciation, it is important to provide access to financial instruments that can mitigate these risks. Implementing measures such as diversification, hedging, and offering inflation-linked instruments can help protect asset values from currency devaluation and inflationary pressures.

Personnel risk is a factor, with a significant number of people leaving Ukraine following the invasion. It is unclear to what extent people will return following the end of the invasion; their return will be affected by factors such as employment opportunities in Ukraine and the availability of government programs for

rebuilding destroyed dwellings. This uncertainty impacts the availability and stability of the country’s workforce.

The suitability of Ukraine’s existing ICT solutions in the pension sector needs to be evaluated. ICT solutions are vital for modern financial institutions, including the pension system. In addition to evaluating existing ICT solutions, private operators should explore opportunities to adopt foreign ICT solutions to improve the pension system, including in the areas of operational efficiency, data management, and customer service. These solutions would need to be adapted to Ukrainian legislation.

Finally, challenging political risks reduce trust in the pension system. The pension system must inspire trust from its participants and stakeholders alike, and the system should not be subject to political or corporate pressure. The pension system needs to be easily understood by citizens and fully accountable to the regulator.

16.6 Financial Flow Projections

Improving the 2nd pension pillar would generate significant financial resources that could be invested in recovery instruments inside Ukraine. If a law targeting the 2nd pension pillar were passed by the Verkhovna Rada in 2023, up to two years would be needed to complete all the necessary steps for implementation, including the development of ICT solutions, adoption of new regulations and procedures, issuing of licenses, etc. Contributions would therefore start in 2026 at the earliest.²⁵⁵

Ukraine could accumulate pension assets worth between \$12.9 billion and \$17.7 billion by 2033. Assuming contribution levels of 2 percent in 2026, 3 percent in 2027, and 4 percent starting from 2028, the country would accumulate projected contributions worth \$13.1 billion under the baseline scenario (Table 16.1) and \$17.5 billion under the upside scenario (Table 16.2) by 2033. The value of assets would be around 0.4-0.5 percent of GDP in the first year and would grow to between 3.3 and 4.4 percent of GDP during the first five years, before reaching 5.7 to 7.3 percent of GDP at end-2033.

Table 16.1 Baseline Growth Scenario with Pension Reform

	2026	2027	2028	2029	2030	2031	2032	2033	Total
Contributions, \$, billions	0,6	1,0	1,4	1,6	2,0	2,0	2,1	2,3	13,1
Pension Assets, \$, billions	0,6	1,6	3,1	4,7	6,7	8,7	10,8	12,9	12,9
Percent of GDP	0,4%	0,9%	1,7%	2,4%	3,3%	4,1%	5,0%	5,7%	

Source: IFC projections.

Table 16.2 Upside Scenario with Pension Reform

	2026	2027	2028	2029	2030	2031	2032	2033	Total
Contributions, \$, billions	0,8	1,4	2,1	2,3	2,4	2,6	2,8	3,0	17,5
Pension Assets, \$, billions	0,8	2,3	4,4	6,7	9,2	11,9	14,7	17,7	17,7
Percent of GDP	0,5%	1,3%	2,3%	3,4%	4,4%	5,4%	6,4%	7,3%	

Source: IFC projections, Table 16.1.

²⁵⁵ Contributions to the mandatory 2nd pillar should not be financed by means of reducing the contribution rate to the main pay-as-you-go scheme, as this would lead to an immediate deficit in the scheme, which would have to be covered by public funds.

ANNEX A

Technical Team and Contributing Reviewers

The report was prepared by a technical team at IFC led by Johannes (Han) Herderschee (Senior Economist, CELCE) and the overview and infrastructure chapters were co-led by Patrick Avato (Principal Operations Officer, CN2UA). The team leaders also prepared the introduction and cross-cutting chapters. The team leaders benefited from the contributions of Zeinab Partow, (Lead Economist, CERCD), Natsuko Toba (Economist, CERCD), Elleanor Robins (Senior Investment Officer, CNGBU), Victoria Tetyora (Operations Officer, CEUA1), Vyacheslav Hordiyenko (Investment Officer, CN2UA), David Bassini Ortiz (Consultant, CELCE), Oleg Kudashov (Senior Investment Officer CTAPU), Iryna Bondarenko (Consultant, CELCE), Svetlana Ignatiuc (Program Assistant, CEUPK), Tatyana Taran (Program Assistant, CEUVN), Tessa Coronado Ulloa (Executive Assistant, CELCE), and Milda Brazyte (Temporary, CEUVN).

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ANNEX TO CHAPTER 3: Methodology and Assumptions – Projected Private Investments in the Agriculture Sector

Needs for recovery and reconstruction in agriculture identified in the RDNA2 stand at \$29.7 billion for the 2023–2033 period. Meeting these needs requires both public (including donor) and private financing. Public support will be essential to crowd in private investment.

The public financing benchmark is calculated based on historical data. Agricultural public expenditure in the years prior to Russia’s invasion of Ukraine averaged \$556 million per year, which includes both direct transfers to farmers in the form of recurrent subsidies, investment grants, tax benefits, and the financing of support services (e.g., food safety, SPS measures, and research).

The private financing benchmark is estimated based on pre-invasion annual private financing from all possible sources attracted to primary agriculture and amounts to \$21 billion (based on historical records and cross-checked with farmers representatives), of which 10 percent (close to \$2 billion) is capital investments and the rest is working capital.

- Economic losses can be recovered with support from private funding, but this would require state support to reduce the cost of

commercial borrowing, reduce agrologistics costs, and help smaller farms.

- Most damages—including damage to machinery and other assets—are expected to be covered by public funds.

The no reform scenario assumes that public funds will remain at the same level as before Russia’s invasion.¹ Private financing is assumed to fund the remaining gap of RDNA2 needs. The reform and intervention scenario assumes that public expenditure in agriculture will increase by 20 percent, on the back of greater donor financing bolstered by the positive effects of reforms. The reforms could unlock additional private financing of approximately \$10.4 billion (\$2.4 billion in 2023–2026 and \$8 billion in 2027–2033).

Both scenarios assume that the government will finance the provision of public goods to crowd in private investment. These public goods include food safety, SPS measures, laboratories, certifications, and compliance verification, as well as other enabling factors such as agricultural research, agrometeorological information, and a range of physical and digital infrastructure, among others.

¹ A key risk facing this assumption stems from the large future needs for public expenditures in other sectors against the country’s low fiscal space.

ANNEX TO CHAPTER 6: Notes on Assumptions and Methodology – Projected Private Investments in the Transport Sector

The transport sector’s potential to attract private investment is estimated in six subsectors: road transport, rail transport, sea and inland water transport, airports, urban transport, logistics and multimodal transportation. The projections for each sector include: (1) funds to address needs assessed in the RDNA2 (World Bank et al. 2023), and (2) development in the sector related to other opportunities. Meanwhile, projected investment needs relate to: (i) underreported damages for privately owned assets (using extrapolation of reported data, e.g. on railway and urban transport fleet); and (ii) opportunities not related to damages but required to maintain the same level of service (i.e., fleet renewal and infrastructure reconstruction) or improve efficiency and resilience of transport systems (i.e., investment opportunities in new infrastructure or assets).

Projections cover two scenarios:

- The no reform scenario describes the potential for private investments that could be possible without reforms. These projections are mostly based on historical flows.
- The reform and intervention scenario estimates the potential for private investments after the implementation of reforms in each subsector. This scenario looks for opportunities to improve services in the sector to support EU integration and decarbonization.

The study uses the IMF’s baseline scenario (IMF 2023) for Ukraine’s medium-term growth trajectory, assuming GDP growth of 4 percent over 2023–2033 in the no reform scenario and 6

percent in the reform and intervention scenario, and net migration relative to end 2021 of minus 2 million people. The study makes projections in constant 2023 prices. To align previous years’ prices with 2023, the study uses IMF GDP deflators.

Investments are considered *public* if the funding sources are budgets of the state, local governments, or SOEs. *Private* investments include those in: (i) assets entirely owned by private entities or individuals; (ii) private deliveries through public infrastructure managed by an SOE or a concessionaire, or private deliveries to multiple customers paid by a single payer; and (iii) private shares in PPPs. The projections follow the WBG’s cascade approach, prioritizing private over public financing to support development, whenever possible.

Funds needed to reconstruct damaged roads and bridges and restore basic services are assessed in the RDNA2 at \$50.7 billion. Since road infrastructure is 100 percent publicly owned and operated, this assessment does not assume private investment in the reconstruction under the no reform scenario. The assessment also assumes that the expansion of the border crossing, described as an RDNA2 recovery need, is publicly financed. This assessment follows the RDNA2 assumptions of the distribution of expected private sector investment at 12 percent of total needs in 2023–2026 and 88 percent in 2027–2033. The reform scenario assumes the introduction of PPP schemes to finance road infrastructure would attract private financing for the reconstruction of selected motorways. The study also considers possible private investment in road segments included in the RDNA2 and that are identified as suitable for PPP (Agency on

Support Public-Private Partnership “Road PPP Program...”).

Other opportunities in road transport include PPPs for selected motorways, upgrade of freight transportation, improvements in international passenger transportation, and expansion and modernization of national EV charging infrastructure.

The no reform scenario assumes patterns of development that existed prior to Russia’s invasion. This assessment expects no expansion of the freight fleet, and it assumes that used trucks will replace 95 percent of much older trucks, resulting in an average fleet age of 14.6 years (Auto24 2023).¹ The assessment further expects no expansion of the international passenger bus fleet, but it assumes some investment in rolling stock renewal to maintain an average age of 16 years (UkrTransBezpeka 2022). The study assumes same pace of intercity bus station reconstruction as existed before 2022 (approximately 1 station in 18 months).²

Restoration of damaged bus stations, although most stations are in private operation, is assumed to be done with public funds. The expansion of EV charging infrastructure is expected to continue at the pace observed in 2021.³

The reform and intervention scenario assumes that the introduction of PPP schemes to finance road infrastructure would allow for the attraction of private financing for the reconstruction of selected motorways, the selection of which would be based on an analysis of the most promising road segments for PPPs (WBG & IFC “Ukrainian Road PPP program”). Although the cargo fleet is not expected to grow,

the investment cost increases as old trucks are replaced with newer vehicles to attain the EU average truck age of 14 years (ACEA 2021). The scenario assumes that the cross-border passenger flow will grow due to the liberalization of international passenger transportation, which would result in the bus fleet growing and being upgraded.⁴ The study further assumes that intercity bus stations in major cities will be reconstructed to meet EU standards. The timeline for implementation depends on city size, with stations in cities with populations over 500,000 to be completed in 2023–2026 and in cities with population above 250,000 to be completed in 2027–2033. The study assumes that the EV charging infrastructure will expand to meet EU standards to reach station access every 60 kilometers on all roads (IFC 2021c), which translates into 8,802 stations by the end of 2033. All newly installed charging stations are assumed to be fast charging.

Rail Transport

The RDNA2 estimates for rail transport include railway track, bridges, stations, rolling stock, railway equipment, and other assets. The data reflect the damages reported by UZ, and investment is considered 100 percent public under the no reform scenario. The reform and intervention scenario assumes the deregulation of UZ as well as concessions of major railway stations. However, concessions are assumed only for the major railway stations with high passenger volumes: only 2 stations included in RDNA2 qualify and are included as potential concessions in the 2027–2033 period (Agency on Support Public-Private Partnership “7 Railway Stations...”).

¹ Only 5 percent of heavy-duty trucks were purchased new in 2021.

² Before 2022, one bus station on average was reconstructed per 1.5 years, and the average cost is extrapolated from previous years and converted into 2023 prices

³ There are 500 new stations per year, of which 75 percent are slow-charging (Kytina 2021).

⁴ The market assessments assume the international bus fleet will grow by three times as well as the decennary replacement of buses with new vehicles.

To cover private sector damages not included in the RDNA2, it is assumed that the private sector suffered the same level of rolling stock damage as the public sector: 5.2 percent for locomotives and 7.6 percent for rolling stock.⁵ In the no reform scenario, it is assumed that passenger stations and UZ terminals will be financed publicly.

In the reform and intervention scenario, it is assumed that the transition to standard European gauge will be implemented by the public sector. However, the study assumes that development of standard European gauge will stimulate private sector investment in rolling stock and logistics terminals. Chapter 6.7 on logistics and multimodal transport explains the investment expected in logistics terminals. The estimate for modernization of rolling stock and investment size and investment cost for specialized terminals for oversized cargoes and dangerous goods are adopted from the Ukraine Sustainable Logistics Strategy 2030. Where a timeline for implementation is not available, the assessment follows the RDNA2 assumption that expected private sector investment in rail transport will make up 12 percent of total needs in 2023–2026 and 88 percent in 2027–2033 in both scenarios.

Maritime and Inland Waterways Transport

RDNA2 needs for the reconstruction of the maritime and inland waterways sector (mostly seaports) amount to \$365.6 million. Since most seaports in Ukraine are publicly owned, they are expected to be restored with public funds. Both the no reform and the reform and intervention scenarios assume that the damaged seaports that are currently in concession (Kherson,

Olvia, and some territories of Mykolaiv port) will be reconstructed privately. The reform and intervention scenario further envisions a PPP for the Dnipro gate locks, with at least 50 percent private investment.⁶ The private investment share of RDNA2 needs is estimated at 12 percent in 2023–2026 and 88 percent in 2027–2033 in both scenarios.

Development of the sector suggests expansion of Danube port infrastructure, modernization of the Danube and Dnipro rivers fleets, construction of the second Kakhovka lock on the Dnipro River, and privatization of stevedoring companies.

The no reform scenario assumes that the development of the Danube ports and Dnipro river infrastructure will be done by the state, while the river fleet would not be modernized, following trends before 2022.⁷

The reform and intervention scenario suggests privatization of SOEs and ports operating on the Danube, with investments adopted from Ukraine's Recovery Plan. The Danube river fleet is expected to triple in size to serve increased demand (Ukrainian Sea Ports Authority 2023) and be upgraded to maintain the average fleet age of 20 years (European Neighborhood Instrument 2023). Since the current average age of Ukrainian river vessels is over 30 years, it is assumed that fleet modernization will require 90 percent of vessels to be replaced in 2023–2026. The Dnipro river fleet is expected to be upgraded and expanded to serve increased cargo volumes, according to 2021 forecasts, assuming a two-year delay in reaching milestones due to the invasion (European Neighborhood Instrument 2023). At least one stevedoring company in each seaport is expected to be privatized, leading to a 40 percent private sector

⁵ Estimates are based on rolling stock data collected from UZ before and during Russia's invasion of Ukraine. While privately-owned locomotives are not allowed at the main railway track, the private sector owns and operates a large share of shunting locomotives.

⁶ In June 2023, the Kakhovska dam on Dnipro River was destroyed, causing massive flooding and likely long-term interruption of Dnipro navigation. As of the date of this report, no assessment has been made of the level of damage and consequences for the transport sector

⁷ Less than 8 percent of the river fleet is younger than 20 years (IFC 2021b)

share of investment in 2023–2026 and 60 percent share in 2027–2033.

Projections for the development of the Dnipro river ports and the seaport concessions are described in Chapter 6.7 on logistics and multimodal transport, since they cover more than one transportation mode.

Airports

The RDNA2 recovery needs in the airports sector are estimated at \$1.68 billion. Most damaged airports are entirely publicly owned and are assumed to be reconstructed from the state budget. In airports with terminals in private ownership (Kharkiv, Dnipro, and Ivano-Frankivsk), the terminals' reconstruction is assumed to be private, while runways remain public, which means that their reconstruction is not included in the projections for private sector investment in either scenario.

The reform scenario suggests reconfiguration of the airport network and implementation of concession agreements to attract private investment in airports reconstruction and development. The number of airports and the size of investment are adopted from the plans of Ukraine's PPP Agency, but the choice airports could be determined later (Agency on Support Public-Private Partnership "List of projects").

The reform and intervention scenario would consider two additional passenger airports, not included in the RDNA's list of damages, for concessions, although the specific airports would be determined later. Construction of the new airport in Transcarpathia is planned for 2027–2033.⁸ A concession would also be granted for the construction of one cargo terminal (Ministry of Infrastructure of Ukraine 2018). The cargo terminal investment is assumed to be based on

existing project cost estimates, but the exact location of the airport would be defined after the reconfiguration.

Urban Transport

RDNA2 estimates for urban public transport rolling stock, infrastructure, depots, maintenance vehicles, etc., are based on the damages reported by local and regional governments and cover only publicly owned assets. As a result, the no reform scenario assumes that the public sector will fund reconstruction. The reform and intervention scenario assumes private financing of urban transport fleet renewal, while infrastructure is assumed to be financed publicly. Private-sector participation is expected to be 12 percent in 2023–2026 and 88 percent in 2027–2033.

In the no reform scenario, it is assumed that the private sector will continue renew the fleet with used rolling stock (the trend observed pre-invasion), and electric urban transport will continue to be managed and renewed by subnational governments, subject to budgets. It is assumed that ride-hailing and micromobility services will continue to develop at the growth rates observed before 2022, with internal combustion engine vehicles being used for ride-hailing services.

The reform and intervention scenario reflects Ukraine's decarbonization strategy (Ukraine Transport Strategy and Law No.8172) and assumes the electrification of 50 percent of public transport buses by 2030 (with batteries being replaced after seven years of operation) and the reorganization of depots. The cost of charging infrastructure allocated to the private sector is assumed based on current private-sector participation in public transport operation (69 percent for bus operation). The private sector is expected to account for 10 percent of

⁸ The public construction cost of Transcarpathia Airport's runway is estimated in the RDNA2.

investment in ride-hailing and micromobility services 2023–2026 and 40 percent of market potential ⁹ in 2027–2033, assuming the transition of public transport to EVs.

Logistics and Multimodal Transport

No direct damage estimates are included in this section of the RDNA2.

Investment in the sector would take place only in the reform and intervention scenario, and it would consist of concessions of logistics and multimodal terminals, as well as the construction of agricultural storage facilities at EU border crossings.

One multimodal terminal assumed to be built at one of the Danube river ports, in line with the Ukraine Recovery Plan (Ukrainian Shipping Magazine “The Minister of Infrastructure...”). Three multimodal terminals assumed to be built on the Dnipro river, as set out in the National Transport Strategy of Ukraine and the Analytical Note to the Law on Inland Water Transport (Dornier Consulting and Egis International 2016; European Neighborhood Instrument

2023). The Danube terminal is expected to be constructed in the 2023–2026 period, but to respond to immediate capacity demand, one Dnipro terminal would be built in 2023–2026 and two in 2027–2033. Another three seaport terminals would be privately developed, with the already-planned Chornomorsk concession carried out in 2023–2026 and two additional concessions in 2027–2033. The specific ports for the latter two concessions have not yet been specified, but the size of the investment will be in accordance with the Ukraine Recovery Plan.

The repair and modernization of sorting railroad stations is expected in 2023–2026 (in accordance with Ukraine’s Recovery Plan), and one new transshipment terminal on the extended EU standard gauge is planned in 2026–2033 (when the new gauge is expected to be prolonged), with the cost assumed to be similar to comparable terminals in Poland and Ukraine. The construction of agricultural storage terminals near the EU border is assumed based on the Ukraine Recovery Plan and proposed for the 2023–2026 period as an immediate need (Government of Ukraine “Ukraine Recovery Plan”).

⁹ Market potential is estimated based on the ratio of taxi or ride-hailing vehicles per 1,000 people. The ratio is estimated as an average and based on data from England and Wales (4.88), Latvia (3.87), and Lithuania (6.32).

ANNEX TO CHAPTER 7:

Notes on Assumptions and Methodology – Projected Private Investments in the Energy and Extractives Sector

General Assumptions

The private sector could contribute to a green and resilient recovery in Ukraine’s energy and extractives sector, especially if the government implements reforms. An estimated \$47 billion in reconstruction and recovery needs is in segments owned by the public and private sectors. Additional private financing will require the government to consider and allow various innovative options for private financing and/participation, such as various types of commercial financing of SOEs, from IFI and commercial bank loans and capital market instruments to various forms of PPPs. The key is to find ways to leverage scarce public and donor resources to finance the hundreds of billions needed for reconstruction.

Since the RDNA2 does not report disaggregated data in the power sector, needs for generation, transmission, and distribution are estimates in this report. Estimates are based on RDNA2 priority 2023¹ needs and a projected baseline potential for gross electricity generation, primary energy supply, and export potential. Baseline projections are based on historical trends and projected annual GDP growth (IMF 2023a), as

annual growth in gross electricity generation, primary energy supply, and real GDP has historically followed similar trends. Baseline projections also consider the projected growth of European energy markets as well as the Ukrainian government’s vision for the energy sector.²

The reported estimates are indicative and could vary significantly depending on the assumptions used. In addition to the cross-cutting caveats reported in Chapter 1, projected net capacity addition is based on certain assumptions. Notably, projected net capacity addition is based on simplified estimates, an assumed electricity system capacity factor³ of 29 percent, and estimates of gross electricity generation, considering increasing variable renewable energy and Ukraine’s historically low capacity factor and nominal overcapacity (OECD 2023 and Figure A7.1).⁴ The baseline electricity generation projection follows the IBRD team’s electricity generation planning model as well as the Energy Community and GoU’s energy strategies (Kantor & E3M 2021). The team also estimated other opportunities (beyond RDNA2), taking into account the GoU’s goals for the development of the energy and extractives sector.

¹ The RDNA2 report provides disaggregated data of the power sector only for 2023 priority needs.

² The report estimates RDNA2 needs and potential private-sector opportunities based on energy demand and supply projections, and it considers Ukraine’s energy strategy and projections and data published by a wide range of sources, such as the United States Energy Information Administration, Energy Community, ENTSO-E, European Network of Transmission System Operators for Gas, EU, EU Agency for the Cooperation of Energy Regulators, GoU, IEA, IRENA, international and Ukrainian companies, Massachusetts Institute of Technology, and the World Bank.

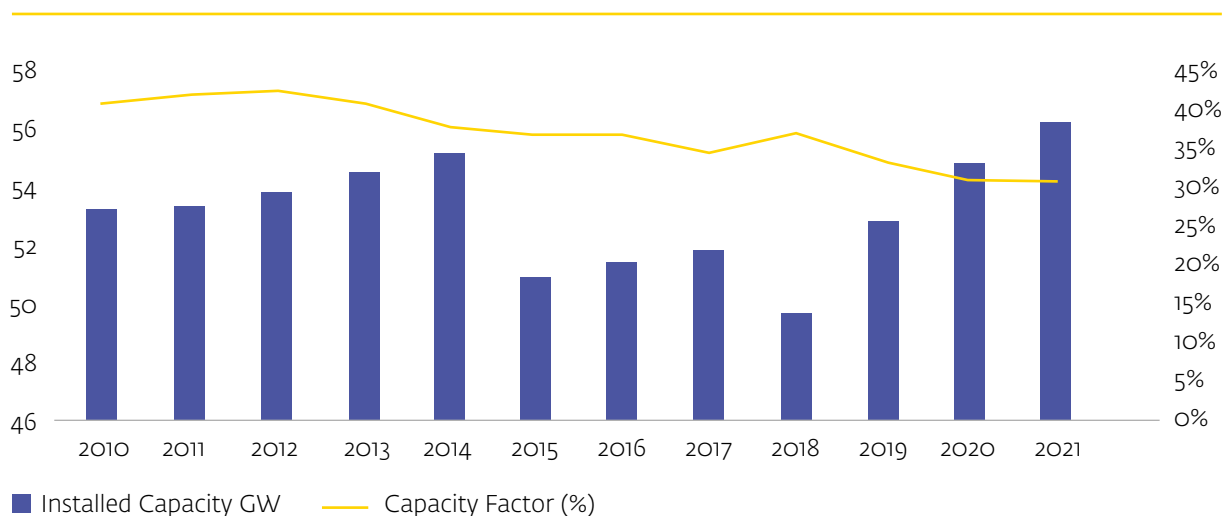
³ Capacity factor: The ratio of the electrical energy produced by a generating unit for a period to the electrical energy that could have been produced at continuous full power operation during the same period. To estimate the additional capacity, the team used the sum of all electricity generation units’ capacity.

⁴ Overall installed dispatchable capacity in Ukraine before the invasion was around 44 GW, while maximum demand in 2021 was 25 GW hours. Before the invasion, Ukrenergo estimated annual growth in demand at 1.5 percent for the next decade. Based on pre-invasion demand, this translates into 29-30 GW of peak demand in 2031, sufficient to cover domestic demand, even if all export capacity was also used.

Both the non-reform and reform and intervention scenarios assess private sector potential against a baseline projection (Figure A7.2) that is based on both GDP projections and Ukraine’s policy objectives for the energy sector (nuclear, natural gas, biomethane, exports, local manufacturing of RES equipment, etc.), although the report’s projections are below those in the GoU’s energy strategy (Figure A7.3 and Figure A7.4). Projections are below

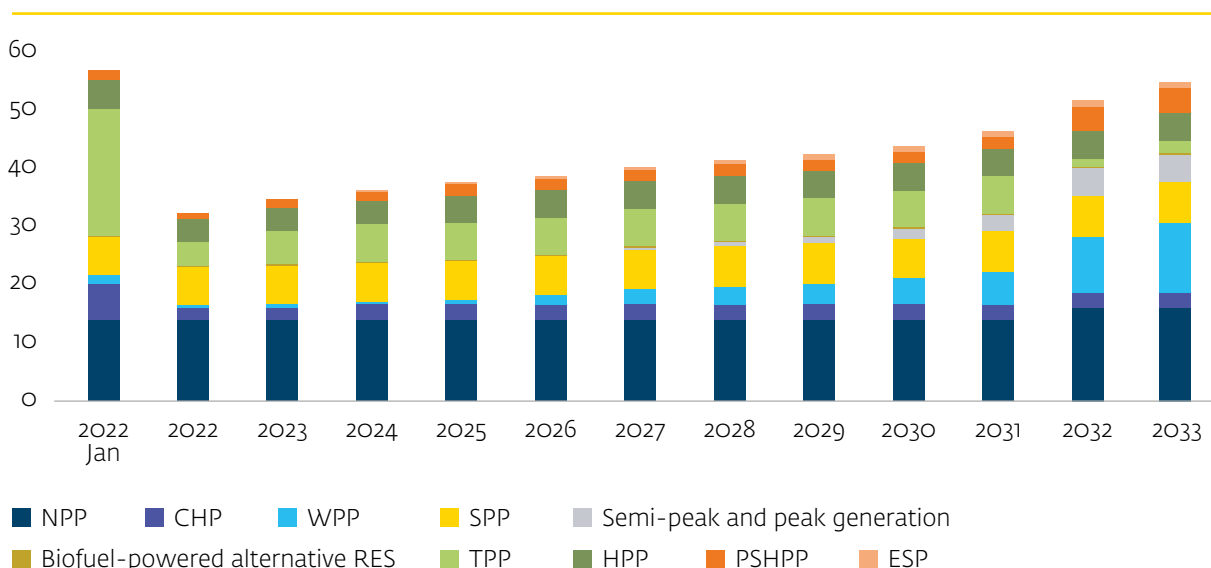
the government objectives even in the reform and intervention scenario due to differences in projections for wind tribunes, wind power, electrolyzers, peakers, and lithium-ion 2-hour battery energy storage. Reported investment opportunities include the development of new or modernization of existing infrastructure and assets, as well as the development of local renewable energy equipment manufacturing capacity.

Figure A7.1 Historical Electricity System Capacity Factor (%) and Installed Capacity (GW)



Sources: OECD (2023) (for installed capacity) and Eurostat (for generation to estimate capacity factor).

Figure A7.2 Assumed Installed Power Generation Capacity, Baseline Projection



Source: IFC estimates.

Notes: ESP= energy storage plant, HPP= Hydro power plant, PSHPP = Pumped Storage Hydro Power Plant, TPP= thermal power plant, SPP= solar power plant, WPP = wind power plant, CHP= Combined heat and power plant.

Figure A7.3 Installed Capacity, GoU Energy Strategy, Baseline Recovery Scenario (GW)

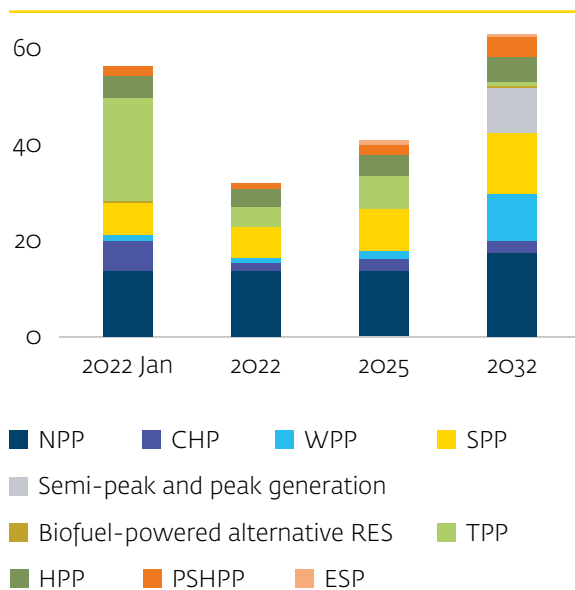
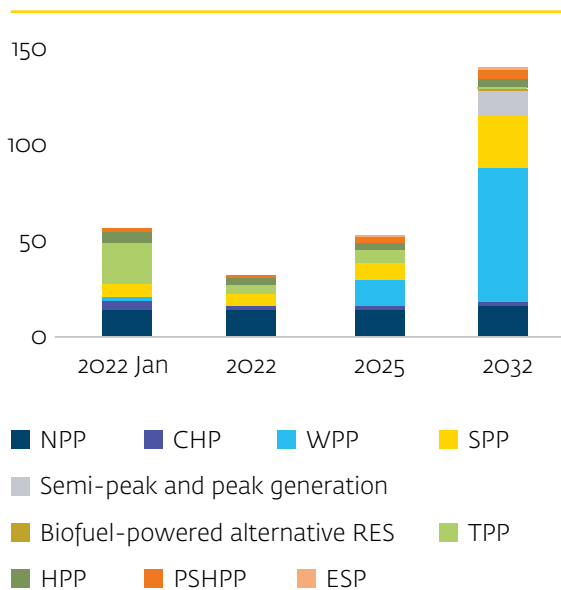


Figure A7.4 Installed Capacity, GoU Energy Strategy, Accelerated Export Scenario (GW)



Sources: Kiyv School of Economics 2023; Energy Map "dashboard/5"

Note: ESP= energy storage plant, HPP= Hydro power plant, PSHPP = Pumped Storage Hydro Power Plant, TPP= thermal power plant, SPP= solar power plant, WPP = wind power plant, CHP= Combined heat and power plant.

The no reform scenario assumes that most financing for reconstruction identified in the RDNA2 will continue along similar trends witnessed before and during the invasion. Beyond the RDNA2, private investment is assumed to continue but is limited due to accumulated outstanding issues such as debt among sector players, lack of competition, and tariffs that do not allow for cost recovery. The reform and intervention scenario assumes that Ukraine promptly and successfully implements domestic market reforms to align with the EU acquis. It also assumes that Ukraine's international partners (including the EU and its member states, US, UK, Japan, Canada, and Australia) take policy measures to enable closer integration of Ukraine's economy into European and global value chains.

Primary and secondary legislation adopted during 2023 or later may take time to implement and have an impact. Therefore, the reform and intervention scenario assume that investments will be made, at the earliest, in 2024. In the short to medium term, Ukraine is expected to implement national legislation in compliance with the EU-Ukraine Association Agreement.⁵ Starting in 2027, in close coordination with the EU accession process, Ukraine, with the support of its international partners, may strive to begin approximation of the most updated EU legislation (e.g., electricity and gas market design, low carbon hydrogen, critical raw materials, and decarbonizing gas infrastructure, including district heating)⁶. Over the medium to long term (2030–2033), the report assumes that the most sensitive publicly owned strategic energy assets (TSO Ukrenergo, EnergoAtom, and

⁵ Title IV Trade and Trade Related Matters, Chapter 11 Trade-Related energy; Title IV Economic and Sectoral Cooperation, Chapter 1 Energy cooperation, including nuclear matters and Chapter 6. Environment; Annexes of Title V: Economic and sectoral cooperation to Chapter 1 Energy cooperation namely Annex XXVI, Annex XXVII-A, Annex XXVII-B and to Chapter 8 Environment namely Annex XXX and Annex XXXI; Association Agreement between the EU and its Member States, of the one part, and Ukraine, of the other part, version consolidated on 24 April 2023 (EUR-Lex 2023)

⁶ EU acquis Chapter 15: Energy, with a detailed list of legislative acts to be further defined during the anticipated accession negotiating process. EU acquis chapters: https://neighbourhood-enlargement.ec.europa.eu/enlargement-policy/conditions-membership/chapters-acquis_en.

Ukrhydroenergo) may become open for private participation, such as commercial financing.

Considering the strategic and national security dimensions of energy infrastructure, calculations envisage that private participation could take various forms, such as PPPs, commercial financing of SOEs with loans from IFIs or commercial banks or through other capital market instruments, divestiture, and (re)privatisation.

This assumption remains broad, as the analysis outlines only potential opportunities for the private sector, which would conduct its own due diligence to determine innovative and suitable formats of participation.

Assumptions follow the historical share of private investment, consider privatization (e.g., Centrenergo), anticipate re-privatization of nationalized assets (e.g., gas and electricity

distribution systems), and include a larger opening to private participation in historically restricted subsectors (e.g., the transmission system, nuclear and large hydropower generation, and district heating) through suitable forms of commercial financing, PPPs, etc. Table A7-1 outlines the assumptions.

The World Bank analysis triangulates between official data presented by the GoU at the Ukraine Recovery Conference in 2022 and 2023 and decarbonization scenarios based on the electricity planning model of the World Bank (2021) and the Energy Community (Kantor & E3M 2021). Additionally, the assessment of capacity growth is checked and adjusted to IMF projections for Ukraine's GDP growth as well as to potential EU markets (ENTSO-E & ENTSOG 2022; IEA 2022; Eurostat 2023). This explains a cautious approach to calculations while following the main drivers

Table A7-1. Anticipated Private Sector Business Financing (% of total financing needs), RDNA2 Needs and Beyond

			Non-reform scenario		Reform and intervention scenario	
			2023-26	2027-33	2023-26	2027-33
Electricity Generation						
RDNA2	2023 priority	Large HPP restoration, 2023-2024	0%		0%	
RDNA2	2023 priority	TPPs restoration for heating, 2023-2024	61%		61%	
RDNA2	2023 priority	Small scale/distributed generation	0%		0%	
RDNA2	2023 priority	Electricity import purchasing needs for the next season	0%		0%	
RDNA2		Optimization of existing nuclear capacities	0%	0%		0%
RDNA2		Wind power		10%		100%
RDNA2		Solar power		10%		100%
RDNA2		Peaker		0%		100%
RDNA2		PSHPP		0%		100%
RDNA2		HPP		0%		100%
		New nuclear power capacity build-out	0%	0%	0%	50%
		Wind power	10%	10%	100%	100%
		Hydro and pumped hydro capacities	0%	0%	0%	100%
		CHP biogas	0%	0%	100%	100%

			Non-reform scenario		Reform and intervention scenario	
			2023-26	2027-33	2023-26	2027-33

Electricity Generation

		Thermal Power Plants (CCGT)	0%	0%	0%	100%
		Local RES equipment production (towers, transformers, cables, solar panels, electrolyzers, Li-ion batteries)	0%	0%	0%	100%
		10 GW RES for H2 production	0%	0%	0%	100%
		5 GW electrolyzer capacities	0%	0%	50%	50%
		H2 transport infrastructure	0%	0%	50%	50%
		2 GW peaker for low carbon hydrogen				100%

Energy Storage

RDNA2		Li-ion 2 hour BESS	0%	100%	0%	100%
		Additional Li-ion 2 hour BESS	100%	100%	100%	100%
		2 GW 2 hour-BESS for low carbon hydrogen				100%

Electricity Transmission

RDNA2	2023 priority	Ukrenergo's emergency equipment needs	0%		0%	
RDNA2	2023 priority	Developing a secure power grid (substations)	0%		0%	
RDNA2	2023 priority	Statcoms to enhance import-export operations	0%		0%	
RDNA2	2023 priority	Building transmission connections with EU via Slovakia	0%		0%	
RDNA2	2023 priority	Building transmission connections with EU via Romania	0%		0%	
RDNA2	2023 priority	Electricity supply (including distribution stations, overhead power lines)	0%		0%	
RDNA2		Construction of 750/330 kV substations		0%		0%
RDNA2		Construction of 330 kV substations		0%		0%
RDNA2		Manufacturing of autotransformers		0%		0%
RDNA2		Modernizing transmission networks		0%		90%
		Expanding interconnectors with ENTSO-E to ~7 GW (multiple)	0%	0%		90%
		Additional modernizing transmission networks	0%	0%		90%

			Non-reform scenario		Reform and intervention scenario	
			2023-26	2027-33	2023-26	2027-33

Electricity Distribution

RDNA2	2023 priority	Electricity supply (including distribution stations, overhead power lines)	62%		62%	100%
RDNA2		Modernizing distribution networks	100%	0%	100%	100%
		Additional modernizing distribution networks	0%	0%	62%	100%

District Heating System

RDNA2	2023 priority	Emergency equipment for the heating infrastructure (mobile units)	0%		0%	
RDNA2	2023 priority	Heat supply	0%	0%	0%	
RDNA2		District heating reconstruction	0%	0%	0%	100%
		Modernizing heat networks and heat generation assets	0%	0%	0%	100%
		Energy efficiency in building	50%	50%	50%	80%

Extractives

RDNA2	2023 priority	Gas purchasing needs for the next heating season	0%	0%	0%	0%
RDNA2	2023 priority	Other Gas system liquidity needs	0%	0%	0%	0%
RDNA2		Gas purchasing and gas system liquidity	0%	0%	0%	0%
RDNA2		Gas transportation system reconstruction, including gas TSO and DSOs	0%	0%	0%	50%
RDNA2		Fuel oil sector reconstruction, including oil refinery facilities and distributions	0%	0%	0%	90%
RDNA2		Coal mining sector (urgent closure works on flooded mines)	0%	0%	30%	50%
		Develop unconventional / tight gas potential	100%	100%	100%	100%
		Intensification of production from existing fields	23%	23%	23%	50%
		Developing Black Sea offshore	0%	0%	0%	50%
		Developing biofuels, e.g., biomethane	100%	100%	100%	100%
		Modernizing gas transmission and distribution network	0%	0%	50%	50%
		Critical minerals	100%	100%	100%	100%

for increasing capacity beyond the RDNA2 based on Ukraine's ambitions presented at the London Ukraine Recovery Conference 2023 (Mitchell et al. 2023). These drivers are: (i) green metallurgy; (ii) green fertilizers; (iii) hydrogen production for domestic and external markets; (iv) electrification, including of the industry and transport sectors; and (v) other factors such as decarbonizing district heating. Demand growth influences all subsectors, requiring an increase in renewable generation capacities and storage, modernization of transmission and distribution grids, and minimization of losses, together with increased energy efficiency and conservation, notably in district heating. Limitations are imposed by transport infrastructure, supply of construction materials, availability of labor, and capacity of the domestic banking system.

Base price year and currency are 2023 dollars, and the exchange rate is \$1 to 36.5686 hryvnia for 2023, consistent with the RDNA2 methodology. For values in different years and/or currencies, unless otherwise noted, the assessment adjusted the values to 2023 dollar prices using GDP deflators in the IMF's World Economic Outlook Database (as of April 2023) and exchange rates in the World Development Indicators database for historical exchange rates and on public websites for 2022 and 2023 rates. Calculations assume no inflation or real price changes from the base year (2023). Investment costs are initial capital costs in terms of overnight costs,⁷ and thus do not include costs for replacement, upgrades, modernization, fixed and variable operation, maintenance, and financing.

Projections in Sub-Sectors

Assumptions for electricity generation, storage, transmission, distribution, and district heating

follow the targets defined in Ukrainian official documents or recommendations of Ukraine's international partners.

Assumptions for the extractives chapter distinguish between selected subsectors: critical raw materials, gas, biogas potential, and coal. For critical raw materials, the calculations are based on historical data and aspirations to develop existing and new deposits. For gas, the calculations account for the potential increase in natural gas production as an important domestic primary energy source, assuming that Ukraine will replace all fossil fuels with green energy by 2050.⁸

The World Bank team first considered the RDNA 2023 priority needs. One of the RDNA2 2023 priorities is the electricity supply (including distribution stations and overhead power lines), but it is unclear if this includes transmission lines. The team assumed that 20 percent of the cost for electricity supply is for transmission and the remaining 80 percent for distribution. The team added the investment needs presented by the Ukrainian government at the June 2023 London Ukraine Recovery Conference (Mitchell et al. 2023) and the previous forecast presented by the Ministry of Energy in July 2022 (Ministry of Energy of Ukraine 2022). As the Ministry of Energy's presentation bundled investment in transmission and distribution networks, and no further data are available, this assessment assumes half of the cost relates to the transmission network. Table A7-1 includes details on the assumed investments.

Electricity Generation

The 61 percent private sector ownership share of TPPs is based on the share of TPP installed capacity owned by DTEK, which owns 13.3 GW out of the 21.84 GW Ukrainian TPP installed

⁷ Overnight cost is the cost of a construction project if no interest was incurred during development and construction, as if the project was completed overnight or single day. Overnight cost provides a simplified cost comparison between power plant projects or technologies

⁸ URC 2023 indicates that "climate neutrality will be achieved in the energy sector by 2050" (Mitchell et al. 2023).

Table 7A-2. Examples of the Assumed Cost of Energy Production (\$/kW)

Means of Production	Cost
Solar and wind	2,000
Hydro and Pumped Storage Hydro Power Plants	2,257
Li-ion 2-hour Battery Energy Storage Systems (BESS)	1,450
Gas turbine (flexible generation)	990
IBRD Li-ion 2-hour BESS 197MWh (rounded up to the nearest 100 megawatts (MW))	1,000
CHP biogas	2,500
Combined cycle gas turbine	1,519
Nuclear—light water reactor	8,882

Source: IFC estimates based on data from IRENA, international and Ukrainian companies, the GoU, United States Energy Information Administration, and the Massachusetts Institute of Technology.

capacity.⁹ RES-based electricity plants are all assumed to be privately owned.

In the no reform scenario, the private sector could play a limited role in financing RDNA2 needs. To go beyond RDNA2 needs, the private sector could provide limited investment in developing additional RES capacity, given that not many commercial or industrial companies have a reliable long-term revenue stream to serve as the basis for long-term corporate/direct PPAs with RES-based electricity providers. In the reform and intervention scenario, calculations assume increased investment in additional renewable energy, peaker, hydropower, and nuclear plants and for the development of renewables for hydrogen production, electrolyzer capacity, and hydrogen infrastructure. It is expected that in the 2023-2033 period, hydrogen investment will require partial grants and/or subsidies and guarantees. Sector-specific policy measures in the reform scenario for electricity generation assume: (i) successful implementation of the roadmap for electricity

market integration with the EU (Roadmap),¹⁰ with effects starting from 2025 and increasing after 2027; (ii) successful implementation of primary and secondary legislation for green energy transformation (e.g., Law 3220-IX) starting from 2024; (iii) construction of additional interconnectors with the EU and full integration of Ukraine's united energy system into the continental European grid in terms of accessing networks and participating in capacity planning;¹¹ and (iv) availability of equipment and materials for construction of new renewables, hydrogen, and industrial capacities to substantiate demand in RES.

Assumed costs are only indicative, given the large variation in available data. Some of the assumed costs include additional 10 percent of the data source to mitigate the tendency to underestimate the full engineering, development, and logistics costs, if those costs are not implicit in the cost estimates. Some examples of unit cost assumptions are set out in Table 7A-2.

⁹ Total TPP 21.84 GW January 2022 from Ukrenergo, Dixi Group website, and DTEK, 2020 Annual Report (DTEK Group 2021)

¹⁰ Roadmap for further market integration following synchronization of Ukraine's (and Moldova's) electricity networks with the Continental European Network.

¹¹ Implementation of the Roadmap implies that Ukraine becomes a full member of ENTSO-E. As such, Ukraine joins the process of Ten Years Network Development plan (ENTSO-E "About the long-term network development study"). The plan is revised every two years (the previous revision took place in 2022) and aims to visualize how the power grid would look in 2030 (ENTSO-E "How is the TYNDP developed?"). The inclusion of this plan increases the certainty and transparency of Ukraine's domestic generation capacities, and the plan sets out how Ukraine's electricity system fits into and contributes to the Continental European Network

Electricity storage

In the non-reform scenario, the calculation assumes that (i) private sector investment is limited compared to under the baseline; and (ii) multiple revenue streams, such as the balancing and ancillary services markets, generate sufficient revenues for electricity storage services. In the reform and intervention scenario, the private sector covers estimated storage needs, while additional storage for low carbon hydrogen may require guarantees. Both the no reform and reform and intervention scenarios assume the availability of equipment (imported in 2023–2026 and imported and nationally produced in 2027–2033), software, personnel and maintained cybersecurity. All energy storage technologies are assumed to be two-hour duration lithium-ion BESS.

Electricity transmission

Considering that electricity transmission is fully state-owned, the calculations assume no private-sector participation in the no reform scenario. In the reform and intervention scenario, the private sector could invest in some projects. Private businesses could also partially support the strengthening of grids, especially after all the policy and technical measures outlined in the Roadmap are timely fulfilled (starting from 2025). In the longer term (2030–2033), additional private capital may be possible for commercial financing (e.g., commercial banks and capital market instruments) to Ukrenergo, specifically in maintaining, operating, and developing grid infrastructure. If reform allows, large RES-based electricity plants may construct private transmission lines for export and allow third-party access of such lines.

Electricity distribution

The no reform scenario assumes that all RDNA2 needs are publicly financed, although privately owned electricity distribution assets may be able cover their own needs related to improving resilience and modernizing infrastructure, but they may not be able to sustain such financing. An additional inflow of private capital could be realized by the re-privatisation of state shares in the DSOs. Beyond RDNA2, the calculation assumes that the private sector can invest in distribution grids to develop smart grids, enable increased penetration of renewable energy, strengthen cybersecurity, and integrate an anticipated fleet of e-vehicles.¹²

The estimate is based on the RDNA2 priority items, including electricity supply (e.g., distribution stations and overhead power lines). This assessment assumes that 80 percent of this cost is for distribution and the remaining 20 percent is for transmission. In addition, this assessment includes investment needs presented by the Ukrainian government at the London Ukraine Recovery Conference in June 2023 (Mitchell et al. 2023); the energy mix forecast presented by the Ministry of Energy of Ukraine in July 2022 (Ministry of Energy of Ukraine 2022). As the 2022 presentation combined investment in transmission and distribution networks, and no further data are available, this assessment assumes that half of the cost presented pertain to the distribution network. The share of private district system operators is estimated at 62 percent, considering nationalizations done during the invasion and the mixed ownership structures of 27 DSOs (or total of 73 subsidiaries registered with the Stock Market Infrastructure Development Agency) as of September 2023 (Comments.ua 2023; Energy Map “distributions”).

¹² URC (2023, slide 27) outlines the increasing need for electric charging stations by 2050, which is forecasted to increase from 4,000 in 2023 to 1.3 million by 2050 (up to 10 electric cars per station). Considering the limited capacity of transport infrastructure to support electric cars and that Ukraine generally produces automobile components but not end products, a sizeable increase in the number of charging stations would require strengthening distribution grids, but it could happen at scale over the longer term. The modernization of distribution grids may need to start in 2027–2033 (Mitchell et al. 2023).

District heating

In addition to the RDNA2, the assessment added investment in modernizing heat networks and heat generation assets¹³ and enhancing energy efficiency in building. In 2017, \$0.25 billion in 2023 dollar prices was available for investment in energy efficiency buildings (UNDP 2017), which this assessment assumed in the baseline projection (Ministry of Energy of Ukraine 2022; National Recovery Council of Ukraine 2022; Tetra Tech ES, Inc. 2020; KT-Energy LLC 2020; UNDP 2017).¹⁴

The no reform scenario assumes that limitations on private-sector participation in district heating remain, which narrows opportunities for private capital to cover needs identified in the RDNA2. Financing beyond RDNA2 needs could come from private investment in improving the energy efficiency of buildings, and estimates are based on two major programs: Energodim and Warm Loans. The no reform scenario assumes that building energy efficiency requires grants, guarantees, and/ or climate or green finance for about half of programs, with limited financing options based on Ukraine's two major existing building energy efficiency programs.¹⁵

The reform and intervention scenario assumes that the private sector could increase its contribution to cover needs identified in the RDNA2. However, larger opportunities could arise beyond RDNA2 needs to modernize the building stock, including measures to improve energy efficiency, decrease losses in heating systems infrastructure, and increase penetration of renewable fuels (to replace fossil gas) or potentially geothermal solutions, which may, however, require some financial and/or technical

support. Such opportunities depend on the institutional capacity of local authorities in charge of district heating systems, their openness to cooperation with the private sector, and the existence of supporting local regulatory frameworks.

The reform and intervention scenario assumes financial support to average 20 percent of total energy efficiency investment in 2027–2033, based on the experience of European and other developed countries, such as Germany, where subsidies range from 10 to 50 percent and average around 15 percent (BAFA 2023). The reform and intervention scenario also assumes that, during 2027–2033, private-sector participation could take various forms such as commercial financing of SOEs or PPPs.

Extractives

Table A7-3 tabulates the investment needs presented by the Ukrainian government at the June 2023 London Ukraine Recovery Conference (Mitchell et al 2023) and by the Ministry of Energy of Ukraine in July 2022 (Ministry of Energy of Ukraine 2022). The table presents Naftogaz data on development potential for unconventional or tight gas,¹⁶ intensification of production from existing fields, and development of Black Sea offshore gas.

This assessment estimates potential private investments for exploration and production of critical raw materials, based on the average number of fields offered for licensing through e-auctions during 2016–2022 and the required of €20 million minimum investment (Ukrainian Geological Survey 2021 and 2023a). The reform and intervention scenario assumes a 35 percent

¹³ This investment would replace a small share of heat networks. The data do not cover the cost of new connections or more comprehensive renovations, resulting in the total cost maybe being higher (Tetra Tech ES, Inc. 2020)

¹⁴ The RDNA2 does not cover building energy efficiency under energy and extractives. Instead, it is covered in the housing chapter of its urban assessments.

¹⁵ The EnergoDim program supports up to 70 percent of investment costs. In the Warm Loans program, the state provides partial compensation of between 20 and 35 percent (Ukrinform 2021).

¹⁶ Natural gas trapped within extremely low permeability reservoirs

Table A7-3: Natural Gas Cost Assumptions (2023 prices)

		Sizing (low)	Sizing (high)	Capex per unit \$, millions	Investment need (low) \$, millions	Investment need (high), \$, millions	Average
Develop potential for unconventional / tight gas production	bcm pa ²⁵	2.0	4.2	1,000.0	2,000.0	4,200.0	3,100.0
Intensify production from existing fields	project	1.0	1.0	17,500.0	17,500.0	17,500.0	17,500.0
Develop Black Sea offshore	bcm pa	10.0	18.0	494.4	4,944.4	8,900.0	6,922.2

Source: Naftogaz.

higher volume of investments in biomethane and minerals with further digitalization and full alignment with EU legislation by 2024.

As 23 percent of natural gas production is assumed to come from the private sector under the reform and intervention scenario, the team assumed the private sector share would increase to 50 percent to intensify production from existing fields until 2027–2033. Gas transmission is public, and gas distribution operators are largely nationalized as of 2023. Reconstruction of the gas transportation system, including the gas TSO and DSOs, could benefit from private funding (e.g., commercial financing) at 50 percent in 2023–2033 (Table A7-1).

In the no reform scenario, the needs identified in the RDNA2 are public finance for the state-owned coal mining sector and the fuel oil sector. Beyond RDNA2, potential extractives opportunities include exploration and

production of critical raw materials, extraction of gas, and production of biogas (biomethane). These opportunities reflect existing legislation, data from the Ukrainian Geological Survey on fields offered for licensing in 2016–2022, and minimum required investment under a license (2021 and 2023 data).

The reform and intervention scenario assumes that the private sector could provide financing for some RDNA2 needs during 2023–2026, considering the necessary implementation period for reforms. Beyond RDNA2 needs, the reform and intervention scenario assumes: (i) a 35 percent increase in new licenses for critical raw materials; (ii) new opportunities for private investment in gas production, transmission, and distribution networks (based on National Joint Stock Company Naftogaz data); and (iii) private investment opportunities for a 35 percent increase in biofuel (biomethane) production and supply.

ANNEX TO CHAPTER 8:

Notes on Assumptions and Methodology – Projected Private Investments in the Telecommunications, Postal, and Broadcasting Services Sector

Overall Assumptions

Potential telecommunications and digital investment opportunities beyond RDNA2 needs include digital technology, 5G, and data centers. Estimates consider available data on historical investments into the IT sector, estimated costs of launching 5G in Ukraine (2019 data), and approximated costs of building a mid-size enterprise data center. The postal sector assumes privatization (or other forms of private-sector participation) of Ukrposhta and the modernization and expansion of private postal services, based on the value of Nova Poshta’s bond issuances.

Broadcasting services opportunities include the expansion and modernization of broadcast, satellite television, and print media, based on major market players’ historical investment.

Legislation and secondary legislation adopted during 2023 or later may take time to implement and have an impact. Therefore, the reform and intervention scenario assumes that investments will occur starting in 2024, at the earliest.

The base price year and currency are 2023 dollars, and the exchange rate assumed for 2023 is \$1 to 36.5686 hryvnia, consistent with the RDNA2 methodology. For values in different years and/or currencies, the assessment adjusted values to 2023 dollar prices using GDP deflators from the IMF World Economic Outlook Database (as of April 2023) and exchange rates from World Development

Indicators database for historical exchange rates, and public websites for 2022 and 2023, unless otherwise noted. Calculations assume no inflation or real price changes from the base year (2023). Investment costs are initial capital costs in terms of overnight costs, which means that they do not include costs for replacement, upgrades, modernization, fixed and variable operations, maintenance, and financing.

Sector-Specific Assumptions

In the telecommunications and digital sector, the RDNA2 notes that, “It is estimated that approximately 10 percent of telecom investments will be undertaken by the private sector and that these private sector investments will only require a small public contribution (e.g., through provision of access to subsidized loans under the [Affordable Loans] 5-7-9 Program)” (World Bank et al. 2023, p. 97) Therefore, the no reform scenario assumes that 10 percent of needs identified by the RDNA2 are private investments.

Beyond the RDNA2, without negative changes in the legislative framework, such as those that could limit the availability of qualified labor, the digital sector could absorb an annual average of \$100 million in 2023–2033, totaling \$1.1 billion in 2023 prices (Table A8-1). Potential private investments in data centers assume commissioning of at least three facilities of the National Backup Centre by the end of 2023. This represents an indicative target, resulting in investments of \$78 million in three data centers (based on an average of \$25.9 million per center) (Table A8-2).

Table A8-1: Examples of Digital Technology Investment in (\$, billions, 2023 prices, unless otherwise indicated)

Recipient	Investment Value
Preply	50
Horizon Capital	125
Assume annual average, \$, millions, 2023 prices	100

Source: Singh 2022; Horizon Capital 2022.

Table A8-2: Data Center Estimates converted from \$ 2022 prices into \$ 2023 prices

	Low	High	Average
Mid-sized enterprise data center (465 square meeters), \$ million 2022 prices	11.5	38.3	24.9
Mid-sized enterprise data center (465 square meeters), \$ million 2023 prices			25.9

Source: Siteltd.co.uk "What does it cost to build a data centre."

Table A8-3: Costs for the Development of 5G Base Stations (\$, millions, 2019 prices)

License	1,000
Equipment for stations in the 1,800 MHz range	175
Equipment for stations in the 2,600 MHz range	32.5
Total	1,208

Source: Thepage.ua. 2019.

Table A8-4: Nova Poshta Bonds Issuances

Million hryvnia nominal price	Issue date	Maturity Terms /Years	
800	February 2023		Series C bonds
700	March 2020	3	Series B bonds
300	2019	1.5	Series A bonds
200	Assumed annual average bond issuance over the period 2023-2033		

Source: News Ukraine 2023.

The reform and intervention scenario assumes that private investments could equal all needs identified in the RDNA2 as of 2024. Beyond RDNA2 needs, calculations assume that digital technology investments could increase by 20 percent during 2027–2033 compared to under the no reform scenario, while 5G investment could amount to \$1.4 billion in 2023 dollar prices, adjusted from 2019 dollar prices (Table A8-3). Additionally, the adoption of legislation to create a national cloud, with

potential PPPs, could attract private capital. Assumptions about an increase in the number of data centers reflect the government's plans to store 50 percent of all official data (e-government, Diia) in Ukraine. The resulting data center investment could amount to \$776 million by 2033, assuming 1 dedicated data center for each of the 27 regions and 3 dedicated data centers for the central government (Table A8-2).

Regarding postal services, the no reform scenario assumes that privately owned Nova Poshta would cover RDNA2 needs in 2023–2026 and publicly owned Ukrposhta would cover RDNA2 needs in 2027–2033. Beyond the RDNA2, calculations assume that Nova Poshta continues to increase its investments in operations both domestically and internationally. Based on Nova Poshta’s bond issuances, the report assumes average private sector investments of \$5.47 million per annum in 2023–2033, totaling \$60 million.

The reform and intervention scenario assumes the possibility of full or partial privatization of Ukrposhta, including possible private participation via PPPs that would fund all needs identified in the RDNA2 in 2023–2033. The assumption uses the total asset value in 2019 and adjusts it for 2023 dollar prices, which results in \$0.5 billion (OECD 2021c). Beyond the RDNA2, Nova Poshta could increase its

investment by 50 percent compared to under the no reform scenario.

In the broadcasting sector, the no reform scenario assumes neither private investment to cover RDNA2 needs nor additional private investment beyond the RDNA2. The reform and intervention scenario assumes that the government could divest some broadcasting assets or work with the private sector under a PPP for reconstruction and further modernize broadcasting infrastructure and services. Private sector investment is assumed to be \$75 million per year in 2022 dollar prices, based on information disclosed by SCM, a company that returned its media assets to the Ukrainian government (SCM 2022). The report adjusted 2022 dollar prices to 2023 prices before it assumed annual investment over 2024–2033. This assumption necessitates Ukraine’s successful alignment with EU requirements on free media.¹

¹ The EU accession process could start in 2024, provided Ukraine successfully implements all seven requirements outlined by the EC in June 2022 (EEAS 2022). The EC notes that Ukraine has met two of the seven requirements (Euronews 2023).

ANNEX TO CHAPTER 15: Methodology and Assumptions – Projected Private Investments in the Banking Sector

Opportunities to provide credit to the private sector are assumed to be the main determinant of private sector opportunities in the banking sector. Projections are therefore based on the total credit that the banking sector can provide to the private sector. Bank credit to the private sector stood at \$23.2 billion (15.6 percent of GDP) at end-2023. Following the IMF baseline projections for the no reform scenario, it is assumed that bank credit to the private sector will reach \$58.3 billion (25.8 percent of GDP) in 2033, an increase of \$35.1 billion over 10 years. The reform and intervention scenario assumes the higher IMF growth rate and that bank credit reaches 56 percent of GDP, equivalent to \$135.4 billion and increase by \$112.1 billion over 10 years.

The assumptions underpinning these results are:

- Return on equity is 7 percent in the no-reform scenario and 10 percent in the reform and intervention scenario, all which is reinvested in bank capital.
- Current banking sector average capital adequacy ratio (20 percent) will be maintained in both scenarios. Based on this ratio, total bank credit is limited to 5 times regulatory capital.
- NPLs will be sold over the succeeding 4 years at a rate of 9 percent of nominal value.

Table A15-2 Bank Credit to the Private Sector and Financing Sources
(flow during 2023-2033, \$, billions, constant 2023 prices)

	No reform scenario	Reform and intervention scenario
I. Included in private sector opportunities	15.1	27.0
1.1 Addressing RDNA Needs	4.3	4.3
1.2. Other opportunities	10.8	22.7
1.2.a Net profit reinvested by private banks	7.3	9.8
1.2.b Bank borrowing	3.5	11.2
1.2.c Privatization	-	1.8
II. Total change in bank credit to the private sector	35.1	112.1
2.1 Increase in private sector banks' capital*	7.6	10.4
2.2 Increase in SOBs' capital**	8.6	11.7
2.3 Borrowing	3.5	11.2
2.4 Deposit	15.4	78.8

Note: * Includes net profit invested, proceeds of selling NPLs, and capital injections, if needed.

ANNEX TO CHAPTER 16:

Pension Sector – Methodology and Assumptions for Financial Flow Projections

1. Methodology

The model is based on GDP and other projections prepared by IMF. The model has two scenarios: the base scenario and a positive scenario, with different levels of projected Real GDP change.

2. Assumptions

In the base scenario, IMF projections for real GDP change are used: 5 percent for 2026 and 4 percent for 2027 – 2033. In the positive scenario, real GDP change is projected to be 5 percent for 2026 – 2033.

Inflation for the end of each year is 5 percent in both scenarios.

In the base scenario, average real wage change is assumed to be 5 percent for 2026 and 4 percent for 2027 – 2033. In the positive scenario, average real wage change is projected to be 5 percent for 2026 – 2033.

According to Draft Law No.9212, citizens aged 55 and below are obligated to pay contributions to the pension system. This restriction is a base for the participants quantity calculation.

3. Key Figures

	Base Scenario	Positive Scenario
Real GDP change	4%	5%
Average real wage change	4%	5%
Real wage in 2026, US\$	456	469
Real interest rate	2%	3%
Contributions (2026-2033), US\$ bn	13,1	17,5
Pensions payout (2026-2033), US\$ bn	0,5	0,7
Assets at the end of 2033	12,9	17,7

According to statistics from the Pension Fund of Ukraine, the number of citizens insured by the single social tax at the end of 2022 was 8,633,451, 73.6 percent of whom were aged 55 and below.

According to the base scenario, the share of employees aged 55 and below insured by the single social tax is 23.6 percent in 2023 – 2033.

In the positive scenario, citizens who had left the country due to Russia's invasion would come back to Ukraine in 2024 – 2025. The number of hired employees insured by the single social tax and aged 55 and below would be 49 percent during 2023 – 2033.

The pension contribution rate would be 2 percent in 2026, 3 percent in 2027, and 4 percent in subsequent years.

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