

Urbicide in Ukraine: Analysis of Environmental Destruction – Challenges, Strategies, and International Cooperation (Part 1)

Abstract

This article presents the findings of an international research collaboration involving Lviv Polytechnic University (Ukraine), Kielce University of Technology (Poland) and Toronto Metropolitan University (Canada). The research analyses the destruction of the housing environment and the multidimensional consequences of the war in Ukraine. The analyses integrated disparate scientific discussions into a unified research subject and employed novel empirical data from first-hand accounts of witnesses and observers of the war in Kyiv, Kherson, Irpin and Lviv, thereby shedding new light on previously unpublished aspects and consequences of the conflict. The objective of the research was to monitor the situation in areas of active escalation on an ongoing basis, to identify indicators related to urban and demographic dimensions, and to analyse the process of complete destruction of urban organisms together with the communities living in them. The results demonstrate a clear pattern of strategic paralysis in urban structures, the collapse of civilised forms of urban life, a humanitarian catastrophe, the exhaustion of demographic potential and growing socio-economic and geopolitical challenges. The article concludes with an outline of the subsequent phase of the research, which aims to integrate contemporary technologies and methodologies and establish a foundation of prospective projects to develop a unified vision of sustainable architecture and new urbanisation as a guarantor of life stability.

Keywords: war in Ukraine, urbicide, consequences of war, empirical research, habitat, quality of living

INTRODUCTION.

The context of global quality of life indicators in the face of social and environmental risks in Ukraine

While rankings are conducted in numerous cities across Europe and the globe, providing insight into the most desirable places to reside, cyclical studies are also undertaken to monitor the countries that offer the optimal quality of life and social development. Examples of such studies include: *Best Countries List* – U.S. News,¹ *Quality of Life Index (Quality of Life Index by Country* – Numbeo, *Quality of Life in European Cities*),² *Mercer Quality of Living*,³ *The World's Best Countries For Quality of Life* – CEO World,⁴ *Human Development Index (HDI)*⁵ – United Nations, *Better Life Index* – OECD,⁶ a significant number of geographical areas and locations worldwide are subjected to a range of disasters.

They are caused by phenomena such as floods, hurricanes, fires, earthquakes, volcanic eruptions, and avalanches. Additionally, anthropogenic factors contribute to the occurrence of such events. It is crucial to highlight the role of human-induced large-scale explosions, terrorism and, most notably, large-scale armed invasions in recent years, exemplified by the ongoing conflict in Eastern Europe, specifically in Ukraine. These result in extensive and challenging to comprehend environmental degradation, land deterioration, economic and material impairment, as well as significant natural disasters and considerable loss of life. The active military operations and terrorist nature of the Russian offensive in Ukraine, which are aimed at material devastation and against the civilian population, have caused complete changes to the human housing environment and exacerbated an already crisis demographic situation. This is corroborated by the extent of depopulation, which is associated with population migration, internal displacement and the decline into poverty. The deterioration

of the housing environment, the demolition of infrastructure and local ecosystems has had a direct impact on the lives of millions of people, resulting in the destabilisation of the housing environment and far-reaching social consequences.

The most direct damage caused by the war is concentrated in the Donetsk (east), Kharkiv (north-east), Luhansk (east), Zaporizhzhya (south), Kherson (south) regions, Kyiv (north) – the capital of Ukraine and a metropolis of several million people (population over 3.5 million, area 839 km²) and all regions close to the current front line (Ill. 5). It should be noted that the aforementioned assessments do not apply to territories currently occupied by Russian troops, given that these territories are inaccessible. However, the data presented in the graphs later in the article concern average results.

The most comprehensive overview of the damages incurred by Ukrainian cities as a result of the ongoing conflict offers a compelling representation of the tangible impact of the war on these urban centres. It is no longer feasible to salvage the bombed and devastated residential environment. However, the ongoing destruction, looting, and threatened desecration of numerous other objects represent a significant and ongoing concern. It is therefore essential to gain an understanding of these phenomena if efforts are to be made to rebuild the residential environment and people's daily functioning.

Divergent realities of Ukraine versus global welfare indicators

In light of the aforementioned criteria, as outlined by experts in the global rankings, it is evident that they are not applicable to Ukraine, a country that has been devastated by a brutal and protracted war, resulting in a significant decline in the quality of life. The initial comprehensive survey conducted following the lifting of pandemic-related restrictions and the escalation of Russian

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aggression against Ukraine was undertaken by Mercer *Quality of Living* between September and November 2023. The survey, which provided valuable insights, considered the evolving global political, economic and environmental landscape and evaluated living conditions in over 450 cities worldwide. It is evident that Ukraine was not among the city representations, given the prevailing circumstances.

The *Quality of Life* and *Quality of Living* indexes employ a comprehensive range of criteria in their rankings, encompassing both objective and subjective indicators. The objective indicators include key socio-economic and political variables, such as life expectancy, income levels, unemployment rates, the extent of poverty, political freedoms, access to cultural goods, property prices, the transport system, levels of environmental pollution and air quality. In addition, subjective indicators, such as the degree of satisfaction with living conditions, feelings of happiness, stress levels and feelings of satisfaction with needs and aspirations, are also considered. In essence, these indicators are unified by the objective of guaranteeing a life of comfort and excellence, founded upon economic and political stability, a welcoming climate, superior air quality, a pristine and secure environment, and a cutting-edge, developed infrastructure. A high quality of life is also characterised by a range of other factors, including excellent healthcare, social services, a rich educational and cultural environment, a sustainable lifestyle and impressive modern architecture.

A total of 39 factors were considered in order to select the cities with the highest reputation. These factors were grouped into ten categories: political and social environment, economic environment, socio-cultural environment, medical and health factors, schools and education, public services and transport, recreation, consumer goods, housing and natural environment. In Europe, the leading positions are held by: Vienna (first), Zurich (second), Copenhagen (fourth). In New Zealand, Auckland (3) holds the best place, in Australia – Sydney (9), in North America – Vancouver (8), among Asian cities – Singapore (29) and in the United States – San Francisco, California (37). These locations guarantee the highest quality of life⁷ (Mercer Quality of Living City, 2023). In view of the aforementioned context, the findings of the Listening to Ukraine Household Phone Surveys (L2Ukr, 2023), conducted between April and December 2023 by the World Bank in collaboration with the Kyiv International Institute of Sociology, are worthy of presentation. The survey addressed two pivotal issues: firstly, the impact of the Russian invasion on the well-being of Ukrainians; and secondly, the strategies employed by Ukrainians to maintain a sense of normalcy amidst wartime circumstances, with the assistance of governmental and external resources.

The principal findings demonstrate that the situation has reached a critical juncture, with living standards having declined by approximately 63% and the number of individuals residing in poverty increasing by 1.8 million since the commencement of hostilities. This is attributable to a substantial diminution in the number of homes, employment opportunities and income. In Ukraine, one in five individuals has experienced job loss, with at least 7 million people living below the poverty line in 2022,⁸ a figure that rose to over 9 million⁹ in 2023. It is estimated that an additional three million individuals have been able to avoid this condition as a result of support from international partners and donors (Development Projects: Public Expenditures for Administrative Capacity Endurance in Ukraine (PEACE, 2023)).¹⁰ Moreover, 63% of households receive social benefits, which account for 73% of the income of the poorest. The provision of external funding has enabled the disbursement of pensions and social

This comparative analysis offers an illustrative overview of the housing environment and quality of life levels in European and world cities



III. 1. **Vienna (Austria), Aspern Seestadt** – a compact residential development situated within a modern and smart district of Vienna, a city with an exemplary reputation. In the 2024 Mercer *Quality of Living* survey, Vienna was ranked first, reflecting the city's high standards of living. Aspern Seestadt offers a welcoming living space with an abundance of green space, public squares, and diverse interstitial spaces between buildings, fostering interaction and promoting walking and public transportation, photo: Joanna Gil-Mastalerczyk, 2024



III. 2. **Kharkiv (Ukraine)**, The site of a multi-family residential development in Ukraine's largest city and a prominent cultural and scientific hub is now in a state of disrepair; (a) source: own archive – V. Proskuryakov, b) Source: redpost.com.ua (accessed 25.04.2024)



III. 3. **Mariupol (Ukraine)**, photo: Alexander Ermochenko/Reuters. The area in the vicinity of the Azovstal metallurgical plant is characterised by the presence of derelict residential properties and a general state of disrepair. Source: <https://nv.ua/ukr/ukraine/events/mariupol-foto-ruynuvan-opublikuvav-wall-street-journal-50235277.html> (accessed 25.04.2024)

benefits, as well as the delivery of assistance to individuals who have been forcibly displaced from their homes. Concurrently, a mere 22% of adults who were gainfully employed prior to the war are still engaged in remunerative activities.¹¹

In conclusion, the aforementioned circumstances have collectively resulted in a considerable degree of financial insecurity, which persists as a significant challenge for the majority of households. Moreover, the conflict has had a deleterious effect on the physical and mental health of Ukrainians, engendering a pervasive sense of fear and anxiety surrounding the potential loss of their loved ones and their places of residence. This has resulted in a heightened state of vigilance and resilience among the population, as they strive to safeguard their cherished cities. In light of Ukraine's remarkable resilience and the gradual recovery that has emerged in the wake of the violent processes that have transpired, it is evident that the vast majority of Ukrainians have returned to their cities, resumed their work and educational activities, and have begun to engage with the banking and business sectors. These developments have been accompanied by a decline in inflation and an increase in bank reserves, as well as the commencement of reforms, including the adoption of the law reforming the Specialised Anti-Corruption Prosecution Service (SAPO) in December 2023.¹²

The findings of this analysis indicate that, although the most challenging circumstances were perceived more strongly by those residing in regions experiencing active hostilities, there has been an overall improvement in the socio-economic situation by mid-2023. However, the ongoing invasion of Ukraine by Russia continues to result in significant losses for the population (see Ill. 1–3) and has had a detrimental impact on the global economy, including elevated interest rates and high debt levels.

SUBJECT MATTER AND PURPOSE OF THE RESEARCH

In light of the aforementioned facts and analyses, a number of fundamental challenges and pressing problems related to the crisis of the war in Ukraine emerge. These have previously been considered from other scholarly perspectives, but require further examination (Ditrych, Laryš, 2024; Bazhenova, 2023; Rogozha, 2023; Graham 2010; Zaulichyna, Yasinsky, 2023; Proskuryakov, Bogdanova, Kopylyak, 2023; Materials and Theses, 2023; Jasiński, 2023). The ongoing conflict in Ukraine presents a distinctive opportunity to examine the long-term consequences of war on the state and its citizens. In this context, research was conducted as part of an international project involving an academic community comprising Lviv Polytechnic National University (Lviv, Ukraine) and Kielce University of Technology. Additionally, an expert from the Cracow University of Technology and Toronto Metropolitan University (Canada) provided input to the research project. The objective of the project was to enhance collaboration between experts in the fields of architecture and urban planning in order to facilitate the post-war reconstruction of residential areas in Ukraine. The research project focused on the analysis of comprehensive and in-depth observational data, in addition to ongoing monitoring processes, pertaining to the situation in areas that have been devastated and threatened by Russian aggression. This data was used to inform the next stages of the work, which included a needs analysis and the development of a database of potential design concepts, corresponding as far as possible to real human needs, ready for implementation immediately after the war (part 2); and work on the application of modern technologies and inventory methods enabling effective reconstruction planning (part 3).

The joint project, which commenced in November/December 2023, has provided a forum for the exchange of experiences and the implementation of research initiatives. Consequently, it can also facilitate the advancement of architectural and urbanism education, while ensuring the continuity of research conducted by the aforementioned units (AED, KTIPA-U).

DATA AND METHODS

This study employs a variety of data sources, facilitating the exchange of experience and a comprehensive analysis. In particular, we seek to capitalise on the potential of international research collaboration, which offers an excellent opportunity to integrate disparate scholarly discourses into a unified research topic. The collaboration employs novel empirical data derived from accounts by observers of the war in Kherson, Irpin, Kyiv and Lviv. The testimonies, including those from academics, have provided information on previously unpublished phenomena and the impact of the war. They have also highlighted the importance of skilled individuals and personal interactions that can have a lasting impact on the shape of future European structures.

In order to gain a comprehensive understanding of the subject matter, it is essential to draw upon a multitude of sources, including existing research and publicly available documents: the analysis of data contained in databases of scientific publications, expert reports, press reports, surveys, forecasts, and reporters', pictures. Furthermore, our own observations allow us to analyse the impact of the attacks on the current economic situation and the daily dimensions of life in a country engaged in armed conflict. The situation with regard to the introduced restrictions, bans and orders that affect the reality, architectural and urban design in Ukraine is subject to continuous monitoring. Since the beginning of the war, we have been trying to assess the actual damage, despite the fact that the information available is often incomplete or unreliable, and that there is an absolute ban on entering and photographing collapsed blocks and ruins.

Despite limited access to some primary data, it was possible to verify the phenomena using a triangulation approach. The data were subjected to qualitative analysis employing interpretative methods, including thematic categorization and comparative case analysis, which enabled the identification of key patterns of destruction as well as local strategies for response and reconstruction planning.

The qualitative research methodology

As part of the qualitative research, several dozen in-depth interviews (IDI – in-depth interviews) were conducted with displaced persons and their relatives, along with six expert interviews with scholars and academic practitioners specializing in architecture, urban planning, spatial management, and reconstruction planning. The experts represented four Ukrainian cities: Kherson, Irpin, Kyiv, and Lviv. The interviews were conducted between January and April 2024. The duration of each interview averaged between 45 and 75 minutes. The selected cities reflect diverse wartime contexts — from areas experiencing intense military activity (Kherson, Irpin) to centers serving reception and logistical functions (Lviv, Kyiv). This variety allowed for a broad analysis of spatial and social changes. The selection of respondents was purposeful and based on the following criteria: professional experience in urban planning and architecture, construction, involvement in reconstruction or crisis planning activities, as well as personal experiences related to the war, such as evacuation, loss of residence, or participation in grassroots reconstruction initiatives. During the research, ethical principles were strictly followed, such as ensuring anonymity, voluntary participation,

and the possibility for participants to withdraw at any stage. The main goal of the conversations was to gather opinions on the scale and nature of building damages, changes in urban structure, as well as proposals, plans, and challenges related to post-war reconstruction of cities and social infrastructure. The interviews were semi-structured, allowing respondents to speak freely, while the discussion guide focused on the following topics:

- The scale of physical destruction of the built environment,
- Changes in urban functions and structures following the attacks,
- Needs of local communities and available resources for reconstruction,
- The role of architects, urban planners, and educational institutions in planning the recovery,
- Institutional and legal conditions,
- Expert recommendations regarding future reconstruction strategies.

The interview content has been anonymized, transcribed, and subjected to qualitative analysis using a thematic approach. The key categories emerging from the research material included, among others: the loss of social infrastructure, issues related to the relocation of residents, institutional resistance in planning, and the emergence of grassroots initiatives in designing temporary and permanent urban solutions.

As a result, we carry out detailed analyses of the collected data on the subject of the research to identify needs and contextualise them in the design processes (p. 2). In particular, we focus on the analysis of material losses in the human living and working environment and the multidimensional consequences of the war, including a diagnosis of the current socio-demographic situation. We then present research conclusions that support the formulation of forecasts and recommendations for the future situation within each of the issues analysed. Finally, we summarise the results and point out perspectives and directions for future research aimed at incorporating modern technologies and methodologies and developing a base of potential projects, in order to create a coherent vision of sustainable architecture and new urbanisation as a guarantor of life stability.

International dialogue

Effective analysis of the research topic required cooperation and continuous monitoring and forecasting of the processes currently taking place in Ukraine. The exchange of experiences was organised by an interdisciplinary cooperation team at the Lviv Polytechnic University and the Kielce University of Technology and dealt with the general situation caused by the Russian war, with a special focus on the residential environment. The meetings were attended by representatives of the academic research communities from Lviv Polytechnic National University (Lviv Polytechnic, Institute of Architecture and Design, Department of Architectural Environment Design (AED), Ukraine), Kielce University of Technology (Faculty of Civil Engineering and Architecture, Department of Theory and Architectural-Urban Design (KTIPIA-U)), Cracow University of Technology (Faculty of Civil Engineering, Department of Construction Management (KZB)) and Toronto Metropolitan University (Canada). Monitoring meetings were convened at two-week intervals for the purpose of discussing the actual effects of the implemented activities and modifying tasks, as necessary. The communication channel (online or stationary) was selected on an individual basis, according to the specific needs and capabilities of the participants.

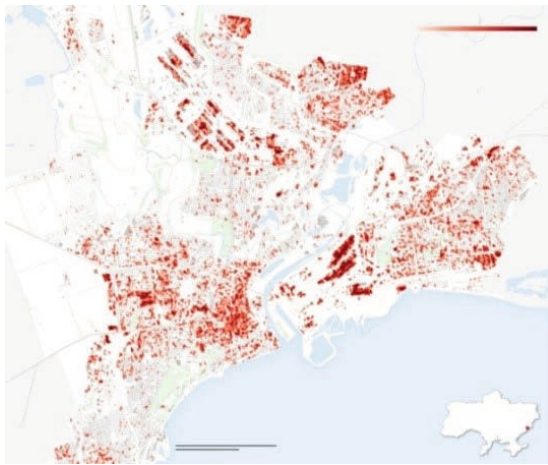
The discussion focused on the assessment of damages, particularly in the context of active Russian military operations, as

well as the necessity for comprehensive reconstruction of the housing sector, civilian infrastructure, and facilities that are indispensable to the human habitat. In this regard, the utilisation of novel empirical data derived from direct eyewitness testimonies and observers of the conflict was of particular significance. The information presented was provided by academics representing a range of regions and cities within Ukraine, including Kyiv, Kherson, Irpin and Lviv. Their input enhanced the research with a local perspective, thereby increasing its credibility. The empirical material was collected between December 2023 and May 2024 through the use of telephone interviews (in the case of Kherson and Kyiv) and personal, in-depth interviews with representatives of Kyiv, Irpin and Lviv. The respondents displayed a pronounced sense of patriotism and a willingness to make personal sacrifices in pursuit of victory. The messages, often articulated with difficulty, depicted a scenario of catastrophic devastation in a domestic setting that had been reduced to rubble. In the context of residing in areas subject to active warfare and being situated within occupied territories, respondents reported experiencing daily life amidst the persistent sound of sirens, the intermittent noise of bombs and shelling. This situation results in a lack of stability in the functioning of the system and its ability to engage in scientific activities. Furthermore, respondents are confronted with a challenging psychological and emotional situation as a result of human suffering, the death of loved ones, separation from family and colleagues, the migration of friends and colleagues towards more secure regions and abroad. The empirical data obtained served to corroborate and enhance the conclusions of the research, furnishing valuable information and new perspectives on the phenomena related to the war in Ukraine. The analysis of first-hand accounts of witnesses to the war enabled a more profound comprehension of the intricate nature of the challenges confronting conflict-affected communities. The analysis of this data has enabled the identification of specific aspects of the destruction of the housing environment that may have previously been overlooked or under-reported. As an illustration, the responses indicated not only material losses but also the influence of the conflict on the respondents' daily lives, the resilience of interpersonal relationships in the context of significant adversity, and the crucial role of support networks in maintaining wellbeing in challenging circumstances.

Moreover, the empirical material demonstrated the intricate interconnectivity between the disparate regions of Ukraine, each grappling with the ramifications of the conflict in a distinctive manner. Furthermore, the current state of housing was highlighted, noting that it is being implemented without a comprehensive, multifunctional development plan. This is particularly evident in the western region of the country, which has experienced the least damage. The findings of the dialogue also indicate the necessity of incorporating local contextual factors into design strategies in order to guarantee that the implemented measures are pertinent to the specific requirements and circumstances of each region within the country.

ACT OF URBAN KILLING (URBICIDE)

The history of Ukraine (area: 603,550 km², population: approximately 38 million) demonstrates that the country has endured prolonged periods of foreign occupation and that, following the dissolution of the USSR (1991), its political landscape underwent a profound transformation. The realm of politics remains riddled with instances of corruption and fraud. In light of the aforementioned considerations, the European Union has established the

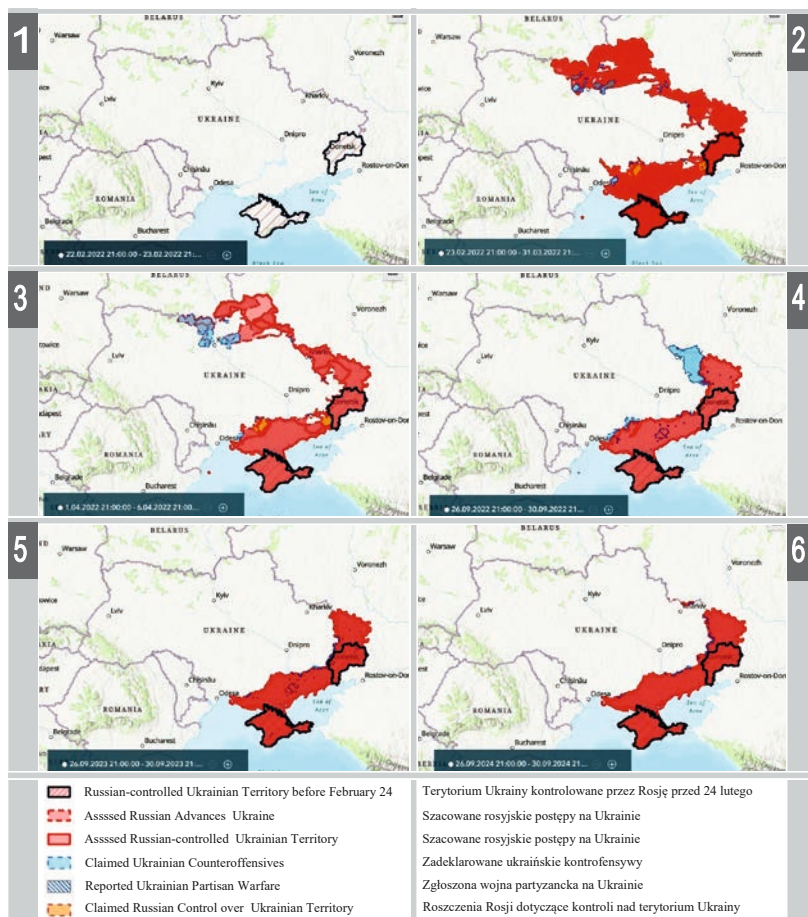


III. 4. Map of the destruction of the city of Mariupol, photo: Emma Brown/The Wall Street Journal; view of destroyed blocks of flats, photo: Pavel Klimov/Reuters, source: <https://nv.ua/ukr/ukraine/events/mariupol-foto-ruynuvan-opublikuvav-wall-street-journal-50235277.html> (accessed 25.04 2024)

eradication of corruption and financial embezzlement as a prerequisite for Kyiv's accession to the European bloc.¹³ Currently, Kyiv faces an absolute obligation to reform, with political, institutional-legal, economic and social dimensions, and the challenges of global reconstruction of the country.¹⁴ The Russian invasion of Ukraine, which was initially scheduled to last for a few days, has now entered its third year of active military

operations. Long-term, permanent hostilities and the most destructive nature of the war, with the likelihood of nuclear weapons (Dityrch, Laryš, 2024, The Bell, 2022), have been directed towards the ruthless destruction of the built environment (III. 4). A number of factors have contributed to the ongoing conflict, including the scale of the offensive, the length of the front line, the tactics of brutal siege warfare involving the bombardment of cities and civilian infrastructure, as well as the

III. 5. This study presents a comparative analysis of Russia's military progress in Ukraine, with a focus on the evolution of the front line and territorial control from February 2022 to September 2024. The data presented here is the result of an original compilation: Institute for the Study of War and AEI's Critical Threats Project, source: <https://storymaps.arcgis.com/stories/733fe90805894bfc8562d90b106aa895> (accessed: April–September 2024)



need to overcome obstacles and face the constant threat from Russia, including the rapid advance of The Russian military presence in early March 2022, coupled with the subsequent Ukrainian counter-offensives aimed at reclaiming lost territories, has led to the conclusion that the hostilities have resulted in extensive destruction of land and facilities, as well as profound and far-reaching impacts on various aspects of social life across the country (III. 5). The repercussions of this destruction were far-reaching, affecting numerous domains, including the economy, industry, legal system, religious sphere, culture, science, labour market and family life. Additionally, it resulted in a significant transformation of the security landscape in Europe. It is important to note that prolonged conflict represents a significant impediment to a country's economic development. In the case of Ukraine, the material and economic costs of the war – in the form of lost production, production potential and destroyed assets – have reached levels of loss that are difficult to comprehend, amounting to hundreds of billions of dollars. Furthermore, it is notable that the geographical distribution of the losses is more balanced in comparison to the damage incurred. Asset damage is mainly concentrated in areas of active warfare¹⁵ (III. 6). In terms of overall material losses, housing represents a particularly striking example of damage caused by the conflict. A considerable number of private residences,

multi-storey apartment blocks, dormitories and educational establishments were destroyed. The conflict resulted in significant damage to civilian infrastructure, including roads, railways, airports, bridges, viaducts and ports. In addition to the extensive damage to residential properties, the list of losses also includes public buildings such as hospitals, educational institutions, offices, production facilities, shopping centres, places of worship and cultural heritage sites. The latter category encompasses a diverse range of cultural assets, including centuries-old monuments, memorials, historical monuments and sculptures, unique building fragments, works of art, museum collections of historical and artistic significance, as well as contemporary cultural assets, such as objects and sites of high social, artistic, scientific and authentic cultural value and intangible symbolic value.

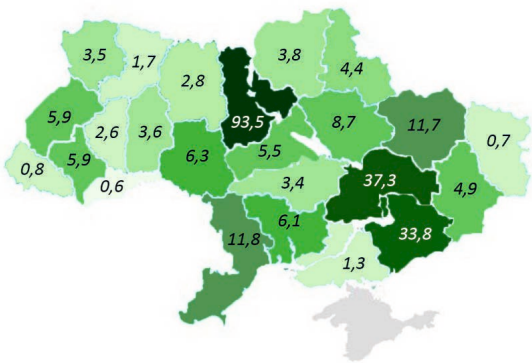
The estimated cost of reconstruction in Ukraine, following the two-year invasion and subsequent environmental hazards, is USD 486 billion (equivalent to approximately EUR 450 billion) as of mid-February 2024. This figure has been calculated by the World Bank, the UN, the European Union and the Government of Ukraine. An earlier estimation, published in March 2023, indicated a total of USD 411 billion, or just over €380 billion.¹⁶ As indicated in the figures published in September 2024,¹⁷ the total estimated losses incurred and yet to be incurred in Ukraine are valued at USD 1.164 trillion in revenue and over USD 385 billion in value added. The greatest losses were incurred in the trade sector, amounting to USD 450.5 billion. This was followed by industry, construction and services, which collectively suffered losses of USD 409.9 billion. Agriculture experienced losses of USD 83.1 billion. The largest expenditure category within the incremental costs is demining, which accounts for approximately USD 42 billion, while the housing sector represents the second largest expenditure category, with an estimated USD 22.4 billion. In aggregate, across all sectors, the dismantling of damaged facilities and waste disposal represent a total expenditure of USD 13.4 billion. A comprehensive visual representation of the most recent losses, estimated in 14 key sectors directly relevant to Ukraine's reconstruction, is presented below (III. 7).

Losses in transport infrastructure, industry and construction.

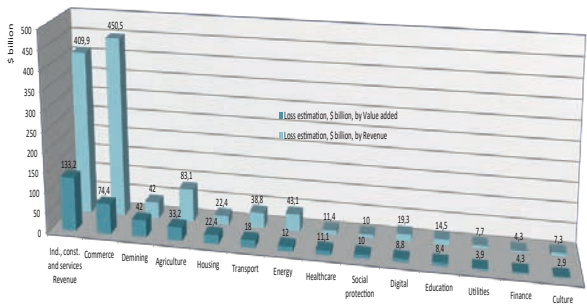
The transport infrastructure was severely damaged, particularly during the initial stages of the conflict. The Russian military forces engaged in indiscriminate shelling of civilian and military airports, subsequently directing their efforts towards the targeting of railway infrastructure. Estimated losses in the transport sector amount to around USD 38.8 billion in revenue and almost USD 19 billion in added value.

In the areas and cities where the most intense combat occurred, the urban transport infrastructure was severely damaged or destroyed, leaving residents without access to private vehicles, which were either damaged or destroyed by rocket and artillery fire. The most significant damage to municipal property, which encompasses public transportation, was sustained in the Luhansk and Donetsk regions, as well as in the city of Kharkiv. This is attributable to the indiscriminate deployment of heavy weaponry and its subsequent impact on civilian infrastructure. This has resulted in the cessation of approximately 60% of public transportation services in the Donetsk region and over 70% in the Luhansk region, according to estimates. The passenger transport industry, which provides services in urban and suburban areas, has been entirely decimated in these two regions.

The Ukrainian railway system is a vital component of the country's critical infrastructure. It has been instrumental in facilitating the evacuation of millions of citizens and the delivery of essential



III. 6. Losses by region of Ukraine, as of September 2024, original work based on primary data sources: Kyiv School of Economics, https://www.agronewscastillayleon.com/wp-content/uploads/2024/10/30.09.24_Losses_Report-eng.pdf (accessed 30.09.2024).



III. 7. Losses in 14 key sectors of Ukraine, status as of September 2024. Developed by: Compiled by J. Gil-Mastalerczyk, based on source data: Kyiv School of Economics, https://www.agronewscastillayleon.com/wp-content/uploads/2024/10/30.09.24_Losses_Report-eng.pdf (accessed 30.09.2024)

supplies to regions affected by the ongoing conflict. In response, the entity in question became the target of attacks launched by Russia, which resulted in substantial financial losses. The aviation sector began to experience financial difficulties even before the onset of hostilities, as insurance companies ceased to provide coverage for Ukrainian carriers as early as 12 February 2022. Following the closure of the airspace, 19 of the 35 airports, including 12 civilian ones, sustained damage as a result of missile attacks. In August 2022, an agreement between Ukraine, Türkiye, the United Nations and Russia resulted in the reopening of three ports: Odesa, Pivdenny and Chernomorsk. These ports accounted for 70% of Ukraine's trade turnover in 2021.¹⁸ Additionally, Ukraine's industrial, construction, and service sectors have been significantly impacted, with total business losses amounting to approximately USD 410 billion in revenue and USD 133 billion in value added. Nonetheless, there are indications of incremental advancement since mid-2024, particularly in the regions less affected by conflict, where commercial activity is resuming, and new construction projects are being developed.¹⁹

Losses in the energy sector. The total estimated losses in the energy sector are USD 43.1 billion. The most severely impacted sectors are electricity generation and transmission, due to a multitude of attacks on generation and distribution infrastructure. The damage sustained includes the destruction of nine thermal power plant units, one of which was completely obliterated.

The destruction of the Kachovka Hydroelectric Power Plant in June 2023 resulted in a loss of approximately US\$100 million, with the estimated cost of reconstructing a similar plant reaching approximately US\$1 billion. Furthermore, the Zaporizhia Nuclear Power Plant, the largest nuclear power plant in Europe, remains under Russian control and is not supplying electricity, which represents a significant risk to nuclear safety. In the preliminary estimates, the losses in the electricity sector are estimated to be USD 19 billion, with power producers accounting for more than USD 13 billion of this total.

Furthermore, the decline in energy demand has had an impact on the gas sector. In the year 2022, there was a 7% reduction in the production of gas, accompanied by a 24% decline in domestic consumption. The introduction of the gas export ban in June 2022 resulted in a decline in revenue for gas companies, with a total loss of USD 5.6 billion, including USD 3.7 billion on the producer side.

The destruction of oil refineries, including those in Krzemenchuk and Shevelynka, has resulted in economic losses amounting to USD 13.3 billion. Prior to the outbreak of hostilities, Ukraine was able to meet approximately one-third of its domestic fuel requirements through domestic production. However, the war has resulted in a significant shift in this dynamic, with the country now relying on imports for the vast majority of its fuel needs.

In the district heating sector, estimated losses amount to approximately USD 2.8 billion, with the financial difficulties experienced by district heating companies limiting the capacity to rebuild infrastructure. The coal industry has incurred losses amounting to USD 0.7 billion, largely due to reduced production at state-owned mines and the seizure of companies. The destruction of thermal power plants also contributes to the decline in demand for coal, thereby exacerbating the sector's existing problems.²⁰

Utilities and digital services infrastructure

The utility services infrastructure has become a primary target of rocket and artillery attacks due to its critical role in the functioning of life support systems within the settlements. The facility has been subjected to persistent shelling and warfare, which has impeded or significantly hindered repair efforts and resulted in the prolonged suspension of essential utilities such as heat and water. In Nikolaev, for instance, the centralized water supply was only reinstated following the liberation of Kherson in November 2022. Prior to that, residents had only been able to access technical water and bottled drinking water.

The estimated losses for utilities are approximately USD 7.7 billion in revenue and USD 3.8 billion in value added. Such costs include the expenses incurred for the dismantling of damaged facilities, the costs of reconstruction, and the revenue lost as a result of the damage. The occurrence of power outages and voltage drops has further highlighted the necessity for the installation of generators.

The digital infrastructure and IT sector sustained financial losses estimated at USD 19.3 billion in revenue and USD 8.7 billion in value added. The aforementioned losses can be attributed to a reduction in revenue for telephony operators and IT companies, in addition to the incurrence of supplementary expenses pertaining to the pursuit of energy independence. A minimum of 726 electronic communications operators were impacted by the hostilities, resulting in disruptions to fixed network and internet access operations.

The combined effects of the destruction in the utilities and digital services sector have significant implications for the functioning of essential services in Ukraine, further complicating the

challenges associated with rebuilding infrastructure and stabilising the economy.²¹

Losses in culture and education in Ukraine

It is estimated that the indirect losses incurred in Ukraine's social sector amount to approximately USD 10 billion. The financial impact of the crisis on cultural, tourism and sporting activities has been significant, with estimated losses reaching almost USD 7 billion. The financial burden of the destruction of cultural sites has a detrimental impact on the long-term value of these regions, which may ultimately result in a reduction in the financial support they receive in the future. The migration of professionals, including artists, serves to compound these losses, thereby undermining the stability of the cultural sector.

The education sector has also sustained significant losses, estimated at over USD 14 billion. The aforementioned losses can be attributed to the suspension of private educational institutions as a consequence of security threats and a reduction in budgetary outlays for education. Furthermore, the movement of pupils and students, including to overseas destinations, serves to exacerbate these issues.

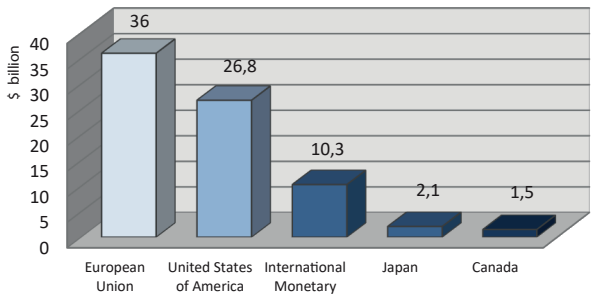
As a consequence of the armed conflict, 3,800 educational establishments, predominantly secondary schools, kindergartens and professional institutions, were either destroyed or damaged. The greatest losses were documented in the Donetsk, Kharkiv, Kherson, Mykolaiv and Luhansk regions. Despite the fact that active hostilities were observed in 11 regions, damage to educational institutions was reported in 21 regions of Ukraine.

As a consequence of the extensive damage and the prevailing security concerns, the educational process has effectively ceased in numerous regions, resulting in a reduction in funding for education from state and local budgets. Furthermore, there has been a notable decline in the demand for private educational services.

The estimated losses in the education sector include foregone revenue for private institutions that have suspended operations and reduced expenditure on education and science. Collectively, these factors have resulted in significant challenges to the functioning of the education system in Ukraine.²²

Losses in the social sector and health care. The indirect losses incurred in Ukraine's social sector are estimated to be approximately USD 10 billion. It is estimated that losses in the health-care sector exceed 11 billion US dollars. The primary causes of these losses can be attributed to the diminished revenue of medical facilities resulting from the suspension of operations due to security concerns and the migration of some patients outside of Ukraine. The aforementioned revenues encompass both the expenditures incurred by the healthcare budget and the revenues generated by public and private institutions. A total of

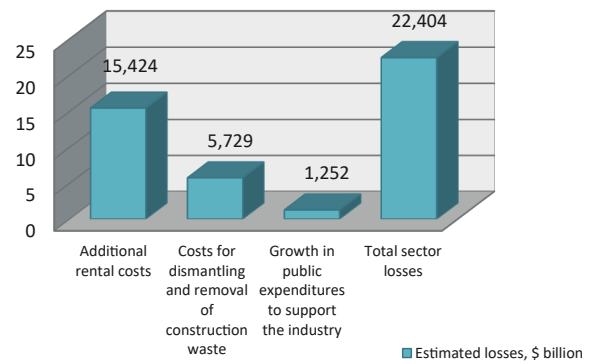
III. 8. Financial assistance to Ukraine has been provided since the outset of the comprehensive military incursion. Own compilation, September 2024



19 regions in Ukraine have been affected by damage to health-care facilities, with the most significant losses occurring in the Donetsk, Kharkiv, Mykolaiv, Luhansk and Zaporizhia regions. The impact of the pandemic was particularly felt in institutions such as hospitals and clinics, with significant consequences for the availability and quality of healthcare in the country.²³ In conclusion, since the commencement of the comprehensive invasion, Ukraine has received a collective sum of USD 93.6 billion in budgetary assistance from external partners. The distribution of budgetary assistance and the identity of the principal donors are presented in the following illustration (Ill. 8).

THE HOUSING ENVIRONMENT IN RUINS: Analysis of damage

The war has had a particularly pronounced and profound impact on the housing environment. The destruction is evidenced by the images of bombed apartment blocks, residential houses and destroyed civilian infrastructure, as well as the desolate social and public spaces where ordinary life was still ongoing two years ago. As a result, the situation regarding the housing stock and conditions is characterised by a significant degree of deterioration. As indicated by data from the Kyiv School of Economics (KSE), the initial phase of the war (February to December 2022) resulted in significant financial losses for a number of entities. A total of 131,400 private residences, 17,500 apartment blocks and 280 dormitories and boarding schools were identified. The estimated value of losses incurred in the housing sector was USD 54 billion.²⁴ It is currently estimated that hundreds of thousands of people have lost their homes as a result of the ongoing conflict in Ukraine. With each attack on a new Ukrainian target, the number of displaced persons continues to rise. In total, more than two million dwellings were damaged and ruined, representing about 10 per cent of the country's total housing stock.²⁵ According to the latest balanced data (analysis as of September 2024)²⁶ in total, more than 50% of the housing stock of cities and towns was severely damaged or destroyed. Furthermore, the number of damaged residential buildings is rising steadily throughout the country as a result of regular rocket and drone attacks. In the context of the residential sphere, it is evident that the most heavily urbanised areas and cities have been the most severely affected. The list includes Mariupol – completely ruined and razed to the ground. In addition to the aforementioned devastated cities, the towns of Kharkiv, Chernihiv, Severodonetsk, Rubizhne, Bakhmut, Maryinka, Lysychansk, Popasna, Izyum, Volnovacha and Irpin were also razed. The latter was particularly affected, with 70% of its infrastructure destroyed as a result of the cessation of Russian troop advancement towards Kyiv. In contrast, it is estimated that 90% of the housing stock in Severodonetsk was damaged, while in the towns of Bakhmut and Maryinka, all buildings were breached. In total, 95% of the urban infrastructure in this city was destroyed. The Azovstal zone was also particularly adversely affected by heavy bombardment (Ill. 3). A total of 22,000 civilians were killed across the city, while more than 100,000 individuals were deprived of essential services, including water, electricity, heat, and communication. The deceased were interred in mass graves, as well as in the rear yards of residential properties and in the thoroughfares of the city.²⁷ In total, the residential space affected by the disaster amounted to over 44 million km². A comprehensive account of the housing losses, classified according to type, is presented in Ill. 9.



Ill. 9. Housing losses, as of September 2024. Developed by: J.Gil-Mastalerczyk, based on source data: regional military administrations, Ministry of Reconstruction calculations, Kyiv School of Economics, https://www.agronewscastillayleon.com/wp-content/uploads/2024/10/30.09.24_Losses_Report-eng.pdf (accessed 30 September 2024)

THE URBAN AND DEMOGRAPHIC DIMENSION OF WAR.

Discussion of results

It is beyond dispute that the aggressive nature of the war against the civilian population of Ukraine and the manner of attacks on Ukrainian cities and their infrastructure assumed a highly urbanised character. The civilian population was subjected to the deliberate and systematic destruction of urban living conditions. Nevertheless, the number of Ukrainian casualties is likely to be high. However, it is still challenging to obtain reliable calculations and estimates of civilian and military casualties due to the ongoing armed conflict, the impeded transmission of information from areas of intense fighting, and the influence of propaganda. Furthermore, the deployment of at least 13 mobile crematoria in Ukraine serves to corroborate this assessment. These facilities were presumably brought in to obfuscate the evidence of the Russian atrocity.²⁸ According to estimates by the UN High Commissioner for Refugees (UNHCR), more than 6 million people have been displaced as of December 2023,²⁹ while another 3.5 million have been registered as internally displaced persons in Ukraine, based on data collected by the International Organisation for Migration (IOM).³⁰ It is important to acknowledge that, among the millions of individuals who have been displaced, the majority have not yet returned to their places of residence. It is possible that some may never do so. Moreover, the reports of those who have witnessed the conflict first-hand indicate that younger generations have little desire to return to areas that have been affected by war. It is anticipated that returns to these areas will be predominantly confined to the older demographic, who evince a profound emotional attachment to their places of birth and previous lives. As a result, these regions will be predominantly populated by an ageing demographic, frequently afflicted by medical ailments, necessitating care and residing in a state of apprehension, with an ever-present concern about the potential for renewed conflict. Prior to the war, Ukraine's population was estimated to be between 34.5 and 37.4 million. As of May 2023, the population is estimated to be between 25 and 29 million. The total number of Ukrainians residing abroad was 8,177,000 as of 21 June 2023, according to research and data from Demographic Change (2023). Following the conclusion of hostilities, Ukraine's projected population is expected to decline significantly, with estimates ranging from 24 to 35 million. This decline is likely to be accompanied by an increase in the number of individuals with disabilities³¹.

The circumstances have resulted in a state of strategic inactivity that persists unabated in urban environments. The repercussions of the assaults on the energy system and grid infrastructure have resulted in over 10 million Ukrainians being deprived of essential utilities, including electricity, water, and heat. Furthermore, the prevalence of inadequate sanitation facilities persists among impoverished households. The consequences of the lack of access to essential services, including electricity, communications, water and sanitation, as well as medical care – both general and specialised – for those who are left unsupported, bedridden and disabled, combined with difficulties in food transport and distribution, result in significant disruptions to production and trade. These factors have contributed to a humanitarian catastrophe and the collapse of civilised forms of urban life. In the present day, these regions bear resemblance to zones of destruction, where the persistent sound of explosives, gunfire and the signals of humanitarian vehicles can be heard.

Moreover, analyses of expert reports³² indicated the presence of worrisome environmental modifications resulting from the armed conflict. Of particular note was the contamination of the soil, which was found to contain landmines, toxic waste and asbestos-containing debris. Furthermore, the contamination of sediment from the flooding of arable land and sensitive ecosystems, caused by the breach of the Kachowka dam, has significantly contributed to the exacerbation of the pollution problem. The aforementioned activities have resulted in significant damage and destruction of infrastructure, including water treatment plants and agricultural crops cultivated in some of Ukraine's most fertile regions.

In conclusion, the analyses conducted revealed the extensive devastation of urban infrastructure and communities. This can be regarded as a deliberate action that has resulted in the complete destruction of the urban organism and the communities that inhabited it (Graham, 2010, p. 84; Jasinski, 2023, pp. 44–55). The aforementioned process has resulted in a severe humanitarian and socio-economic crisis, affecting millions of citizens. Furthermore, it has led to the depletion of demographic potential, increased economic and geopolitical problems, a lack of technical and financial capacity, and environmental degradation. Notwithstanding some indications of stabilisation, the circumstances in the beleaguered regions remain grave. The extent of the physical devastation and its ramifications are intensifying the prevailing chaos, jeopardising future stability and eroding confidence in public institutions.

CONCLUSIONS

As has been demonstrated, the financial losses incurred across numerous sectors are substantial, with a particularly detrimental impact on the quality of living conditions. The ramifications of the Russian incursion encompass the devastation of pivotal infrastructure, the disruption of the global energy grid, a reduction in production, and an augmented reliance on imported resources. In view of the above, we argue that in the process of rebuilding Ukraine and seeing it as a safe place to live and invest, the following become crucial:

- **The necessity of long-term reconstruction and the requirement for structural reforms: the function of research, technological innovation and the collaboration of the R&D sector:** The scale of investment required for Ukraine's reconstruction will span decades and will necessitate substantial financial commitments and comprehensive reforms that enhance governance standards. It is imperative that scientific

research, technological development and collaboration between the scientific sector and businesses play a pivotal role in this process, in order to facilitate the creation of innovative solutions. It is of particular importance to provide support for the collaboration between research and development (R&D) units, as well as to develop models and methodologies for the effective transfer of research and innovation results to practical applications. Furthermore, it is essential to implement policies that facilitate investment in contemporary technologies and infrastructure, which will contribute to long-term economic growth and the reconstruction of devastated areas.

Przy czym, warunkami niezbędnymi do realizacji długoterminowej odbudowy Ukrainy są:

- **The meaning of Ukraine's NATO membership and international support:** It is recommended that the reconstruction of the country be supported by political guarantees, such as Ukraine's membership of NATO, which will ensure long-term security and stability of life. As the conflict in Ukraine has far-reaching implications for the shape of the international order, financial and investment support from the European Union and Western countries is needed. In the absence of this, there is a risk of further socio-economic destabilisation and significant consequences across Europe, including the potential for further millions of Ukrainian migrants and the necessity for increased defence spending in the context of the Russian threat³³.
- **The concept of integrated architectural and urban design projects: accessibility, sustainability and priority building types:** In the context of the current situation, it is unprecedented to develop a comprehensive project base, including residential buildings, medical and rehabilitation facilities, educational infrastructure, public and municipal facilities, social support centres, commercial buildings, industrial buildings, cultural facilities, and so forth. These projects should address the current issues facing the country, including security issues and ensuring universal accessibility. It is recommended that future users be integrated into the planning process at all stages, as this will facilitate a more comprehensive understanding of their needs and expectations, thereby enhancing the efficacy and acceptance of the implemented solutions. It is of particular importance to adapt infrastructure to the specific requirements of the elderly and those with limited mobility, who will constitute the majority of the population in areas affected by conflict. A comprehensive approach provides a robust foundation for the effective reconstruction of the housing environment, facilitating the development of strategies to enhance resilience in the face of future crises. Furthermore, it facilitates the sustainability of urban settlements and the communities therein, thereby promoting inclusivity, which is pivotal to the long-term stability and quality of life of residents.

SUMMARY

In conclusion, the reconstruction of the housing environment in Ukraine necessitates the implementation of comprehensive measures that address the political, infrastructural, and social aspects of the situation. It is imperative that the construction sector be rebuilt and that institutional reforms be implemented to enable effective management of the reconstruction process.

This should be done with international involvement, technological cooperation and know-how. It is only through an integrated effort, focused on identifying priority areas for reconstruction, combined with a multi-sectoral approach, that effective

coordination of activities, reconstruction and the restoration of stability and quality of life for the population in conflict-affected regions can be achieved. These actions are of paramount importance for the future and security of Europe as a whole.

ENDNOTES

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