



REPORT ON LOSSES AS A RESULT OF RUSSIA'S MILITARY AGGRESSION AGAINST UKRAINE

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September 2024

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PREFACE

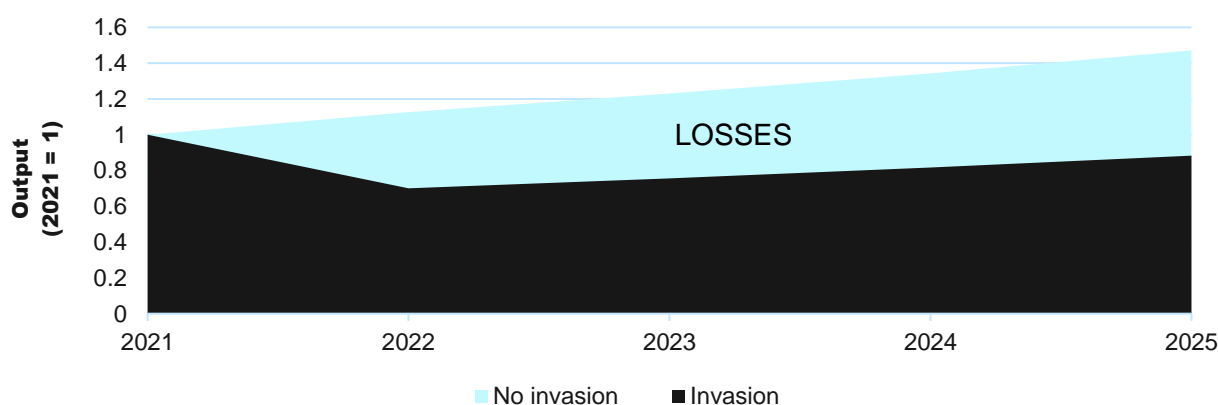
Losses are changes in economic flows as a result of Russia's full-scale invasion of Ukraine. They include loss of income in various sectors of the economy and additional costs associated with the war (for example, dismantling of destroyed objects and waste removal, demining, additional social benefits, etc.).

The report covers the period from February 2022 to June 2024 (actual losses) and the period up to and including the end of 2025 (18 months from the date of data collection). The division into actual and projected losses is artificial, since the latest data on the financial performance of companies is available only for 2023.

The assessment of losses was carried out by the analytical team of the Kyiv School of Economics (KSE) together with the Ministry for Communities, Territories and Infrastructure Development (Ministry of Infrastructure) and in cooperation with other relevant ministries and the National Bank of Ukraine (NBU). The overall damage assessment was carried out in accordance with the World Bank (WB) methodology. The calculations were made with the support of the DTA (Digital Transformation Activity) project.

The evaluation methodology has changed significantly compared to the previous release. Due to the availability of financial reports of most companies in Ukraine for 2022 and 2023, instead of assumptions about the revenue dynamics of various sectors of the economy, modeling is now being carried out based on the revenue of companies in the last year before the invasion (in 2021), revenue during the invasion years (2022-2023) and forecasts for economic development from the International Monetary Fund (IMF). Using these indicators, it is estimated what revenue would have been in 2022-2025 without a full-scale invasion, what it was in 2022-2023 and is expected for 2024-2025. The difference in the corresponding amounts gives loss of income.

Graph 1. Loss calculation model.



Source: IMF, Ukrstat, KSE calculations.

The very definition of losses has also been revised. Previously, loss of revenue was defined as loss of revenue. But since all companies from all sectors are now included in the calculation, this leads to duplication within value chains. To avoid this, revenue is converted into gross value added according to the average ratios between these indicators for the last two years, for which aggregate data from the State Statistics Service (2019-2020) were available. For comparison purposes, we now provide both metrics. Additional costs of the entities are included in the total amount in full in both cases.

KEY RESULTS

Since the beginning of the full-scale invasion, the total amount of losses that have been and will be inflicted on Ukraine is estimated at \$1.164 trillion (revenue) or over \$385 billion (value added). Compared to the previous report, which was published a year ago, this means an increase in revenue losses of more than three times. This is due to both the expansion of the list of affected entities (from the most affected to all) and the increase in the assessment period (from 34 to 46 months). Value added losses are almost twice as high as Ukraine's GDP in 2021.

In terms of revenue, the largest amounts of losses are in productive sectors. These are commerce (\$450.5 billion), industry along with construction and services (\$409.9 billion), and agriculture (\$83.1 billion). The main infrastructure sectors — energy and transport — also suffered heavy losses (\$43.1 billion and \$38.8 billion, respectively).

In terms of additional costs, the largest groups are demining and the housing sector (\$42 billion and \$22 billion, respectively). In the housing, it is mainly additional expenses of citizens for renting, which we consider losses, although technically this means a redistribution of income among Ukrainian citizens. In addition, state spending on social benefits has increased and will increase significantly (by \$10 billion). In all sectors combined, the dismantling of destroyed facilities and waste disposal accounts for \$13.4 billion.

Table 1. Estimation of losses by sector.

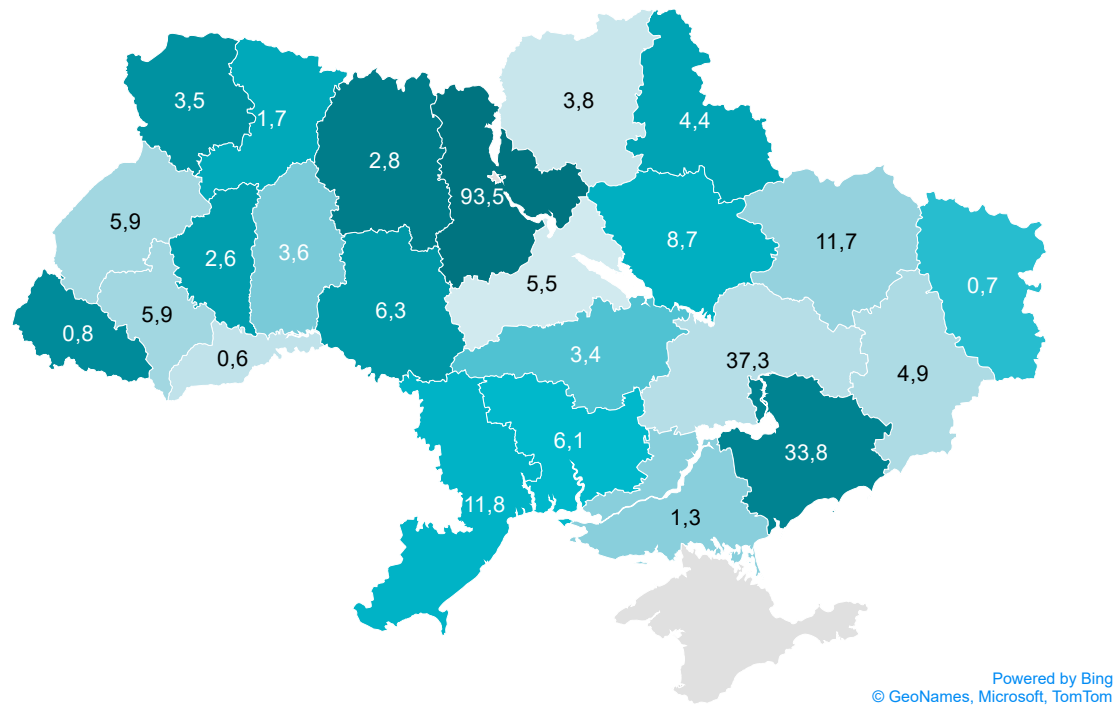
Sector	Loss estimation, \$ billion, by method	
	Revenue	Value added ↓
Industry, construction, and services	409,9	133,2
Commerce	450,5	74,4
Demining	42,0	42,0
Agriculture	83,1	33,2
Housing	22,4	22,4
Transport	38,8	18,0
Energy	43,1	12,0
Healthcare	11,4	11,1
Social protection	10,0	10,0
Digital	19,3	8,8
Education	14,5	8,4
Utilities	7,7	3,9
Finance	4,3	4,3
Culture	7,3	2,9
TOTAL	1 164,4	385,7

Source: Kyiv School of Economics.

The geographical distribution of losses is more even compared to damages.

This distribution roughly corresponds to the share of regions in the gross domestic product before the full-scale invasion (the correlation is 95%), while damages to assets are concentrated in areas where active hostilities have taken place and are being conducted.

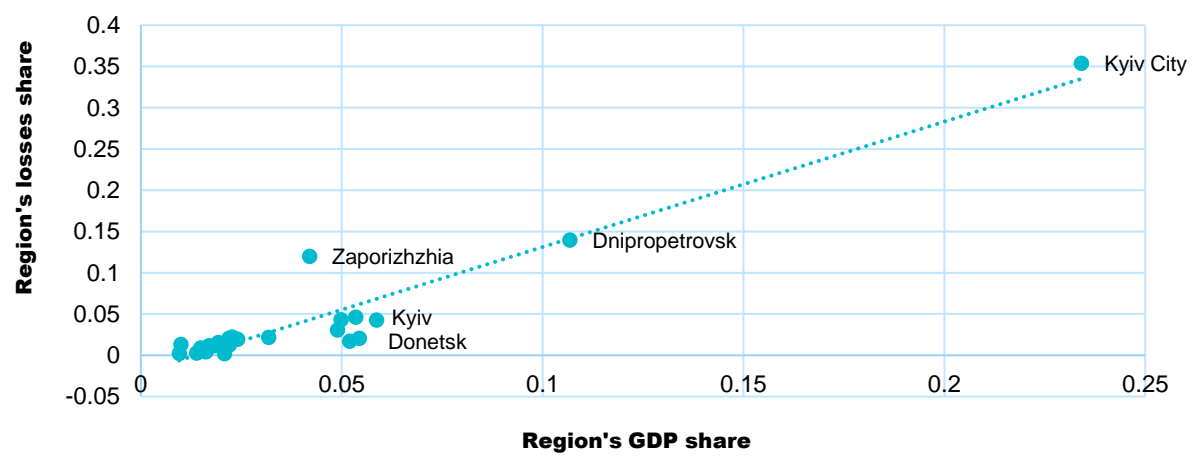
Map 1. Loss estimation by oblasts.



Powered by Bing
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Source: Kyiv School of Economics.

Table 2. Correlation between the shares of oblasts in GDP and in indirect losses.



Source: Ukrstat, Kyiv School of Economics.

A photograph of a dilapidated brick building with a basketball hoop in the foreground. The building is in a state of significant disrepair, with missing windows and crumbling masonry. The sky is clear and blue. The basketball hoop is a standard outdoor hoop with a white backboard and a red border, mounted on a metal pole. The overall scene suggests a neglected urban environment.

01

SOCIAL SECTOR

Housing

Active shelling of cities with missiles and artillery is part of Russia's combat tactics. This leads to significant destruction of the housing stock in cities and towns, especially those located near the front line. As a result of the hostilities of the Russian Federation, more than 50% of the housing stock in a significant number of cities and towns was damaged or destroyed.

The housing stock of such cities as Mariupol, Kharkiv, Chernihiv, Severodonetsk, Rubizhne, Bakhmut, Maryinka, Lysychansk, Popasna, Izyum and Volnovakha suffered the greatest destruction. For example, according to preliminary estimates, 90% of the housing stock in Sievierodonetsk has been damaged, cities such as Bakhmut and Maryinka have almost no intact buildings. At the same time, the number of damaged residential buildings (both multi-storey and individual buildings) is increasing due to the continuation of active hostilities in the territories of Kharkiv, Luhansk, Donetsk, Zaporizhzhia, Kherson regions and the temporary occupation of part of the territory of Ukraine, as well as throughout the rest of the country due to regular attacks by missiles and drones.

As a result, losses in housing amount to \$22.4 billion. This amount includes an increase in expenditures to support the industry, additional costs of citizens for renting housing, as well as the cost of dismantling and removal of construction waste.

Table 2. Housing losses estimation.

Types of losses	Estimated losses, \$ billion
Additional rental costs	15,424
Costs for dismantling and removal of construction waste	5,729
Growth in public expenditures to support the industry	1,252
Total sector losses	22,404

Source: Data from regional military administrations, calculations by the Ministry of Restoration and Kyiv School of Economics.

Healthcare

Losses to the healthcare sector amount to more than \$11 billion. This amount consists mainly of the lost income of medical institutions, taking into account the suspension of activities due to security risks and the departure of some recipients of medical services outside Ukraine. Income means both budget expenditures on health care and revenue (both state/municipal and private institutions).

19 regions of Ukraine suffered damages to health care facilities, the largest were in Donetsk, Kharkiv, Mykolaiv, Luhansk and Zaporizhzhia regions. The main damages relate to institutions such as hospitals and clinics.

Table 3. Healthcare losses estimation.

Types of losses	Estimated losses, \$ billion
Decrease in sector income (revenues)	11,040
Costs of dismantling and removal of construction waste	0,312
Total sector losses	11,352

Source: Kyiv School of Economics.

Education and science

The education sector is one of the most affected sectors as a result of the war in terms of the number of destroyed, damaged and lost infrastructure.

In total, 3.8 thousand educational institutions were destroyed and damaged as a result of hostilities. The main losses relate to secondary, preschool and vocational education institutions due to their prevalence and attractiveness for use in hostilities by the aggressor's manpower. Despite the fact that active hostilities were carried out in 11 regions, educational institutions were damaged in 21 regions of Ukraine. The greatest losses from the destruction and damage to educational institutions are in Donetsk, Kharkiv, Kherson, Mykolaiv and Luhansk regions.

As a result of the destruction, as well as due to the security situation, in many regions the educational process was stopped, either altogether, or for a long time, or with long breaks. This forced the state to reduce spending on education from the state and local budgets. The demand for private educational services has also decreased.

The estimated losses of the education sector are over \$14 billion. This amount consists of the lost income of private educational institutions, taking into account the suspension of activities due to security risks and the departure of some recipients of educational services outside Ukraine; as well as reducing budget expenditures on education and science.

Table 4. Education and science loss assessment.

Types of losses	Estimated losses, \$ billion
Reduction of planned budget expenditures	12,651
Decrease in private sector income (revenues)	1,141
Costs of dismantling and removal of construction waste	0,679
Total sector losses	14,471

Source: Kyiv School of Economics.

Social protection

Indirect losses that have already been caused and will be caused to the social sector amount to \$10 billion. They include Ukraine's additional expenditures on social assistance payments to the population and financing of additional social services aimed at overcoming the consequences of Russia's military aggression.

Table 5. Social protection losses assessment.

Types of losses	Estimated losses, \$ billion
Payments of social assistance for the accommodation of IDPs	7,038
Payments to persons with disabilities who became disabled as a result of the war	0,633
Payments of social benefits on the territory of administrative-territorial units, where structural subdivisions for social protection of the population do not have (or did not have) the opportunity to ensure the exercise of powers	0,357
Payment of assistance to low-income families/individuals	0,346
Expenditures on prosthetic and orthopedic products issued to certain categories of the population	0,331
Payment of state social assistance to persons with disabilities from childhood and children with disabilities	0,321
Payments of temporary disability benefits	0,291
Other payment categories	0,525
Costs of dismantling and removal of construction waste	0,021
Total sector losses	10,014

Source: Ministry of Social Policy of Ukraine.

Culture, sport, and tourism

Since the beginning of the large-scale invasion, the cultural sector has suffered the greatest damages in the history of independent Ukraine. For every country, culture is the basis of self-determination of every citizen, the destruction of cultural objects, such as museums, historical buildings, monuments and works of art of prominent people, is a very painful blow for Ukrainians, because with the destruction of each cultural object, a part of the history of Ukraine and the Ukrainian people is lost.

Due to the high intensity of hostilities in the east and south of Ukraine, as well as regular rocket attacks throughout its territory, most cultural and sports institutions have stopped working or significantly reduced its activities. As a result, 12.5 million residents of at least 6 regions of the country (Donetsk, Zaporizhzhia, Luhansk, Mykolaiv, Kharkiv, Kherson regions) lost access to services, another 13 million people from 7 regions are limited in receiving them.

According to the registers of national cultural heritage, there are about 15.5 thousand objects of cultural heritage in Ukraine, of which about 1.2 thousand are objects of national importance and 14.3 thousand are of local importance. These objects are

sorted into eight types: historical, architectural, archaeological monuments, landscape, objects of monumental art, objects of urban planning/urban planning, objects of landscape art and objects of science and technology.

The total losses in culture, tourism and sports are almost \$7 billion (lost revenue) or \$2.6 billion (lost added value).

Culture and tourism are dependent on each other. The accumulation of cultural heritage sites and cultural institutions that combine cognitive/educational and entertainment functions in their activities creates tourist attraction for such places, which is why cultural and tourist zones are formed. Such zones suffer the greatest losses, since the destruction and damage to cultural objects leads to large losses not only in the cultural sphere itself, but also in the losses of the tourism sector. It also works the other way around. Accordingly, this affects indirect economic losses due to the destruction of the most attractive cultural and tourist sites, the migration of the cultural union and the lack of domestic and foreign tourists.

The loss of cultural and tourist sites leads to partial losses of cultural and tourist value of certain regions, due to which they may lose economic and financial support in the future. The migration of representatives of professional communities is also a very important factor in indirect losses, since culture is formed thanks to the people who are engaged in it. The migration of a large number of troupes, choirs and ensembles, even within Ukraine, can contribute to the imbalance of the financial situation within the country towards more "safe" regions.

Tourism in Ukraine is currently losing a very significant amount of money.

First of all, this is due to a decrease in the total number of tourists. Ukraine is currently left almost without foreign tourists, who numbered about 4 million people in 2020. The situation with domestic tourism is somewhat better, since due to the ban on traveling abroad for men of military age, the demand for recreation is satisfied within the country. In any case, due to active hostilities, threats of missile strikes and mined tourist areas, 13 out of 24 regions were left without tourism completely (100% of tourism enterprises stopped their work) or partially (50% of tourism enterprises stopped their work).

Table 6. Assessment of losses in culture, sports and tourism.

Types of losses	Estimated losses, \$ billion, by method	
	Revenue	Value added
Decrease in income (hotels)	2,131	0,794
Decrease in income (film production and screening)	1,916	0,714
Decrease in income (publishing)	1,295	0,483
Decrease in income (culture)	0,788	0,294
Decrease in income (tourism)	0,496	0,185
Decrease in income (sports)	0,257	0,096
Decrease in income (entertainment)	0,112	0,042
Costs of dismantling and removal of construction waste	0,309	0,309
Total sector losses	7,304	2,916

Source: Kyiv School of Economics.

An aerial photograph of a cornfield. The rows of young corn plants are clearly visible. A large, white, cylindrical pipe or container lies on its side in the middle of the field. The pipe is partially buried in the soil and appears to be made of a light-colored material, possibly plastic or metal. The lighting is bright, casting shadows from the plants and the pipe.

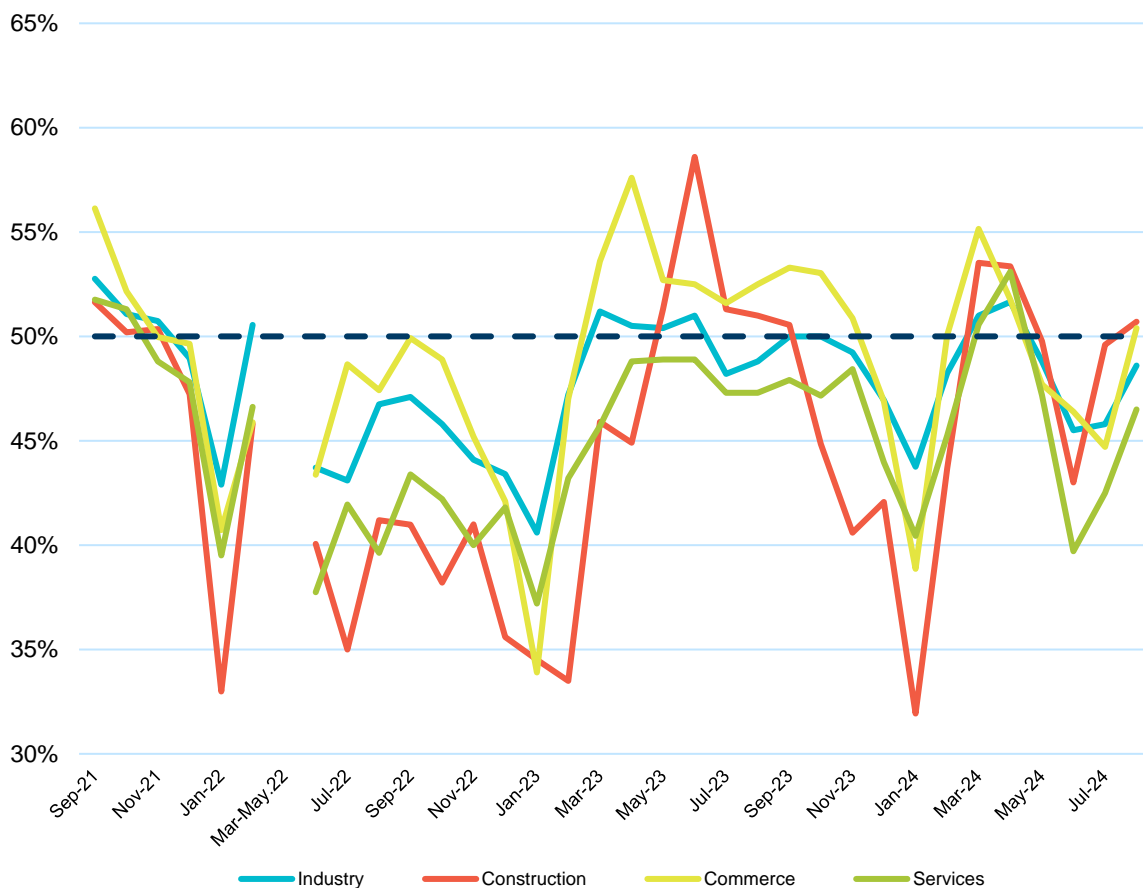
02

**PRODUCTIVE
SECTOR**

Industry, construction, and services

Ukrainian industry, as well as the construction sector and services, have been hit hard by the full-scale invasion. Many assets were destroyed or partially damaged due to missile or drone strikes. Export-oriented industries have not always been able to supply their products abroad due to logistical problems. Local demand declined due to emigration, falling incomes, and consumer sentiment. Due to emigration and mobilization, the number of employees has decreased. Over time, interruptions in the supply of electricity were added to this. For a long time, there were almost no orders for construction due to a significant reduction in investment demand.

Graph 3. Business Activity Expectations Index.



Source: National Bank of Ukraine.

The total losses of enterprises are estimated at almost \$410 billion (revenue) or \$133 billion (value added). This is the largest losses among all sectors (in terms of value added) and the second largest (in terms of revenue). Losses include the loss of income of enterprises, both destroyed or damaged, and all others, whose revenues have decreased due to problems with logistics, reduced demand, outflow of employees, etc. On the contrary, the incomes of some industries and enterprises (primarily suppliers of the Armed Forces of Ukraine — manufacturers of weapons, ammunition and uniforms, food suppliers) increased; Without this effect, the casualty estimate would be even higher.

Table 7. Assessment of losses of industry, construction and services.

Types of losses	Estimated losses, \$ billion, by method	
	Revenue	Value added
Decrease in income (industry)	303,8	89,6
Decrease in income (services)	49,8	25,8
Decrease in income (construction)	55,0	16,5
Costs of dismantling and removal of construction waste	1,3	1,3
Total sector losses	409,9	133,2

Source: Ukrstat, Kyiv School of Economics.

Commerce

Losses of wholesale and retail trade reached \$450.5 billion (revenue) or \$74.4 billion (value added). This puts commerce in first or second place in terms of indirect losses, depending on the indicator. Losses are related, in particular, to the outflow of customers abroad and to more dangerous places, changes in the volume and structure of consumption, the need to relocate businesses, and changes in logistics routes. Since the beginning of the war, the security situation has forced the suspension of work of some retail chains throughout the country and retail facilities in the frontline areas. Regions in close proximity to the contact line were more affected.

But due to the security situation, shopping establishments are suffering throughout Ukraine. According to the Ukrainian Council of Shopping Centers (UCSC), since the beginning of the full-scale invasion, as of 01.07.2024, only due to air raids, each shopping center in Ukraine has been closed for an average of 78 working days. The most dangerous situation is observed in Donetsk, Zaporizhia and Kharkiv regions, where retail outlets are closed to visitors due to alarms for 31%, 22%, and 21% of the working hours of retail outlets, respectively.

However, compared to the first year of the invasion, there is some recovery. As of mid-2024, key network operators have resumed work in Ukraine (this applies primarily to safe regions). Developers are building and opening new retail space, chains are focused on development. Retail is gradually recovering, and the industry's monthly indirect losses are decreasing.

Table 8. Commerce losses assessment.

Types of losses	Estimated losses, \$ billion, by method	
	Revenue	Value added
Decrease in income (retail trade)	149,683	25,528
Decrease in income (wholesale trade)	300,555	48,594
Costs of dismantling and removal of construction waste	0,281	0,281
Total sector losses	450,519	74,403

Source: Ukrstat, Kyiv School of Economics.

Agriculture

Losses of agriculture are estimated at \$83 billion. This includes losses of crop production, animal husbandry, losses of producers due to export disruptions, as well as losses due to rising production costs and losses due to the need for reclamation. These losses are estimated by indirect methods by combining state, regional statistics, as well as data from a survey of agricultural producers conducted in 2022.

The largest share of losses was caused by a decrease in crop production.

The total indirect losses due to the reduction in crop production amount to \$46.5 billion and correspond to a decrease in production during four cycles of annual crops (in 2022-2025 calendar years). Crop production decreased both due to a decrease in sown areas and due to a change in production technology, which leads to a drop in the yield of major crops.

The second largest category is losses due to export disruption. Losses due to export disruptions are estimated at \$24.1 billion. The naval blockade imposed by the Russian Federation at the beginning of the invasion, and subsequently the limited functioning of the so-called grain corridor, led to an increase in logistics costs, which led to a decrease in domestic prices for the main export-oriented products of the agricultural sector. Despite the resumption of sea transportation with the opening of a full-fledged Ukrainian sea corridor, the freight price in such transportation significantly exceeds the prices before the full-scale invasion, which is all a factor of pressure on the price of basic agricultural products. Given the improvement in the situation observed in 2024, we assume that the reduced prices for basic agricultural products had an impact on the harvests of the 2022-2023 calendar years, on the carry-over balances of 2022, but will not have an impact on the harvest of the 2024 calendar year.

The rest of the categories account for 9% of the total. Indirect losses due to the reduction in livestock production amount to \$7.5 billion, losses due to the rise in the cost of production factors (fuel and mineral fertilizers) amount to \$4.4 billion, and losses due to the need for land reclamation are estimated at \$0.3 billion.

Table 9. Agriculture losses assessment.

Types of losses	Estimated losses, \$ billion, by method	
	Revenue	Value added
Decrease in income due to reduced production (crop production)	46,535	18,547
Decrease in income due to reduced production (livestock, beekeeping, fisheries and aquaculture)	7,499	2,989
Decrease in income due to disruption of logistics and lower domestic prices for major export crops	24,110	9,809
Decrease in producers' profits due to rising prices for basic factors of production	4,437	1,768
Additional costs due to the need for reclamation	0,329	0,329
Costs of dismantling and removal of construction waste	0,180	0,180
Total sector losses	83,090	33,423

Source: Ukrstat, Kyiv School of Economics.

Finance

The full-scale war has had a very strong impact on the financial sector, primarily on its main component, banks. They have been impacted both directly and through problems with their clients' (especially borrowers') businesses.

Initially, banks were forced to reduce the activities of branches in areas where there was a threat to staff safety. At the beginning of March, only 21% of branches of systemically important banks operated in or near the war zone, and 60% in Ukraine as a whole. But thanks to the de-occupation of the northern regions, as of mid-June 2022, 85% of branches were already working. After the de-occupation of certain territories in the East and South, banks began to resume the work of branches here as well.

In any case, due to the drop in demand for services, banks were forced to optimize their branch networks. According to the National Bank, which it published in the Financial Stability Report for June 2023¹, in total, since the beginning of the invasion, banks have closed about 1.5 thousand branches, or 20% of the total number (in regions where active hostilities are taking place, this share reaches two-thirds). In autumn and winter, banks suffered from interruptions in the supply of electricity, but over time, institutions established autonomous operation of 45% of branches.

Banks' losses are estimated at \$4.3 billion. First, we mean credit risks. According to NBU estimates, as of June 2024, losses of the loan portfolio due to collateral damage and deterioration of borrowers' financial condition may amount to up to 20% of the net loan portfolio as of February 2022, or \$3.861 billion (the previous estimate made in June 2023 was more pessimistic — 30%). Operational risk (expenses and lost revenues) is estimated at UAH 15 billion. (\$410 million). Its growth has slowed down; over the past six months, these losses have increased by UAH 3 billion, while in previous months they amounted to UAH 6 billion. This assessment is still maintained, since, according to the NBU's estimates, as of June 2024², the credit risk of corporations has not changed, and the level of defaults of enterprises is gradually decreasing.

Table 10. Banks' losses assessment.

Types of losses	Estimated losses, \$ billion
Losses from the realization of credit risks	3,861
Losses from the realization of operational risks	0,410
Total sector losses	4,271

Source: National Bank of Ukraine.

¹ https://bank.gov.ua/admin_uploads/article/FSR_2023-H1.pdf?v=7

² https://bank.gov.ua/admin_uploads/article/FSR_2024-H1.pdf?v=7

A photograph of a power substation. In the foreground, a large, complex metal structure, likely a transformer or switchgear support, has collapsed and is lying on the ground amidst tall grass and weeds. The structure is made of dark grey metal beams and plates. In the background, several tall metal towers are visible, with power lines stretching across the sky. The sky is blue with some light clouds. The overall scene suggests a state of disrepair or a recent accident at the facility.

03

INFRASTRUCTURE

Transport infrastructure

Infrastructure facilities have become one of the key areas that have suffered the greatest attacks from the aggressor. In particular, in the first weeks of the war, Russian troops carried out massive shelling of aviation infrastructure, primarily airfields not only for military, but also for civilian and military-civilian (dual) purposes. Subsequently, the targets of active attacks were railway infrastructure facilities.

The total amount of losses in the transport sector is estimated at \$38.8 billion (revenue) or almost \$19 billion (added value). This amount includes shortfalls in revenues by enterprises in the sector, costs of dismantling destroyed facilities, economic costs, reduction of road construction costs, economic costs associated with the implementation of civilian and military tasks, etc.

Since the beginning of the war, Ukrainian railway has demonstrated its role as a critical infrastructure facility, taking the brunt of the free evacuation of millions of Ukrainian citizens (as well as a lot of businesses) who found themselves in the war zone, as well as the delivery of critical materials and equipment to these regions. In response, Ukrainian railway became an active target for Russian shelling and attacks. As a result, the railway infrastructure suffered considerable losses, mainly consisting of the lost income of Ukrzaliznytsia.

The aviation sector began to suffer losses from military aggression even before it actually began. After all, on February 12, 2022, global insurance companies notified Ukrainian carriers about the termination of aircraft insurance due to the high threat of invasion from Russia. This led to the risk of cancellation of flights of international air carriers to Ukraine, as a result of which the state expressed its readiness to support air carriers by providing additional financial guarantees to support the aviation market.

With the outbreak of hostilities, the airspace over Ukraine was instantly closed, and air traffic was suspended. At the same time, Russian troops began active missile attacks on all key airfields in Ukraine, trying to deprive it of the ability to provide air defense. As a result, 19 out of 35 airfields were damaged, including 12 civilian and 7 dual-use airfields (excluding military airfields). Some airfields were subjected to several repeated shellings.

After Russia's full-scale invasion of the Ukraine, all of Ukraine's maritime trade routes became inaccessible for export and import. This has led to significant losses for Ukraine's economy. In March 2022 alone, Ukraine's exports decreased by 50%³. But already in August, as a result of the agreement reached between Ukraine, Turkey, the UN and Russia, it was possible to unblock the work of three Ukrainian ports for the export of domestic agricultural products — Odesa, Pivdennyi and Chornomorsk, which in 2021 provided 70% of Ukraine's trade turnover⁴.

³ <https://www.epravda.com.ua/columns/2022/10/24/692959/>

⁴ <https://www.epravda.com.ua/publications/2022/07/22/689519/>

As a result of the work of the so-called "Grain Initiative", it was possible to export 19 million tons of agricultural products through seaports (August 2022 - June 2023)⁵. Even with the work of such an initiative, the ability to trade by sea remains limited. Subsequently, the Russian Federation began to sabotage even the limited mode of operation that was guaranteed by the agreement, and then refused to sign another extension. However, thanks to the work of the military on the Russian Navy, Ukraine managed to partially restore maritime traffic unilaterally, without the participation of Russia.

In the territories and cities where the fiercest fighting took place, the municipal transport infrastructure was destroyed, and people were left without private vehicles, which were damaged or destroyed as a result of rocket and artillery shelling. The greatest damage to municipal property, which includes municipal (public) transport, was caused in Luhansk and Donetsk regions, as well as in the city of Kharkiv. This is due to the fact that the enemy, mercilessly using heavy weapons, struck civilian infrastructure. This led to the loss, according to estimates, of about 60% of public transport in the Donetsk region and more than 70% in the Luhansk region. In these two regions, the industry for the provision of passenger transportation services by urban and suburban transport has actually been completely destroyed. Most private cars were also lost by citizens in these two eastern regions of Ukraine.

Table 11. Transport losses assessment.

Types of losses	Estimated losses, \$ billion, by method	
	Revenue	Value added
Decrease in income (road transport)	7,130	3,257
Decrease in income (air transport)	6,442	2,943
Decrease in income (rail transport)	5,666	2,588
Decrease in income (warehousing)	4,313	1,970
Decrease in income (water transport)	3,849	1,758
Decrease in income (mail and courier services)	1,332	0,608
Decrease in income (urban transport)	0,985	0,450
Decrease in income (other)	6,763	3,090
Costs of dismantling and removal of construction waste	2,334	2,334
Total sector losses	38,814	18,998

Source: Ukrstat, Kyiv School of Economics.

Energy

The total amount of losses of Ukraine's energy sector due to the full-scale invasion of the Russian Federation is \$43.1 billion. The assessment of losses is carried out on the basis of publicly available data, estimates of direct losses, as well as using expert assumptions.

⁵ <https://www.ukrinform.ua/rubric-economy/3662574-ukraina-eksportovala-19-milioniv-tonn-agroprodukcii-u-mezah-zernovoi-iniciativi.html>

The electricity generation and transmission sector suffer the most from Russian aggression. The Russian Federation continues to carry out targeted and large-scale attacks on facilities that provide production, transmission and distribution of electricity. A significant amount of indirect financial losses falls on large power generation facilities. As a result of one of the latest massive shelling, according to the Prime Minister of Ukraine, 9 units of thermal power plants were damaged, and at least one of them was completely destroyed as a result of a direct missile hit.

At the beginning of June 2023, the Kakhovka Hydroelectric Power Plant was blown up and completely destroyed by the Russians. Annual economic losses caused to the state-owned company Ukrhydroenergo amount to more than \$100 million. The need for the construction of a new hydroelectric power plant of similar capacity will amount to about \$1 billion.

In addition, the largest nuclear power plant in Europe, Zaporizhzhia, remains occupied (the capacity of the ZNPP was more than 10% of the total capacity of the Ukrainian energy system before the Russian full-scale invasion). The occupied nuclear power plant does not supply electricity, and meets its internal needs from the Ukrainian energy system, as well as from diesel generators in case of emergency. The IAEA and the Ministry of Energy call the nuclear safety situation threatening. Also, the Vuhlehirska, Zaporizhzhya and Luhansk TPPs are located in the territories occupied after February 24, 2022, and fierce fighting is taking place around the Kurakhove TPP.

RES also suffers significant losses. The occupied facilities have not been producing electricity for more than a year, generating no revenue. According to the Energy Charter Secretariat, 13% of solar generation capacity are located in the occupied territories, and 8% has been damaged or destroyed; about 80% of wind generation is occupied and some is damaged due to shelling; 2% of bioenergy capacities are under occupation, and at least 4 biogas plants are known to have been destroyed. Such losses are multiplied by the impossibility of commissioning new unfinished facilities in which resources, including credit, were invested. According to the estimates of specialized associations, by the end of 2022, only wind farms with a total installed capacity of about 800 MW should have been completed and put into operation.

Also, due to the mass migration of the population, the reduction of business activity as a result of the full-scale war, the demand for energy has fallen significantly. According to the statements of the management of NPC Ukrenergo and the available data on the hourly balance of capacities of the IPS of Ukraine, since the beginning of the invasion, electricity consumption and production have fallen by more than 30%. In addition, the destruction of the electricity infrastructure has led to the impossibility of supplying and transporting significant amounts of electricity.

In addition, the weighted average wholesale price of electricity during the first 14 months of the full-scale war did not exceed the pre-war level. This leads to significant losses for electricity producers and companies that transport it. According to preliminary project estimates, losses to the electricity sector reach more than \$19 billion, of which more than two-thirds are accounted for electricity producers (more than \$13 billion).

The drop in demand for energy due to the full-scale war also applies to the natural gas sector. At the end of 2022, despite the drop in natural gas production by almost 7%, domestic consumption decreased by 24% (~7 billion m³), and energy exports were banned in June 2022 to guarantee the preservation of a sufficient amount of resource for the heating season. As a result, due to the saturation of the domestic commercial market and the impossibility of exports, the gap between the market price of natural gas within the country and quotations on the largest European exchanges, from where Ukraine also imports the resource, has increased.

Thus, in March-December 2022, the average price of natural gas on the Ukrainian Energy Exchange was about \$900 per thousand m³, and on the Dutch TTF hub — \$1400 per thousand cubic meters. m³. As a result, there is a drop in income for mining companies. The decrease in consumption has a negative impact on the revenues of companies that transport and distribute gas. According to the Project team's estimates, the total financial losses of gas companies amount to almost \$5.6 billion, including \$3.7 billion in losses among natural gas producers.

With the destruction of all operating oil refineries, the oil refining market in Ukraine has practically disappeared, and losses for this industry are estimated at \$13.3 billion. Before the start of the full-scale invasion, Ukraine processed about 3.6 million tons of oil per year, satisfying a third of domestic demand. With the destruction of the active Kremenchuk refinery and Shebelynka gas processing plant, as well as the inactive Lysychansk and Odesa refineries, Ukraine now has to almost completely cover domestic consumption of petroleum products through imports. In addition, due to the destruction of oil depots and the reorientation of import routes, importers had to incur additional capital and logistics costs.

The destruction of heat supply facilities and a decrease in demand for thermal energy led to losses in the district heating sector in the amount of almost \$2.8 billion⁶. District heating companies, most of which are public utilities, are in a difficult financial situation. The attraction of financing for the reconstruction of damaged facilities and the necessary modernization of infrastructure is extremely limited due to a drop in demand among non-domestic consumers and a moratorium on raising heat supply tariffs for household consumers introduced in August 2022.

Due to the reduction in coal production at state-owned mines and the occupation of coal enterprises, the coal industry suffered losses in the amount of almost \$0.7 billion. Coal production at state-owned mines, which provided about a quarter of total production, reportedly halved during the full-scale invasion. At the same time, the DTEK group of companies, which owns most of the private coal mines, managed to maintain production at the level of 2021 in 2022. However, the overall decline in the ability of national producers to supply thermal coal due to the war leads to losses for them and increases Ukraine's dependence on imports of this resource. The destruction of thermal

⁶ Previously, losses of the heating sector were included in utilities.

power plants will lead to a drop in demand for thermal coal in the country, and therefore increase the losses in the coal sector.

Table 12. Energy losses assessment.

Types of losses	Estimated losses, \$ billion, by method	
	Revenue	Value added
Decrease in income (oil production and refining)	13,458	3,364
Decrease in income (power generation)	12,838	3,209
Decrease in income (gas production)	3,795	0,949
Decrease in income (electricity distribution)	3,764	0,936
Decrease in income (heat supply)	2,792	0,698
Decrease in income (electricity transmission)	2,326	0,581
Decrease in Revenue (gas distribution)	1,173	0,293
Decrease in income (coal industry)	0,700	0,175
Decrease in income (gas transportation)	0,667	0,167
Costs of dismantling and removal of construction waste	1,614	1,614
Total sector losses	43,114	11,988

Source: Ukrstat, Kyiv School of Economics.

Utilities

The infrastructure of utilities, which is an important part of the life support systems of settlements, has become one of the targets of missile and artillery strikes by the Russian Federation. Constant shelling and hostilities made it impossible or significantly complicated the repair work, which led to a long-term shutdown of heat and water supply systems. In some cities, residents do not receive housing and communal services and still do not have adequate access to drinking water.

For example, due to damage to the water supply, most districts of Mykolaiv were left without centralized water supply for a long time. The water supply system was restored only after the liberation of Kherson in November 2022, and until that moment only technical water was available in the city, and drinking water was delivered from other cities as bottled through the retail network. In addition, the housing and communal services of cities under heavy artillery fire suffered a significant level of destruction.

The water supply sector experienced constant interruptions in cities due to forced power outages and a drop in voltage on equipment, which led to the need to install generators and accelerated the wear and tear of assets.

Losses of utilities are estimated at about \$7.7 billion (revenue) and \$3.8 billion (value added). The amount includes the dismantling of destroyed facilities and the removal of demolition waste, the Government's expenditures for the reconstruction and maintenance of utility companies, as well as a decrease in the industry's income.

Table 13. Utilities losses assessment.

Types of losses	Estimated losses, \$ billion, by method	
	Revenue	Value added
Decrease in income	6,744	2,859
Costs of dismantling and removal of construction waste	0,598	0,598
Additional expenditures of the Government for the reconstruction and maintenance of facilities	0,404	0,404
Total sector losses	7,746	3,861

Source: Ukrstat, The Ministry of Infrastructure, Kyiv School of Economics.

Digital infrastructure and IT

Indirect financial losses of digital infrastructure and the IT sector are estimated at \$19.3 billion (revenue) or \$8.7 billion (value added). It consists of a decrease in the income of fixed and mobile operators, IT companies, as well as additional costs for digital communications operators, primarily related to the need to ensure energy independence.

At least 726 operators of fixed Internet access electronic communications suffered losses as a result of hostilities. After the de-occupation of settlements, the destruction of networks reaches 100%. In the country, the quality of data transmission over fixed Internet access networks decreased by an average of 13%, across mobile networks — by 26% (estimated as of 01.05.2022). Over time, the situation improved.

The sector then suffered additional losses due to the difficult situation in the energy sector (see relevant section). In the winter of 2022/2023, operators faced the inability to work due to the lack of electricity, and had to incur additional costs for their own electricity generation and storage systems. Starting in May 2024, this problem has become relevant again.

There are also several problems in the digital infrastructure. Operators, whose networks are fully or mostly under occupation or in the war zone, if possible, maintain the networks so that citizens of Ukraine continue to use access to the Internet from the free territory. In this case, income is close to zero, but expenses remain. At the same time, some of these operators have loans from banks. They cannot pay for the use of the loan and repay the principal amount of the loan. At the same time, banks charge penalties for late payments, as well as submit them to credit bureaus as improper borrowers.

At the same, the IT sector suffered losses time due to the war and the deterioration of the global demand. In 2022, the export of information services decreased by 9% in dollar terms, the staff of IT companies decreased by about the same amount, there were fewer vacancies on the market and more applications for vacancies. This is due to both Ukraine's security risks and reduced demand from foreign companies (since most Ukrainian teams worked outsourced rather than on their own products).

Table 14. Assessment of losses of digital infrastructure and IT.

Types of losses	Estimated losses, \$ billion, by method	
	Revenue	Value added
Decrease in income (IT)	7,174	3,242
Decrease in income (mobile)	6,171	2,788
Decrease in income (broadcasting and television)	3,229	1,459
Decrease in income (fixed connection)	2,723	1,231
Costs of dismantling and removal of construction waste	0,051	0,051
Total sector losses	19,348	8,771

Source: Ukrstat, Kyiv School of Economics.

A person wearing camouflage pants and a light-colored shirt is using a black metal detector in a grassy field. The detector's coil is on the ground, and its handle extends upwards. The background is a blurred green field.

04

DEMINING

Since the beginning of the invasion, about 270 thousand km² of the territory of Ukraine has been affected by direct hostilities, mining of combat areas, or as a result of damage by artillery shells, strategic aviation, etc. Mines, other explosive ordnance, as well as their remnants pose a direct threat to the life and health of Ukrainian citizens, as well as interfere with normal economic activity in the affected areas.

According to the State Emergency Service of Ukraine (SES), as of the beginning of 2024, about 156 thousand. km² or approximately 30% of Ukraine's territory is potentially contaminated with explosives and should be surveyed for mine threat and cleaned up. Based on the current results of mine action, the density of neutralized explosive devices is almost half a thousand explosive objects per 1 km² of the cleared area. At the same time, the figure may be significantly higher in areas of prolonged and active hostilities.

The territories that were flooded after the Russian terrorist attack on the Kakhovka Hydroelectric Power Plant became especially dangerous. The water washed away mines and other explosive objects and carried them away with the current. Due to the unpredictability of water flows, it is difficult to predict the places where mines may be located. Thus, the calculation of the cost of demining these areas is based on the entire area affected by flooding as a result of the explosion. To determine the area of flooding, we used an interactive map created by the American Institute for the Study of War (ISW). Based on satellite images, it shows the difference between the territories as of June 5 (before the explosion) and June 9 (3 days after the explosion). So, according to our calculations, based on the map, a total of about 530-540 km² were flooded in the Kherson and Mykolaiv regions – we consider this entire area to be potentially mined.

It is necessary to carry out humanitarian demining in all territories, which consists of three main stages, after each of which the territories that are already considered unmined are released:

- Non-technical inspection is the collection of information about where there is potentially a mined area, without the use of technical means of detecting explosive objects, for example, mine detectors (i.e. surveys of the population, local self-government bodies, etc.).
- Technical inspection is the collection of direct evidence of the presence of a residence permit using technical means.
- Direct demining is the direct search and clearance of the territory from explosives.

These processes are already taking place. The area of potentially mined areas decreased by 18 thousand km² during 2023. These areas of fields, forests and water can be used again. According to the First Deputy Prime Minister and Minister of Economy Yulia Svyrydenko, during the year, sappers of the State Emergency Service, the State Service of Ukraine and private operators inspected 274 thousand hectares. hectares of agricultural land (or 58% of the four-year plan). 208 thousand hectares of these lands have already been transferred to farmers for use. Almost a million tons of grain can be grown on the returned

lands⁷. Since the beginning of 2024, another 171 thousand people have been examined. hectare.

Up to \$41 billion will be needed to demine the entire presumably mined territory of Ukraine (excluding demining of reservoirs, since we do not yet have data on the cost of this process). The cost of demining as a result of the terrorist attack on the Kakhovka Hydroelectric Power Plant can be estimated at up to \$1 billion.

⁷ <https://www.me.gov.ua/News/Detail?lang=uk-UA&idA686904-7a23-4951-9a83-b0cfa87b1bb0&title=RezultatiRobotiZRozminuvannia>

A person wearing a yellow jacket is sitting at a desk, writing in a spiral notebook with a black pen. On the desk, there is a large black calculator, a silver laptop, and a black folder. The scene is brightly lit, suggesting an office environment.

05

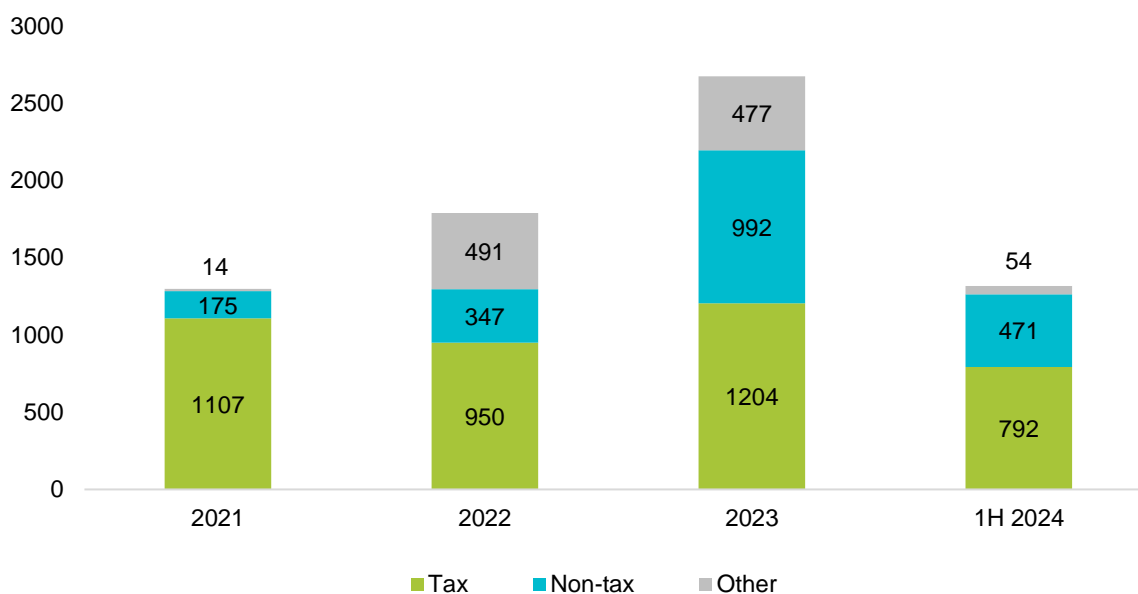
FISCAL SECTOR

Budget revenues

In 2021-2023, there was a sharp increase in state budget revenues. This trend is likely to continue in 2024. In 2021, revenues amounted to UAH 1.3 trillion and the following year, due to the full-scale invasion, they increased to UAH 1.8 trillion due to an increase in the share of non-tax and other revenues (in particular, grants and loans).

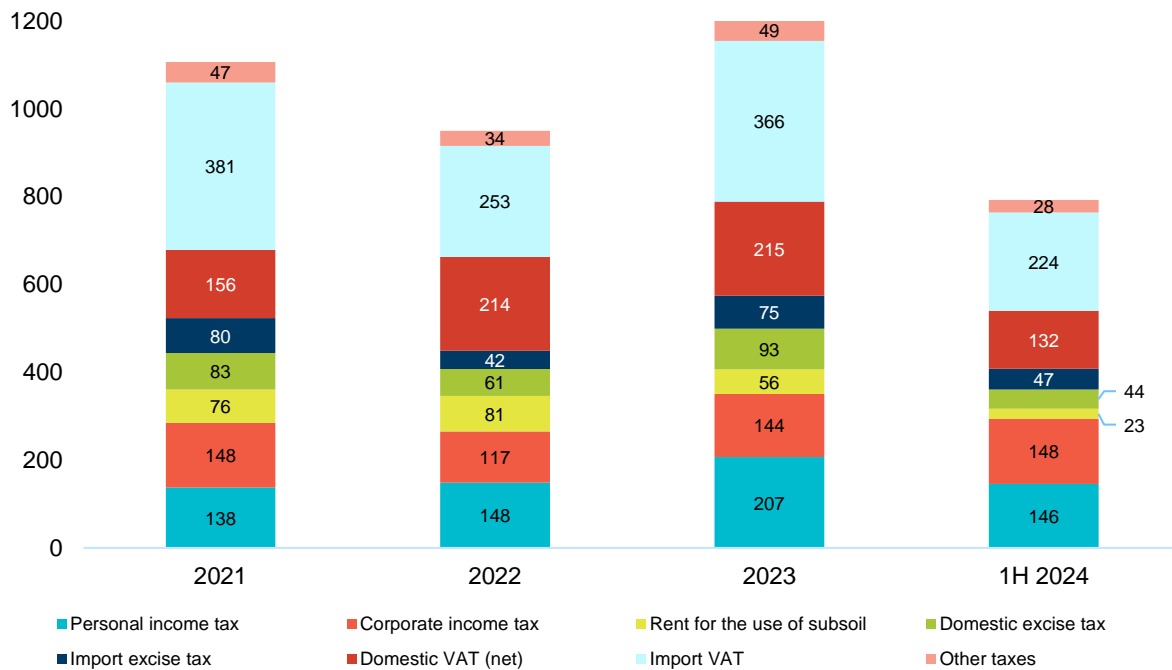
At the same time, tax revenues decreased by 14.2% due to a decrease in business activity because of hostilities, relocation of enterprises and restart of production in safer areas. The impact of supportive measures for the temporary liberalization of tax and customs legislation, which were actively applied until mid-2023, was also reflected. In 2023, despite the growth of tax revenues, including due to military personal income tax, their share was less than half of the state budget revenues. The resumption of greater importance of tax revenues is observed in the first half of 2024, which is associated with an increase in taxation of banks, the redirection of military personal income tax to the state budget, less grant support from partners, as well as the devaluation of the hryvnia.

Graph 4. Structure of state budget revenues, UAH billion



Source: NBU

The structure of tax revenues has also undergone changes (see Graph 5). First, there was an increase in the share of personal income tax in tax revenues — from 12% in 2021 to 18% in the first half of 2024 due to its payment by the military. Secondly, the decrease in the share of domestic VAT during the full-scale invasion is noticeable (from 23% in 2022 to 17% in the first half of 2024), although its share is still higher than in 2021 (14%). Thirdly, revenues from royalties for the use of subsoil were more significant in 2022, when rates were significantly increased and world prices were high, in particular, for natural gas.

Graph 5. Structure of state budget tax revenues, UAH billion

Source: NBU

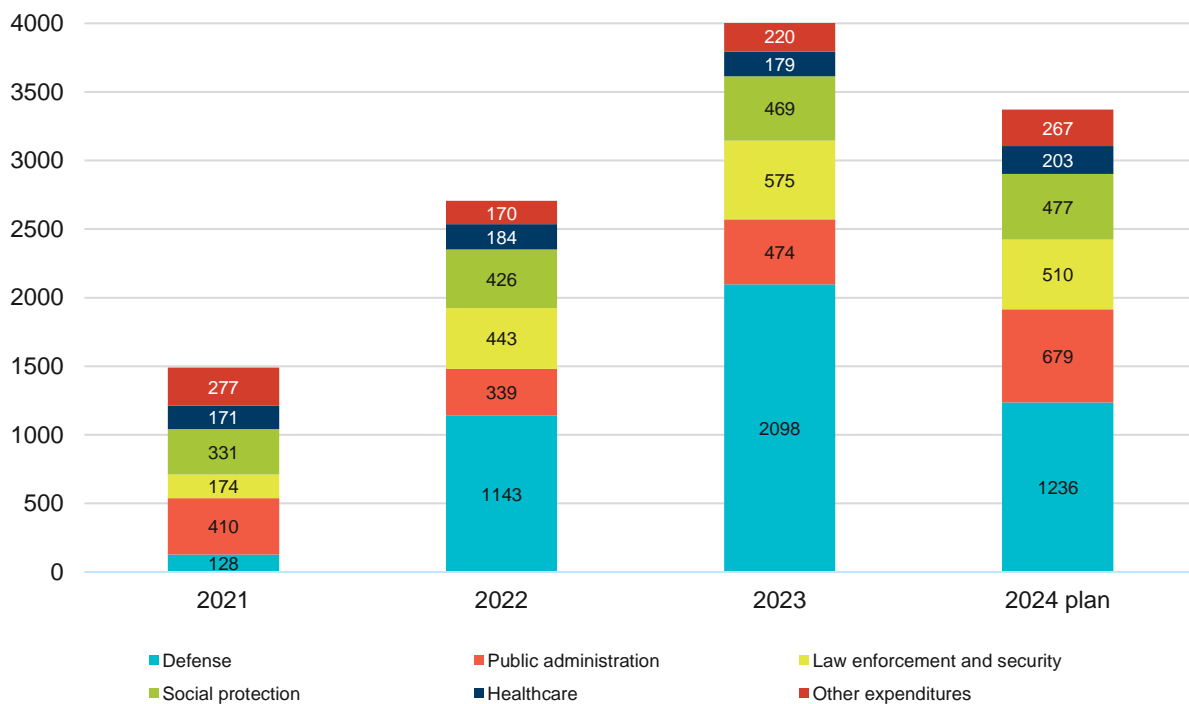
Budget expenditures

Since the beginning of the large-scale invasion, the dynamics and overall level of financing of public expenditures have changed significantly. Thus, until 2022, the leaders in the field of expenditures were national functions, economic activity and social protection, which accounted for about 60% of all expenditures. This approach is typical for countries that are not at war and focus on economic development and support for the population.

As a result of the invasion, Ukraine had to reallocate significant resources to other sectors, primarily to maintain its defense capabilities. The sectors on which the state focused its attention were the defense and security sectors. Thus, in 2022, the defense sector increased its funding by almost 10 times (from UAH 127.5 billion in 2021 to UAH 1142.9 billion in 2022). A similar situation, albeit not with such rapid growth, was observed in the security sector, funding of which increased by 1.5 times compared to 2021 (from UAH 174.3 billion to UAH 443.3 billion). The corresponding trend continued in 2023 with an increase in funding for the defense sector by 83.5% to UAH 2097 billion and an increase in the security sector by 29.6% to UAH 574.4 billion. In 2024, according to the priority targets, it was expected that the level of funding for the defense sector would be at the level of UAH 1235.7 billion, and the security sector at the level of UAH 509.8 billion. However, such indicators are very conservative given the continuation and intensity of hostilities, which is why the total level of funding, primarily for the defense sector, is likely to increase to the level of 2023 (about UAH 2000 billion).

At the same time, the overall level of financing of public expenditures also increased. Thus, in 2021, expenditures of almost UAH 1.5 trillion were financed. Already in 2022, this amount increased by 81.5% to UAH 2.7 trillion, and in 2023 by another 48.4% to UAH 4 trillion. In 2024, according to the planned indicators, expenditures are expected to be financed in the amount of UAH 3.4 trillion, although, as noted, due to the likely increase in funding for the defense sector, the overall level of financing of the state budget will also increase, probably up to UAH 4 trillion.

Graph 6. Structure of state budget expenditures, UAH billion



Source: NBU

It is also necessary to pay attention to the dynamics of changes in other key sectors. The social protection sector, which had funding of UAH 331.3 billion in 2021, received an increase in funding to UAH 426 billion in 2022, UAH 469.2 billion in 2023 and the planned UAH 477 billion in 2024. Such a systematic increase in the level of funding for this sector is associated with a significant increase in the number of IDPs and the overall socio-economic situation in the country. The sectors of public administration and economic activity most affected by the invasion are gradually restoring the level of funding to pre-war levels. The sector of public administration, which held a leading position in 2021, was reduced to UAH 338.8 billion from UAH 409.5 billion in funding in 2022. Although already in 2023, funding was restored to the pre-war level, taking into account inflationary growth – UAH 473.5 billion. Planned for 2024, UAH 678.9 billion is expected, which should make this sector the second in terms of funding in the country. The economic activity sector, with funding of UAH 187.8 billion in 2021, also received a significant reduction in 2022, to UAH 95.4 billion. In the next 2023, the sector managed to finance UAH 134.3 billion, and in 2024 it is expected to finance UAH 144 billion.

Budget deficit

As a result of Russia's full-scale invasion of the Ukraine, there was a significant increase in the budget deficit. Budget expenditures increased, in particular of a military nature, which could not be covered with the help of one's own financial resources. If in 2021 the state budget deficit at the end of the year amounted to UAH 197.9 billion or 3.6% of GDP, then in 2022 the actual size of the deficit amounted to UAH 914.7 billion or 17.6% of GDP, growing by 4.6 times comparing to 2021. The deficit remained much higher than provided for by the fiscal rule in 2023 and is planned for 2024 — 20.5% and 20.3% of GDP, respectively.

In 2021, most of the state budget deficit was financed by external borrowing. Net external borrowing provided financing for 55.8% of the state budget deficit, in 2022 this figure increased to 61.8%, the figure was even higher in 2023 — 81.4% and only 13.7% of the deficit in 2023 was financed by net domestic borrowing. The figures reflect the significant dependence of Ukraine's financial stability on external financing. However, all funds raised from external loans or grants can be used exclusively to finance humanitarian expenditures, while military expenditures are financed only from their own sources of income — taxes, non-tax revenues, domestic government loans (OVDPs).

In total, since the beginning of the full-scale invasion, Ukraine has already received \$93.6 billion in budget support from foreign partners. The largest donors of budget assistance to Ukraine since the beginning of the full-scale war are:

- European Union, \$36 billion (\$8.5 billion in 2024)
- United States of America, \$26.8 billion (\$3.9 billion)
- International Monetary Fund, \$10.3 billion (\$3.1 billion)
- Japan, \$6.4 billion (\$2.1 billion)
- Canada, \$5.2 billion (\$1.5 billion)

