

War consequences and prospects for post-war reconstruction (case of Ukrainian urban agglomerations)

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ABSTRACT

During the years of Russia's lasted war against Ukraine, cities and suburbs have become the main centers of military aggression. The restoration and revitalization of territories – particularly cities and urban agglomerations – is a pressing issue, as they serve as concentrators and catalysts for development. Many countries of the world have experience of recovery after large-scale hostilities. Their successful recovery practices should be studied and can be implemented for effective recovery and post-war development of cities and urban agglomerations of Ukraine.

The purpose of this study is to identify the key characteristics of the war's consequences, as well as the challenges and prospects for post-war recovery in Ukraine's urban agglomerations, incorporating successful global practices and aligning with the goals of sustainable development. This analysis incorporates successful global practices and aligns with the goals of sustainable development. The research aims to develop a flexible recovery model that integrates economic, social, and environmental aspects, adapted to the contemporary challenges facing Ukraine.

Results. The study highlights the multidimensional impact of the war on Ukrainian cities, including the physical destruction of infrastructure, socio-economic disintegration, and environmental challenges. Drawing on international experiences of post-war reconstruction in countries such as Germany, Japan, and South Korea, the research identifies effective strategies, including infrastructure modernization, industrial recovery, social integration of internally displaced persons, and land restoration. The article examines urban agglomerations around the world that have experienced significant destruction, including Warsaw, Berlin and Tokyo, and identifies key features of their reconstruction processes. The study emphasizes the importance of rebuilding Ukraine in alignment with the principles and goals of the Concept of Sustainable Development, adhering to the "build back better" strategy. This includes the reuse of "post-war brownfields," the integration of innovative technologies, and the active involvement of local communities in the recovery process. The article outlines the potential for restoring Ukraine's urban agglomerations and presents a comprehensive set of measures and practical recommendations for the recovery of cities, urban areas, and affected regions. These recommendations are rooted in the framework of the 17 Sustainable Development Goals.

Keywords: *urban agglomerations, post-war reconstruction, sustainable development,, post-war brownfields, uricide.*

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Relevance. The foundation of the modern world order lies in powerful cities and urban agglomerations, which, alongside countries, play a pivotal role in transforming the global system. The 21st century is often referred to as the "century of cities," as, for the first time in history, more than half of humanity resides in urban areas. The roots of this phenomenon, however, were established in the 19th and 20th centuries, when the processes of rapid urbanization became a global trend, manifesting across all regions of the world. These processes led to unprecedented urban expansion, along with increased construction, destruction, and regeneration of urban spaces. Urban agglomerations are ambas-

sadors of economic growth, which perform an organizational, social, ecological and innovative function, and ensure the comprehensive evolution of countries and regions of the world [18]. The reuse of the territories of the centers and peripheries of agglomerations comes to the fore, especially in the context of sustainable development, disproportionate urban growth and the revival of urban centers [14]. The number, capacity and competitiveness of urban agglomerations today become the identifier of the development of the territory. And the key feature of cities and urban agglomerations is determined by sustainability and the ability to synergize [30].

War accompanies humanity throughout its exis-

tence. However, the ways and means of waging war are evolving quite quickly. It is in our time that their destructive influence is the most powerful in the entire history of mankind. Military operations have a multidimensional negative impact on cities and urban agglomerations. It covers a wide range of different aspects. The physical destruction of infrastructure is one of the most obvious consequences, which includes damage to housing stock, leaving thousands homeless, destruction of transport routes, bridges and roads, complicating logistics and access to services, and damage to utility networks such as electricity, water supply and sewerage. The social impact of hostilities is manifested in the occurrence of forced resettlement of the population, which destabilizes both the affected regions and places of temporary stay. Social ties and cultural centers are destroyed, leading to the loss of local identity, and the psychological stress of the residents due to hostilities makes it difficult for them to return to normal life. Economic consequences include the loss of jobs due to the destruction of businesses, a drop in revenues for local budgets, and the loss of investment attractiveness of damaged areas, which slows down their economic recovery [39, 42].

The war in Ukraine has been going on since February 2014, its full-scale phase – from February 2022. During the Russian-Ukrainian war, cities and suburbs became the main centers of military aggression [24]. Before the war in Ukraine, in 2013, there were 23 urban agglomerations in the country, with a population of 38,000 and over. persons (the largest – Kyiv, the smallest – Debaltseve) [41]. During this time, some regions and cities were occupied, de-occupied, some of them are being re-occupied. These processes are accompanied by significant destruction. There are settlements that have been completely destroyed and can no longer function due to the large-scale destructive impact. In cities such as Shchastya, Bakhmut, Avdiivka, Toretsk, Vovchansk, and many others, not a single building remains intact, and all communications have been destroyed. A number of front-line cities such as Kharkiv, Mykolaiv, Sumy, and Kramatorsk are being destroyed on a daily basis. All these are manifestations of direct urbicide. At the same time, cities that are under Russian occupation and have experienced a greater degree of non-military destruction have experienced indirect urbicide [24]. However, after the war, the restoration and revitalization of territories – particularly cities and urban agglomerations – will become a pressing issue, as they serve as concentrators and catalysts for development [3]. Many countries of the world have experience of recovery after large-scale hostilities. Their successful recovery practices should be studied and can be implemented for effective recovery and post-war

development of cities and urban agglomerations of Ukraine.

Analysis of recent research and publications.

A significant body of scientific research focuses on the impact of military operations on cities and territories, as well as their subsequent restoration. This is a critical issue, as most countries worldwide have, in some form, experienced post-war reconstruction. The speed and efficiency of this process directly influence the prospects for the further development and renewal of cities and urban agglomerations. With the ongoing war in Ukraine, located at the heart of Europe, the destruction of the physical urban environment, shifts in the social landscape, and other challenges have intensified. Consequently, a growing number of studies and publications are addressing issues related to post-war planning, reconstruction, and recovery [22], as well as analysis of the restoration of architecture in a number of European cities after the Second World War [35]. Among the studies devoted to the restoration of cities, urban agglomerations and countries of Europe and the world, the following studies should be noted.

Alvanides, S., Ludwig, C. argue that the full-scale destruction caused by war creates multi-layered challenges for urban regeneration. Post-war reconstruction covers not only the restoration of physical infrastructure, but also the revival of the socio-economic sphere, the preservation of cultural heritage and the adaptation of cities to modern challenges [5]. According to the authors, physical reconstruction plays a key role in post-war reconstruction, and one of the effective tools in this process is geo-spatial analysis, which allows visualization and assessment of the scale of destruction. Using the example of the city of Essen (Germany), using historical maps of destruction and modern geo-information technologies (GIS), the authors proposed a destruction index (BDI), which contributed to the identification of the most affected areas and, in the future, to optimize the planning and recovery processes. The study also demonstrates a clear connection between the scale of destruction during the Second World War and socio-economic disparities in the modern development of the city, because the areas that suffered the most destruction were more vulnerable in terms of unemployment and low levels of home ownership. The authors note that innovations in urban planning become especially important in terms of adaptation to modern challenges. In the post-war "new towns" of Great Britain, the concept of "neighborhood units" was actively implemented, which provided access to all necessary facilities within walking distance. Therefore, the study of historical examples, in particular, the experience of rebuilding cities after the Second World War to

solve modern problems and create sustainable urban environments in the future [5].

The research of Bugalski, Ł., Lorens, P. is devoted to the analysis of the post-war reconstruction of Polish cities, which is based on historical, political and social aspects that influenced the reconstruction processes [7]. Polish cities suffered extensive destruction during the Second World War. Their consequences required the creation of a multi-layered recovery strategy, which included the restoration of historical heritage, adaptation to new social realities and the integration of modern urban principles. In particular, the reconstruction of Warsaw, Gdańsk and other cities based on pre-war plans was aimed at reproducing the pre-war appearance and restoring the symbolic role of cities. In the 1950s, the political emphasis shifted to meeting the housing needs of the working class. New quarters were created according to the principles of industrialized construction, which sometimes contradicted the preservation of historical centers. The reconstruction of cities such as Malbork or Slupsk shows an example of the synthesis of new architectural styles with the remains of historical buildings [7].

Since the 1980s, the restoration of cities such as Elblong and Głogów involved the integration of historical forms into modern architecture. The idea of "retroversion" of cities was based on preserving the spirit of the past, but with innovative approaches to design. Modern trends and commercialization began to appear in 2004, after Poland's accession to the EU. Nowadays, the reconstruction of historical cities includes the development of tourism and thematization of urban space [4]. Although this contributes to economic growth, there is a risk of loss of architectural authenticity due to "facadism" and excessive "tourismization", which is a certain challenge.

Abdulla, Z. R., Hussein, S. H. investigated post-war recovery using the example of the revitalization of the city of Mosul [1]. One of the leading ideas emphasized in the study is the importance of involving local professionals and the community in recovery processes. The study shows that local experts have access to valuable information and can make informed decisions that meet the needs of residents. This bottom-up approach helps ensure that recovery is aligned with expectations and needs. The challenge of post-war recovery raises questions about the best strategies for physical and social recovery. In the case of Mosul, the main strategies suggested by local experts are the mixed use of development, rehabilitation, restoration and conservation of cultural heritage. For example, experts point to the importance of integrating the old and the new in the building, which is critical for preserving the city's identity. In view of the existing significant

destruction, most experts agreed that, first of all, it is necessary to restore residential buildings, since many residents were forced to leave their homes, and social infrastructure institutions, communal services. In summary, it is worth noting that the development of recovery plans should be based on the opinion of the local community, and in the recovery process it is necessary to use technological solutions for monitoring and optimizing the recovery process [1].

In the study of Vialard, A. the process of reconstruction of French cities after the Second World War is analyzed, in particular, the impact of relevant reconstruction plans on urban spaces [44]. Recovery strategies varied based on the level of destruction, ranging from localized interventions to a complete reimagining of the city's layout. While some cities chose the path of innovation, others tried to preserve the old plan with some modifications, such as widening of streets, etc. The study examines how new urban plans facilitate navigation in redesigned spaces while highlighting their impact on city identity. It notes that many plans fail to adequately preserve historical essence, raising concerns about cultural heritage preservation. The research emphasizes the crucial role of public associations in safeguarding urban heritage and stresses the importance of involving local communities in the restoration process. In particular, the study characterizes how post-war urban regeneration in France reflects the complex interrelationships between architectural solutions, urban structure and cultural heritage, and provides insight into contemporary approaches to urban regeneration [44].

Shaaban, M. H. I., presents an approach to the restoration of polluted and abandoned areas (brownfields) in the context of sustainable urban development in his research. In particular, it considers brownfields as a resource for restoration and reducing the consumption of new land. Brownfields can be strategically transformed into places for housing, new businesses, cultural and social centers. The author suggests considering sustainable development as the main principle of recovery. The author has performed an analysis of brownfield rehabilitation practices in cities such as New York, London, and Stockholm, which allows for the creation of adapted strategies for other war-affected cities. On the basis of the achieved development, it is worth noting that the reconstruction of urban areas after the war through the use of brownfields can become a powerful tool for sustainable development, especially in conditions of scarcity of new land. It is important to do this through inclusive, ecological and cost-effective planning that delivers long-term results for cities and urban agglomerations [37].

A significant amount of research is devoted di-

rectly to the post-war reconstruction of Ukraine. In particular, in December 2023, an international seminar was held under the auspices of NATO Science for Peace and Security. The scientific event is dedicated to the reuse of military brownfields, sustainable reuse of facilities, community involvement, risk assessment, war-related consequences of the war in Ukraine [27].

Among other studies aimed at finding ways to restore the cities of Ukraine, the study carried out with the support of the Konrad Adenauer Foundation is significant. It presents an opportunity to evaluate approaches to the post-war reconstruction of Ukrainian cities and urban agglomerations, taking into account modern challenges and principles of sustainable development [36]. The focus of the study is the concept of "green reconstruction" and "green transformation", which is the basis for building sustainable urban environments in the post-war period. In the study, all cities of Ukraine are divided into two groups: those that have suffered significant destruction, and those that have kept their infrastructure relatively intact. For the first group, the authors consider physical restoration a priority, and for the second - transformation in accordance with modern environmental standards. The authors consider human resources as the basis for the restoration of cities and territories, the importance of the return of the population, which requires the creation of comfortable living and working conditions, including housing, functioning infrastructure, access to medical services and education, is emphasized. Human capital is defined as a central element in the development of urban infrastructure. It is important that as the main principle of urban regeneration, the authors note "it should be better than before", which includes energy efficiency, use of renewable energy sources, etc. [26]. The main sources of financing are international aid, reparations, the state budget and private investments. It also emphasizes the need for transparent funding mechanisms that will avoid delays and ensure effective use of funds. Thus, the post-war recovery of Ukrainian cities is seen as an opportunity for a systematic rethinking of urban approaches. "Green reconstruction" not only complies with the European principles of sustainable development, but also contributes to building a sustainable future for the country [36].

The study of Pidorycheva, I., examines the post-war recovery of Europe. This is an experience for the implementation of the applied policy in Ukraine. In particular, the study examines France's post-World War II modernization plans, including the Monnet Plan and the Marshall Plan, emphasizing the need for integration between existing government organizations, businesses, and the public. These programs served as the basis for the forma-

tion of qualitatively new forms of cooperation in the reconstruction of cities and villages, which can be adapted in Ukraine in the conditions of post-war reconstruction. The author emphasizes that the reconstruction of cities should be based on the creation of an innovative industrial economy, excluding the reproduction of the agrarian and raw material model that existed before the war. This means the need to transition from an agrarian economy to Industry 4.0, with an emphasis on technological and digital solutions for the modernization of industry and infrastructure, which includes housing policy and the development of social infrastructure. In particular, the experience of France shows that the implementation of recovery plans can be delayed or not implemented at all without strong management control and support from the state [34].

Aiginger, K., & Moskalenko, O. analyzed the post-war reconstruction of cities and urban agglomerations in the context of Ukraine after the war. In particular, the proposals for a new Marshall Plan focus on rebuilding infrastructure, including roads, bridges, railroads, housing, and social facilities such as schools and hospitals. However, recovery should be based not only on physical needs, but also take into account socio-economic aspects, such as previous GDP growth and pre-war poverty levels [2]. The authors also point out that the demographic aspect is crucial for recovery planning, as strategies must be adapted to the new demographic system. Undoubtedly, the process of post-war urban reconstruction in Ukraine requires a comprehensive, strategic approach that takes into account economic, social and environmental aspects, including significant international support and involvement of the local community to achieve success [2].

In another study, Faraponov V. conducts an analysis of the Marshall Plan in terms of the evolution of US assistance [13]. The author examines the development of this policy from the middle of the 19th century to the present, highlighting the transition from technical to complex economic and political programs. This approach allows for a better understanding of the genesis and changes in the administrative goals of aid, as well as its role in the formation of international relations. This study offers a new perspective on the experience of implementing the Marshall Plan for the military recovery of Ukraine. The author emphasizes the parallels between historical experience and contemporary challenges, emphasizing the importance of strategic planning, intergovernmental coordination, and long-term perspectives in the implementation of the aid program.

In the article Duka A. and others, the post-war reconstruction experience of Germany, Japan, South Korea, Bosnia and Herzegovina, and Singapore is

systematized. It is proposed to understand the experience of these countries for the purpose of implementation in Ukraine [9]. The authors emphasize that the success of recovery depends on the correct choice of strategic directions, which form the basis for long-term positive changes. Research emphasizes the systematization of the positive experience of exiting the crisis, paying attention not only to the reproduction of what was lost, but also to the provision of social, economic and political development. Among the key areas emphasized by the authors, for the successful restoration of countries, cities and urban agglomerations, it is worth noting: anti-corruption measures, because the fight against corruption is presented as a basis for the effective use of resources; prioritization of innovations, in particular, through the concentration of limited financial resources on education, scientific research and the latest technologies; appropriate tax regulation, in particular, the implementation of effective tax management mechanisms to stimulate economic growth.

A series of semi-structured, in-depth interviews with participants in the reconstruction process in Ukraine is given in the study by Dulko, I. The author analyzes the key role of post-war physical reconstruction for national economic development and rehabilitation. The concepts of urbicide and ecocide are also introduced to study the spatial context of the destructive impact of military actions on the state of Ukrainian cities [10].

Mezentsev, K., Mezentsev, O.'s research is devoted to the issue of urbicide, that is, the deliberate destruction of cities, in the context of the ongoing war in Ukraine. The main focus is on new forms of urbicide that arise as a result of military operations and the impact of this process on the post-war reconstruction of cities and urban agglomerations. The study includes various aspects such as changes in urban infrastructure; the terrible state of the occupied cities; social and economic factors; which influence migration processes and intentions of internally displaced persons (IDPs). In the article, the author singles out three key aspects of urbicide, which are important for post-war reconstruction. In particular, direct urbicide, which includes violent acts, planned destruction of urban infrastructure; indirect urbicide, manifested through the destruction of social ties; disintegration of communities and management strategies. The authors emphasize that the reconstruction of cities after urbicide should include the development of a recovery strategy that takes into account the needs of IDPs and local communities; the integration of new technologies and approaches to city management, which can contribute to the restoration of social ties and communications; creation of inclusive policies to prevent new forms of urbicide, for example through control of

construction and social infrastructure [24].

Our previous research examined the challenges caused by the war in Ukraine and the possibilities of reusing military brownfields, considering their potential to contribute to the social, economic and environmental post-war reconstruction (development) of Ukraine [32]. Given that the Russian war in Ukraine has significantly increased the number, spatial scale, and concentration of brownfields, the key characteristics of four generations of brownfield transformations in Ukrainian cities under the challenges of war have been identified [25]. An approach for monitoring urban areas affected by military influence is presented. Its application to Kharkiv, which suffered from hostilities caused by Russian aggression, is demonstrated [17]. We also analyzed the experience of European countries for the post-war recovery of Ukraine, in particular the cases of Germany, Poland, Croatia, Albania, Kosovo, etc. Although the destruction after World War II was larger in area, newer and more powerful weapons were used in the territory of the former Yugoslavia [19].

Therefore, a significant number of thorough scientific works have been devoted to the issue of post-war reconstruction of cities, urban agglomerations, regions and countries of the world, including Ukraine. Some of them reveal the possibilities of implementation of successful world and European practices, a number of previously unresolved parts of the general problem remain. In particular, in our opinion, it is necessary to develop a scientifically based flexible recovery model based on the concept of sustainable development and its components: economic, social and environmental. This would allow combining the best practices of recovery and development, and be adaptive to modern realities. The need for post-war reconstruction of the territory of Ukraine is undeniable. For effective implementation, the recovery strategy should be aimed at the development of cities and urban agglomerations. However, the development of the program for the recovery and development of Ukraine, its cities and regions based on the best European and world practices is an urgent need right now. Since, for its successful implementation, it is necessary to involve a wide range of specialists of various subject areas, discussion with the public and agreement at various hierarchical levels of power. Therefore, it is urgent to develop an effective recovery model based on the concept of sustainable development. Such a model would be comprehensive and adaptive for cities and urban agglomerations that have experienced various levels and types of destruction. The development of the program is an extremely difficult task, because the war continues, and it is impossible to predict the level of further destructive influence on the cities

and urban agglomerations of our country. It is also impossible to assess the real level of destruction in the temporarily occupied territories due to the lack of access there by independent specialists of international organizations. Unfortunately, the Ukrainian Recovery Plan proposed in 2022 [29], could not take into account the devastating consequences of Russian aggression that took place in 2023 and 2024, such as the blowing up of the Kakhovskaya HPP, the destruction of Ukraine's energy system, etc. [8]. Also, given the fact that cities and urban agglomerations are the main drivers of economic, social, cultural and innovative development, in our opinion, an important task is the development of a recovery and development model that could be an element of the recovery program and would contribute to the rapid recovery due to influence on potential and existing "growth points" - cities and urban agglomerations.

The purpose of this study is to identify the key characteristics of the war's consequences, as well as the challenges and prospects for post-war recovery in Ukraine's urban agglomerations, incorporating successful global practices and aligning with the goals of sustainable development. The research employs a variety of approaches and methods, including systemic and synergistic approaches, which account for the unique characteristics of urban agglomerations, and a socio-geographical approach, which provides a comprehensive analysis. The study also utilizes content analysis to examine literary sources, concepts, and development plans, as well as the method of analogy to adapt recovery and development programs and strategies. Additionally, quantitative and qualitative assessment methods are applied to evaluate the extent of destruction.

The main material. The war in Ukraine is the largest conflict in Europe since the Second World War. The enemy employs powerful weapons with highly destructive and devastating effects. As a result, the consequences for Ukraine are unprecedented in scale and devastation. However, post-war recovery has become a critical and timely task for Ukraine. Its planning and implementation must begin immediately. The experience of European countries in rebuilding their territories and economies after the Second World War serves as an invaluable and important resource in this context [6, 43]. At the beginning of the war, a theory like the Marshall Plan for Ukraine was quite common, based on the experience of European countries that actually "rose from the ashes." In July 2022, the Recovery Plan of Ukraine was presented in the city of Lugano (Switzerland) as part of the "Ukraine Recovery Conference" [29]. However, since that time, Ukraine has suffered even greater destruction (in particular, in the field of energy infrastructure). This deepened the

crisis, and requires more global actions for recovery with their rapid implementation. Also, the experience of restoring European countries after the armed conflicts of the 1990s is useful for Ukraine.

The war in Ukraine has been going on for over 10 years, which is unprecedented for Europe in the 21st century. During this time, the occupying forces caused, in many respects, devastating and irreparable losses to our country. This is a concentrated destructive effect on the main components of the socio-geosystem – Society, Economy, and Nature, and the connections between them, specifically [31, 32]:

- *impact on society*: the appearance of forced migrants (since 2014, from the occupied territories, as a result of hostilities, there are people who have been forced migrants several times over the years, because they chose for life the territory close to home, which over time the occupiers chose) for a new goal), many people have gone abroad and have already adapted there, and are not planning to return; they are also dead soldiers and civilians, including children;

- *impact on the economy*: forced "deindustrialization": industrial enterprises of Donetsk, Kharkiv, Dnipropetrovsk, Zaporizhzhya and other frontline regions of Ukraine were destroyed and disabled. These enterprises mostly formed the GDP of the country in the pre-war period [16]. Considering the proximity to the front line, restoring the integrity of these enterprises in modern conditions is practically impossible. The destruction of energy capacities: Kakhovska HPP and Dnipro HPP, Trypilska TPP, and many others – had an irreparable impact on the energy system of Ukraine, hindering not only generation (as of the summer of 2024, only 5% of the former generating capacities have been preserved), but also energy transmission. This, accordingly, causes an increase in the price of not only the cost of electricity, but also, as a result, of almost all goods and services, because electricity is an important factor in pricing. Due to shelling and mine danger, there are problems with the development of the agro-industrial complex. Fields are burning, farmers are being blown up almost daily in the frontline regions while cultivating the fields, enemy rockets are destroying terminals with harvested grain;

- *impact on nature* – mine danger and constant forest fires, fires in the fields. Destruction of the Kakhovskaya HPP dam is ecocide. Destruction of ecosystems, as bombing, artillery shelling and ground fighting lead to the destruction of trees, vegetation and animal life. The rivers and lakes of the frontline regions are full of unexploded shells, dangerous for both people and animals. The loss of flora and fauna is irreparable, because the chances of escape from fires after shelling are minimal. Some species, having lost their natural range of exi-

stence, are doomed to perish.

Currently, due to military operations, a significant area of the territory of Ukraine can be classified as "brownfields". In our research, special attention is paid to brownfields of cities (urban agglomerations) of Ukraine, which are post-war brownfields as a result of military operations. They can be very small areas in mixed urban or rural areas, or large military complexes, public places, industrial facilities, airports, etc., which arose as a result of military operations in large cities and agglomerations [32]. Today, Post-war brownfields in Ukraine are territories that were formed as a result of shelling and military attacks in central areas, on the outskirts of the city, in historical areas, in traditional industrial areas, in the metropolis and in the countryside. The full-scale war in Ukraine led to significant destruction and unprecedented consequences, creating new types of brownfields. Which, among other things, also contain social consequences and memory [32] that remains in the landscape and must be taken into account both physically, regarding the reconstruction of the remains, and psychologically, in the light of rethinking and re-evaluating the heritage [45], search for new meanings, formation of collective memory including "places of pain and shame" and pride at the same time [25]. When discussing post-war reconstruction, the main question is whether the abandoned territories will remain deserted for an extended period or whether the conflict will escalate without a clear resolution. Therefore, determining the best approach to address these challenges is crucial [11].

In the State Regional Development Strategy for 2021-2027 (with changes introduced in accordance with the Resolution of the Cabinet of Ministers of Ukraine No. 940 of 13.08.2024), it is clearly defined that "...measures for the implementation of state regional policy are aimed at restoring infrastructure, economic activity, public services and the balance of ecosystems, creating safe conditions for the return of internally displaced persons to the regions, creating favorable conditions for the activities of all business entities on the restoration of territories, support and effective use of the potential of territories with special conditions for development, expansion of the positive influence of regional poles, growth (urban agglomerations, cities) and territories of sustainable development, which contributes to the reduction of disparities in the development of territorial communities and the quality of human life" [15]. Therefore, in this regulatory document, urban agglomerations are recognized as "poles of growth" and areas of sustainable development. Also, the strategic goal is "Formation of a united state in social, humanitarian, economic, climatic, ecological, security and spatial dimensions." In the aspect of

operational goal No. 1 "Ensuring the integrated development of territories taking into account the interests of future generations", the task, in accordance with the direction "Stimulation of the development of territories", is defined as "Creating a legislative basis for the functioning and development of agglomerations, ensuring balanced spatial development of the territories that are part of them" [15]. In fact, this document is one of the first to declare the importance of restoring and stimulating the development of urban agglomerations. According to the State Strategy, urban agglomerations are defined as Kyiv, Kharkiv, Dnipro-Kamyanske, Zaporizhzhya, Kryvorizka, Odesa and Lviv [15].

The Russian war in Ukraine significantly increased the number, concentration and spatial scale of brownfields. In addition to all existing problems, there are challenges associated with the massive destruction of industrial zones in cities and the forced relocation of industrial facilities. Therefore, Ukrainian cities face the task of finding effective post-war strategies both for brownfields in cities and agglomerations that are directly bombarded and destroyed, as well as temporarily occupied, that is, that directly and indirectly experience urbicide [25].

Among the most affected agglomerations, Kharkiv, Dnipro-Kamyanske, and Odesa stand out, as they have faced, and continue to face, frequent and devastating attacks. Overall, large-scale assaults have impacted nine regions of Ukraine, with the majority of attacks concentrated in the East and South. This reflects the aggressor's strategic focus on densely populated and industrially developed areas. The shelling has targeted residential buildings, railway stations, shopping centers, and other infrastructure facilities, demonstrating the indiscriminate nature of the aggression. The social impact of Russian attacks on cities and urban agglomerations has been profound. Some of the deadliest incidents include the strikes on the Kharkiv Regional Administration, the Mykolaiv Regional Administration, the railway station in Kramatorsk, the market in Kostyantynivka, the shopping center in Kremenchuk, and the city centers of Vinnytsia, Chernihiv, and Zaporizhia. Residential buildings in cities like Dnipro and Lviv have also suffered severe damage. Almost every attack has resulted in civilian casualties, leaving a lasting impact on local communities and sparking widespread public outrage. The destruction of critical infrastructure has led to enormous economic losses. Attacks on logistics facilities, such as the "Nova Poshta" terminals in Kharkiv and Odesa, have caused significant casualties and economic damage. The total economic losses from these attacks are estimated to exceed \$6 billion. In addition, large-scale ecocide has had long-term environmental consequences. For instance, the spill of

3,800 tons of oil products in Kharkiv has severely impacted the environment. The destruction of the Kakhovska HPP caused extensive flooding, disrupted ecosystems, and destroyed agricultural land. The majority of these mass attacks have been aimed at destroying critical infrastructure, including energy, transport, logistics hubs, and residential buildings, posing substantial challenges for future recovery efforts.

The consequences of the most large-scale shelling prove the vulnerability of urban areas to military threats. Cities that can exist for hundreds or even thousands of years are subjected to systematic destructive effects, and are not always able to recover in a short period of time due to lack of resources. For example, the majority of historical and cultural monuments cannot be restored in case of significant damage. It is also necessary to take into account the fact that it is currently impossible to calculate the number of victims in the temporarily occupied territories. Obviously, an important and urgent issue is the rapid recovery of the affected areas, in particular, the cities and urban agglomerations there. Let's consider the cases of cities and urban agglomerations of countries in Europe and the world, which have experience of effective post-war recovery (table 1).

Military actions have caused significant destruction to infrastructure, industry, and housing stock in many countries across Europe and the world. Some cities and urban agglomerations that became epicenters of fighting were almost completely destroyed. For instance, Berlin, Warsaw, Hiroshima, and Seoul lay in ruins after the war, necessitating comprehensive reconstruction efforts to ensure rapid recovery while preserving the authenticity of each city and incorporating modern architectural solutions. The consequences of using advanced weapons, such as the atomic bombs in Japan that annihilated Hiroshima and Nagasaki, or the massive bombing campaigns on major European cities, were particularly devastating. Notably, during the Second World War, Germany and Japan, despite being the aggressor nations, received substantial international support for their recovery.

Both countries became primary recipients of funds under the Marshall Plan, enabling the rapid restoration of industry and modernization of infrastructure. Similarly, international aid organized by the United States and the United Nations had a transformative impact on South Korea. In the cases of Bosnia and Kosovo, international organizations not only provided financial assistance but also took an active role in managing and supervising the reconstruction of these territories. A key focus of post-war reconstruction in countries like Poland, Japan, and South Korea was the restoration and modernization of industry. Large-scale industrialization pro-

grams were implemented, aimed at establishing new industrial enterprises, developing heavy industry, and improving transport infrastructure. Additionally, land reforms in Japan and South Korea played a critical role in the effective redistribution of resources, creating a solid foundation for future economic growth.

The restoration of critical infrastructure, namely transport networks and energy facilities, has become a priority in the support of many countries of the world, in particular in France, Croatia, Bosnia and Serbia. Considerable attention was paid to the restoration of roads, bridges, railways and water supply systems. Such projects not only ensured the restoration of cities and urban agglomerations due to the restoration of destroyed connections, but also created new jobs, which contributed to economic stabilization.

Israel, for example, in addition to the intensive development of industry, agricultural technologies and medicine, focused on the integration of refugees and displaced persons due to the creation of new settlements and ensuring their social support. Such an approach made it possible to avoid social tension and laid the foundation for stable demographic growth. Successful educational and medical reforms implemented in Japan and South Korea significantly improved the quality of life of the population and ensured the training of qualified personnel for further recovery.

Reforms aimed at political stability also played a significant role in post-war recovery. In Croatia and Albania, aspirations to join the European Union spurred the modernization of public administration and the economy. In Bosnia and Kosovo, stabilization was facilitated by establishing new democratic institutions with international community support. Regional development policies, particularly in France, ensured balanced national growth and prevented economic disparities between regions. Additionally, adopting anti-corruption legislation and mitigating corruption risks were crucial steps for many of these countries.

Countries that have invested in large-scale reforms and adopted a systematic approach to recovery, such as Germany, Japan, and South Korea, have achieved significant economic breakthroughs. In contrast, other nations, like Kosovo and Serbia, remain dependent on foreign aid and exhibit slower recovery rates. However, such evaluations must consider the pre-war development levels of these countries. The post-war reconstruction of cities and urban agglomerations necessitates a comprehensive approach that integrates international financial support, social reforms, industrial modernization, and political stability. Investments in infrastructure, education, and healthcare, coupled with effective mana-

Table 1

Cases of European and world countries in post-war recovery
(created by the authors based on [20, 21, 38, 46])

Country / duration of hostilities	Hostilities / destruction	The most destroyed cities	Actions to overcome destruction	Result
Germany <i>World War II</i> (1939–1945), 6 years	After the end of World War II, Germany was in ruins. Infrastructure, industry and the housing stock suffered significant destruction.	Berlin – bombing, battle for Berlin in 1945. Dresden – almost completely destroyed during the bombing in February 1945. Hamburg – large-scale destruction due to air raids (Operation "Gomorrhah", 1943). Cologne – 90% destroyed by bombing. Nuremberg – suffered from bombing and fighting at the end of the war.	Germany became a major recipient of Marshall Plan aid and received significant financial resources to rebuild industry and infrastructure. Reforms were implemented in the social security system, which included social benefits, health insurance and support for the unemployed.	In a few years, the German economy not only recovered, but also showed significant growth. This recovery became the basis for the "economic miracle" of the 1950s.
Poland <i>World War II</i> (1939–1945), 6 years old	After the war, Poland suffered significant destruction, especially in infrastructure and industry.	Warsaw – almost completely destroyed during the Warsaw Uprising (1944) and the German occupation; Gdansk was the scene of hostilities at the beginning of the war; Wroclaw – destroyed during the fighting between German and Soviet troops; Krakow – avoided mass destruction, but suffered from the German occupation.	Poland chose the path of industrialization. An industrialization plan was implemented. It included the construction of new factories, the development of heavy industry and the modernization of transport. A land reform was carried out, which provided for the redistribution of land among the peasants and investments in agriculture.	Poland was able to rebuild its industrial base and provide jobs for a significant number of the population. Poland has become one of the leading agricultural countries in the region.
France <i>World War II</i> (1939–1945), 6 years	After World War II, France was in ruins, with its infrastructure and economy badly damaged. The war created an imbalance in the development of different regions of France.	Paris – partially damaged during the war, but avoided large-scale destruction. Verdun is almost completely destroyed. Caen – seriously injured during the Allied landings in Normandy (1944). Le Havre – destroyed by 80% during the bombing in 1944. Saint-Nazaire – bombing and blockade during the Second World War.	"Plan Monnet" was launched for France. The Monnet Plan was designed to revive the French economy through industrial and infrastructure modernization. New factories were created, the transport system and energy infrastructure were updated. The policy of regional development was implemented. It envisaged investments in backward regions, infrastructure development and creation of new jobs.	France was able to quickly restore the economy and ensure stable economic development in the post-war period. The policy of transition to a polycentric model contributed to the even development of the country and improvement of living conditions in various regions.
Japan <i>World War II</i> (1937–1945), 8 years	Japan suffered large-scale destruction due to intensive bombing of cities. It was here use of atomic bombs. More than 2.5 million soldiers and civilians died.	Hiroshima was almost completely destroyed by an atomic bomb on August 6, 1945. Nagasaki – the city suffered an atomic attack on August 9, 1945. Tokyo – more than 50% of the city was destroyed during massive bombings (in particular, the bombing of March 10, 1945). Osaka – significant destruction of industrial facilities and residential areas. Yokohama – suffered heavily from air attacks due to its port and industrial facilities.	For some time, Japan was under the control of the Allied forces, led by the United States. Subsequently, it transitioned to democracy. A program of economic support was implemented, in particular at the expense of the Marshall Plan. Infrastructure was restored and military spending was reduced. The main resources are aimed at economic development. Land, industrial and educational reform has been implemented, and a major role has been given to modernization and innovation based on the creation of new technologies in cooperation with foreign partners.	The result of recovery is an economic boom. Today, Japan has become the second largest economy in the world. Japan is a stable democratic country with a developed economy, high standard of living and technological innovation made possible by effective post-war reconstruction.

Country / duration of hostilities	Hostilities / destruction	The most destroyed cities	Actions to overcome destruction	Result
<p>Israel <i>The first Arab-Israeli war (1948-1949), 1 year.</i> <i>The hostilities are periodically renewed.</i></p>	<p>During the fighting, Israel faced numerous attacks that resulted in great destruction. Despite the military victory, the war left the country with a large number of civilian casualties, massive destruction of cities and infrastructure, and a significant influx of refugees.</p>	<p>Jerusalem – one of the most affected cities. Jerusalem was divided into Arab and Jewish parts, which were subjected to intense shelling, especially the old city and important strategic objects. Jaffa (now part of Tel Aviv) – suffered serious destruction during the fighting. After Israel's victory, the city was evacuated by the Arab population, and a large part of it was destroyed. Akko - during the war, the city was destroyed. Tel Aviv – the city was under constant shelling, which created significant difficulties for the civilian population.</p>	<p>After the war, programs were organized in the country to settle new territories and build residential areas for refugees. Foreign aid and investments were actively involved, in particular from the diaspora. The country's government has initiated reforms in agriculture and industry to ensure food security. Programs for refugees provided for their integration into society through the creation of new settlements and providing them with the necessary support. At the same time, the government actively worked to restore industry and infrastructure, including transport, energy networks and water supply.</p>	<p>The country was able to provide social stability by integrating new immigrants and refugees, which led to a significant increase in population. The level of education and health care has improved significantly, which has made it possible to ensure general progress in the social sphere. Israel has become a stable and prosperous state that plays an important role in the region and the world.</p>
<p>South Korea <i>Korean War (1950-1953), 4 years</i></p>	<p>Large-scale hostilities occurred in the country, including bombings, artillery barrages, tank battles, and air attacks. South Korea experienced massive devastation, with its infrastructure, industry, transport networks, and housing stock almost completely destroyed.</p>	<p>Seoul - the capital, was captured and several times passed under the power of rivals, which led to the almost complete destruction of the city. Incheon - seriously damaged during the landing of Allied troops (Battle of Incheon, 1950). Busan - Although the city remained under South Korean control, it was overwhelmed by refugees and suffered from bombings. Daegu – significant destruction due to its strategic importance as a transport hub.</p>	<p>The United States provided more than \$3 billion in technical and economic support programs, other countries and the UN participated in financing humanitarian projects. Emphasis was placed on the reconstruction of the transport network (roads, bridges, railways) and the reconstruction of the housing stock, hospitals and schools. Land reform and stimulation of industrial development took place. Powerful anti-corruption measures were implemented, the government was reformed.</p>	<p>By the 1980s, the country had become an "Asian economic tiger", known for industrial giants such as Samsung, Hyundai, LG, etc. Mass urbanization took place and the standard of living of the population improved significantly. Currently, South Korea is the world's leading economy, technological leader and democratic state.</p>
<p>Bosnia and Herzegovina <i>Bosnian War (1992-1995), 4 years</i></p>	<p>After the war of 1992-1995, Bosnia and Herzegovina was left in ruins, with great human losses and destroyed infrastructure.</p>	<p>Sarajevo – a long siege (1992-1995), significant destruction of infrastructure and numerous victims. Mostar – seriously damaged during the fighting, the famous Old Bridge was destroyed. Srebrenica is a place of genocide during the Bosnian war.</p>	<p>In 1995, the Dayton Agreements were signed. They put an end to the war. International organizations were created to monitor and assist in recovery. Economic reforms aimed at privatization, development of small and medium-sized businesses and attraction of foreign investments were implemented.</p>	<p>Attracting significant international resources and financial aid made it possible to restore basic infrastructure and stabilize the political situation. The recovery of the economy contributed to the increase in the standard of living of the population.</p>

Country / duration of hostilities	Hostilities / destruction	The most destroyed cities	Actions to overcome destruction	Result
Kosovo <i>War in Kosovo (1998–1999), 2 years</i>	After the 1998-1999 war, Kosovo faced serious security and reconstruction challenges.	Pristina – destruction during the war (1998-1999), significant losses of infrastructure. Pecs was seriously affected by ethnic cleansing and armed clashes. Djakovica – significant destruction during the war in Kosovo.	UN Resolution 1244 established the UN Interim Administration in Kosovo (UNMIK). It exercised control over the region and provided international aid. A new legal framework was created, local authorities were restored, and democratic elections were held.	Basic infrastructure was restored, including electricity, water and roads. Kosovo has begun the transition to democratic development.
Croatia <i>Croatian War of Independence (1991–1995), 5 years</i>	After the 1991-1995 war, Croatia needed significant efforts to restore and stabilize the political and economic situation.	Vukovar is almost completely destroyed during the siege (1991), a symbol of the Croatian War of Independence. Dubrovnik – shelling and destruction of the historic center during the war. Zagreb – suffered from rocket attacks.	The Croatian government has focused on reforms necessary for integration into the European Union. This included reforms in the sphere of rule of law, economy and public administration. Much attention was paid to the restoration and development of the tourism industry, which was one of the key factors for the country's economy.	In 2013, Croatia became a member of the EU, which contributed to economic growth, political stability and improved infrastructure, and Croatia regained its tourist attractiveness.
Serbia <i>Yugoslav wars (1991–1999), 9 years</i>	After the conflicts of the 1990s, Serbia faced an economic crisis and a destroyed infrastructure.	Belgrade was repeatedly bombed. Niš – suffered from bombings. Novi Sad – destroyed bridges and infrastructure facilities.	International aid was involved, in particular from the EU, to restore infrastructure, modernize transport and energy.	The main infrastructure facilities were gradually restored and the economic situation stabilized.
Albania <i>Kosovo conflict (1998–1999), 2 years</i>	Albania faced internal instability and economic crisis after the end of the communist regime and the events of the 1990s.	Tirana – was not physically affected, but was overwhelmed by the humanitarian crisis, with more than 400,000 Kosovar Albanians seeking refuge in Albania. Kukës became a point for refugees, military operations on the border and artillery shelling by the Serbian army affected the outskirts of the city. Tropoja – military actions on the border and artillery shelling by the Serbian army affected the outskirts of the city.	A number of economic and political reforms aimed at stabilizing the country, developing democracy and a market economy were carried out. Much attention was paid to the development of transport infrastructure, the energy sector and telecommunications.	Albania has made significant progress in democratic development and economic growth, which has contributed to NATO integration and the start of EU accession negotiations.

gement of reconstruction processes, are essential for sustainable development and long-term economic growth. The successful experiences of countries that have rebuilt «better than before» should serve as a valuable model for Ukraine's post-war recovery efforts.

Therefore, the post-war recovery of Ukraine, its cities, urban agglomerations and regions requires a comprehensive approach. It should include reconstruction of infrastructure, social integration, restoration of human potential and, modernization of the economy and regional development. Many cities and urban agglomerations have to change and expand the performed functions, taking into account the loss of traditional (such as industrial, in particular) and the acquisition of new ones: innovative, creative, etc. Based on the analysis of historical examples, several key recovery models can be proposed, which can be adapted for modern conditions and combined with each other:

- *programmatic reconstruction of infrastructure and economy* – the model was developed based on the cases of Germany, Japan and France after the Second World War. Their success is based on large-scale investments in the restoration of transport, energy and housing infrastructure. Governments coordinated international aid (including the Marshall Plan) and introduced reforms to stimulate economic growth. This approach made it possible not only to restore the destroyed territories, but also to lay the foundation for the future economic "miracle".
- *industrialization and modernization* – a model formed on the basis of the experience of Poland and South Korea, whose effective recovery is based on the development of industry and the introduction of modern technologies. Poland focused on industrialization, developing heavy industry and modernizing transport. South Korea, in turn, has become one of the "Asian economic tigers" thanks to the support of innovation and the formation of industrial giants such as Samsung and Hyundai.
- *decentralization and regional development* – France after the war introduced a policy of regional development, investing in less developed regions. This contributed to the steady economic growth of the country and the improvement of the quality of life of the population. Such an approach can be useful for reducing the socio-economic disparity between cities and urban agglomerations of different regions.
- *attraction of international aid and integration into international organizations*. In particular, Bosnia and Herzegovina, Kosovo and Serbia have successfully used international programs to restore infrastructure. International organiza-

tions provided financial support, contributed to the reconstruction of transport networks, electricity supply and other key sectors of the economy. This approach makes it possible to compensate for the lack of own resources. After the military conflicts, Croatia and Albania carried out deep reforms with the aim of joining the European Union and NATO. This gave them access to international funds, stabilized the political situation and accelerated economic development. Integration into international organizations creates investor confidence and opens up new opportunities for post-war recovery, growth and development.

The restoration of Ukraine's cities, urban agglomerations, and regions should incorporate the three pillars of sustainable development: economic, social, and environmental. Research on the sustainable brownfields' redevelopment includes integrated approaches to environmental, spatial and urban planning in the configuration of relevant policies and strategies [28]. The economic, environmental and social aspects of the problem of brownfields involve working with the different interests of various stakeholders [33]. As sustainable development remains a fundamental objective of the EU, specific sustainable development policies should be incorporated into development practices that preserve and protect, minimizing the negative impact of brownfields areas within urban communities [28]. Realization of the regeneration potential for the sustainable development of the city, has a clear and understandable methodology and parameters, including a whole sustainable development for pollution management and reuse rationale and content; management of existing buildings and infrastructure; land use and urban planning in built-up areas; processes and methods of planning citizen participation; management of brownfield projects [33]. Implementation of the principles of sustainable development for the restoration of cities and agglomerations involves: balancing and integration of social, economic and ecological components of the community; meeting the needs of existing and future generations; respect for the needs of other communities in the region and at the international level [32]. For the effective implementation of measures for the restoration and development of cities and urban agglomerations, based on the concept of sustainable development, the consistency between its three components: ecological, social and ecological, their parity and harmonious combination is extremely important. It is necessary to determine the needs and challenges of recovery and development of cities and urban agglomerations of Ukraine in accordance with the 17 goals of sustainable development (table 2).

Table 2

Needs and challenges of restoration and development of cities and urban agglomerations of Ukraine in accordance with the 17 goals of sustainable development (created by the authors based on the data [40])

Sustainable Development Goals	Relevance for Ukraine	Actions required	Implementation for Ukraine	Result
1. No Poverty	The war led to a large-scale loss of income for millions of Ukrainians, especially in the most affected regions.	To provide targeted assistance to the victims, in particular to displaced persons and vulnerable sections of the population. Implement programs for employment and small business support.	The creation of state programs for the retraining of the population, especially for forced migrants, the introduction of social aid packages for vulnerable groups, financed from the state budget and at the expense of international aid. Special attention should be paid to settlements that have been destroyed and local residents have lost their jobs.	Reduction of the poverty level, stabilization of population incomes, integration of internally displaced persons into host communities.
2. Zero hunger	Agricultural infrastructure is destroyed, large areas of agricultural land are contaminated with mines, which threatens food security.	Invest in the agricultural sector, restore agricultural production in the affected areas. Provide humanitarian aid and food security.	De-occupation of territories and demining of agricultural lands. Restoration of the agro-industrial complex thanks to state support programs and subsidies.	Creation of food hubs to provide the population with food, export of necessary products.
3. Good health and well-being	The medical infrastructure, especially in the frontline areas, needs to be restored.	Reconstruct hospitals, implement psychosocial support and rehabilitation programs for war victims.	Reconstruction of destroyed hospitals and creation of mobile medical teams in hard-to-reach areas. Organization of psychological rehabilitation of military personnel and the injured population. Creation of rehabilitation centers for veterans and civilians.	Improving the population's access to medical services, restoring the psychological health of the affected population.
4. Quality education	Destroyed schools and universities limited the population's access to educational services.	Restore schools and universities, provide digital infrastructure for distance learning. Implement personnel training programs for regional recovery.	Restoration of educational institutions using modern technologies. Expansion of distance learning programs. Programs for children of immigrants from temporarily occupied territories.	Increasing the level of education and training of specialists capable of ensuring the recovery of the country.
5. Gender equality	Women in Ukraine, like men, are actively involved in defense and volunteer initiatives.	To implement social adaptation programs for resettled women and military women. Stimulate the participation of women in local self-government.	Introduction of special grants for women entrepreneurs in affected regions. Develop support programs for female veterans. Support for women who lost breadwinners due to the war.	Equal access to recovery opportunities for women and men.
6. Clean water and sanitation	The hostilities disrupted access to water supply in many regions of Ukraine.	Restore water supply and drainage in destroyed cities, implement water purification projects.	Restoration of centralized water systems. Implementation of programs to clean water bodies from the consequences of hostilities.	Guarantee of access to clean water and sanitation for the entire population of Ukraine.
7. Affordable and clean energy	The energy infrastructure has become the main target for enemy attacks and has	Create renewable energy capacities (solar, wind stations). Replacement of destroyed energy	Installation of distributed solar and wind power plants. Restoration of power systems using attack-resistant technologies, system modularity.	Reduction of dependence on fossil energy sources, energy security.

	actually been destroyed, Ukraine is dependent on energy exports.	facilities with environmentally friendly technologies.		
8. Decent work and economic growth	Millions of Ukrainians lost their jobs, particularly in the most affected industrial regions of the country.	Stimulate the development of small and medium-sized businesses through tax incentives, grants and loans. Invest in industrial parks.	Creation of industrial parks in affected regions. Tax incentives for businesses that create jobs. Restoration of the country's industrial potential.	Job creation, economic revival.
9. Industry, Innovation, Technology and Infrastructure	Ukraine's critical infrastructure is heavily damaged, particularly the transport system.	Restore transport, communication and digital infrastructures. To implement innovative solutions in urban planning.	Integration of Ukraine into the European transport system. Construction of modern highways and railways.	Infrastructure that is resistant to future challenges and integrated into the European transport system.
10. Reduced inequality	The development gap between the country's regions has widened as a result of hostilities.	Ensure access to renewable resources for all regions, especially rural and small towns.	Investments in the development of affected areas. Ensuring equal access of the country's population to resources and services.	Ensuring comprehensive development of regions.
11. Sustainable cities and communities	The reconstruction of cities must take into account the risks of future conflicts, the rebuilt cities must be technological, protected and safe.	Develop a polycentric model of recovery, with an emphasis on the development of regional centers. To implement green technologies in urban regeneration.	Creation of "smart cities" with bomb shelters and modern defense systems. Decentralization policy to strengthen local self-government.	Sustainable cities with a high quality of life of the population and a high level of safety and protection of the population.
12. Responsible consumption and production	Necessity of supporting domestic production, introduction of circular economy in Ukraine.	Implement construction waste processing projects. Promote environmentally friendly production methods.	Processing of construction waste, which was formed as a result of destruction, and its reuse in construction, implementation of environmental initiatives.	Waste minimization, environmental sustainability.
13. Climate action	Identification of prolonged consequences of military operations in Ukraine	Implement adaptive measures to climate change, including emergency warning systems.	Decarbonization of the energy sector, development of an ecological transport system, expansion of green zones.	Protection of ecosystems, reduction of the carbon footprint.
14. Life below water	As a result of hostilities, the waters of the Azov and Black seas are polluted by mines, oil products, etc.	Cleaning of sea water areas, preservation of marine flora and fauna	Cleaning the water areas of the Black and Azov seas from mines and other waste.	Restoration of marine ecosystems, rehabilitation of marine flora and fauna
15. Life on land	A large number of Ukrainian ecosystems were destroyed as a result of ecocide.	Restoration of forests, reclamation of lands damaged by hostilities.	Reclamation of damaged lands, protection of forests,	Preservation of biodiversity, restoration of ecosystems.
16. Peace, justice and strong institutions	The need for enhanced protection and provision of security conditions for the population of Ukraine.	Develop local self-government, ensure the rule of law, promote transparency in recovery processes.	Creation of platforms for public participation in the planning and implementation of reconstruction projects, support for internally displaced persons and creation of equal conditions for all citizens in access to resources and development opportunities.	Stability and efficiency of state administration, ensuring equal access of citizens to resources and benefits.

17. Partnerships for the goals	Ukraine should attract international partners to speed up recovery.	Create partnerships with international organizations, the diaspora and business to implement recovery projects.	Agreements with the EU, USA, European countries and other countries of the world for the implementation of large infrastructure projects. Creation of a platform for sharing experiences of post-war reconstruction and development and attracting funding.	Coordinated efforts of the global community and sustainable recovery.
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In order to ensure the sustainable economic development of affected cities and urban agglomerations, it is crucial to restore infrastructure. This includes the reconstruction of transport networks and their components, such as roads, bridges, and logistics points, as well as the restoration of destroyed energy facilities and utility systems. Such measures will lay the foundation for further economic development and improve population mobility and the transportation of goods. Another important direction is the diversification of the economy. To achieve this, it is necessary to support small and medium-sized businesses, which form the backbone of economic stability, develop high-tech sectors such as IT and the creative cluster, and stimulate the creation and implementation of start-ups. These efforts will help create new jobs and attract innovation for recovery and growth. An essential step is establishing industrial parks, which should serve as platforms for attracting international investments. The operation of these parks can enable the creation of modern enterprises in affected regions, facilitate the introduction of new technologies, and increase employment levels. Further integration with the European economy is also vital. This requires reconstructing and modernizing logistics hubs, such as ports, airports, and railway stations, to support the export of Ukrainian products and ensure integration into European supply chains. Providing tax benefits to enterprises operating in affected regions, along with grants to support local production, can also be effective incentives. These measures will boost economic activity and contribute to the development of local communities.

Integration of forced migrants into host communities, providing housing, and granting access to social services, as well as creating retraining and employment programs, are important tasks in the context of implementing the *social component* of sustainable development. This will allow displaced people to feel stable and engage in the economic recovery process. It is also essential to focus on the reconstruction of social infrastructure, including the restoration of schools, kindergartens, hospitals, and cultural institutions. Special attention should be given to the accessibility of these facilities for people with disabilities, which will help ensure equal opportunities for all segments of the population.

Another key aspect is psychosocial rehabilitation. For this, it is necessary to establish a network of psychological support and rehabilitation centers to assist veterans, individuals affected by the war, and their families in restoring mental balance and adapting to peaceful life. An important task in post-war reconstruction, as practice shows, is to strengthen local self-government by granting communities greater powers and resources to participate in reconstruction processes. This will foster decentralization, ensure effective resource management, and encourage active citizen involvement in decision-making. The restoration and preservation of cultural heritage must be guaranteed through the reconstruction of historical monuments and the implementation of programs aimed at restoring national identity. This will not only preserve the country's unique history but also promote social cohesion and enhance the cultural development of the population.

The transition to *ecologically sustainable development* of cities involves minimizing the impact on the environment and creating a comfortable environment for living. One of the main directions of its implementation is the implementation of "green" technologies in the urban space [13]. This includes the use of renewable energy sources such as solar and wind farms, especially when renovating energy systems to reduce dependence on fossil fuels. It is also necessary to organize the effective disposal and processing of construction waste generated as a result of the destruction, to open modern waste processing plants that would reduce the negative impact of waste on the environment and promote the reuse of resources [23]. Special attention should be paid to the development and expansion of green areas in the restoration process. The reconstruction of parks and the creation of new green spaces will help to reduce the consequences of urbicide, improve the microclimate of cities and provide citizens with places for recreation and health. It is necessary to systematically monitor the state of the environment based on the implementation of the environmental monitoring system. This will make it possible to monitor the state of air, water and soil, as well as to respond quickly to environmental challenges, in particular those that arise as a result of military operations and have a prolonged impact.

The post-war reconstruction of cities and ag-

glomerations of Ukraine on the basis of sustainable development can be represented through a combination of key components: cooperation between various stakeholders, including local communities, state bodies and private investors; availability of financial resources, international support and funding from governmental and non-governmental organizations, rational allocation of resources and strategic planning; application of the adaptive reuse approach. This will contribute to the restoration of territories, economic growth and development of communities, preservation of the history of the nation and the memory of the feat and heroism of Ukrainians in the struggle for the independence and sovereignty of the state [32]. In our opinion, given the subsidized nature of Ukraine's economy and significant dependence on international support, it is necessary to use all the mentioned models in a combined version, in accordance with available opportunities, taking into account the scale of destruction, available resources and strategic priorities. Based on the analysis, it is necessary for the cities and regions of Ukraine to:

- develop a detailed reconstruction plan with an emphasis on environmental friendliness and sustainable development;
- to attract international aid and investments for the implementation of projects of various scales and deadlines. To turn for help to sister cities of Europe and the world, which at one time also experienced destruction and recovery;
- to develop the production of goods and the sphere of services, to attract innovative technologies and world practices in order to obtain a competitive product;
- integrate displaced people through the creation of new jobs, the construction of residential complexes and the implementation of educational initiatives;
- carry out an assessment of the level of destruction, and invest in the restoration of potential "poles of growth" based on the Concept of sustainable development.

Conclusions and prospects for further research. The war in Ukraine has been ongoing for over ten years and represents the largest military conflict in Europe since World War II. It is characterized by acts of genocide, urbicide, and ecocide. Cities, villages, and regions – particularly urban agglomerations, which serve as centers of social, economic, and cultural life, as well as 'growth points' and centers of innovation driving Ukraine's

development – have been severely impacted by the destructive influence of military operations. An analysis of post-war reconstruction experiences in other countries demonstrates that successful restoration of damaged territories ("post-war brownfields") is achievable through a comprehensive approach. This approach must integrate the restoration of physical infrastructure, economic modernization, social reintegration, and environmental considerations. Holistic recovery of affected areas is only possible with the alignment of all components of sustainable development – social, economic, and environmental. Urban agglomerations remain the main drivers of development and should be prioritized in the recovery process, as they are "poles of growth" and centers of innovation. Their polarizing power can significantly accelerate and improve the rehabilitation of Ukraine's entire territory. Attracting international aid, including investments and grants, is crucial for the successful implementation of reconstruction programs. Equally important is social integration, which requires active participation from the public and local communities. Such involvement will enhance the effectiveness of recovery efforts and ensure sustainable results.

This work contributes to the scientific discourse on Ukraine's recovery in accordance with the Concept of Sustainable Development under conditions of uncertainty, particularly focusing on the rapid and effective restoration of cities and urban agglomerations. The authors' further research aims to test an adaptive model of urban agglomeration restoration that addresses modern challenges, including the processes of urbicide and ecocide, using the Kharkiv urban agglomeration as a case study, which suffered significant destruction during the war. In-depth research is also required to examine changes in the sex-age structure of the population and migration processes caused by the war to enable effective planning for future recovery. Additionally, assessing the economic impact of international recovery programs on regional development and the evolution of urban agglomerations is a key task for future studies. The greatest challenge in conducting scientific research in this area is the state of uncertainty, as the war continues and the scale of its destructive influence keeps increasing. Nevertheless, efforts to develop and adapt recovery programs and prospective development models remain crucial for Ukraine's future post-war recovery.

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Наслідки війни та перспективи поствоєнного відновлення (на прикладі міських агломерацій України)

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За роки тривалої війни росії проти України міста та передмістя стали головними осередками військової агресії. Нагальним питанням постає відновлення та ревіталізація територій, зокрема – міст та міських агломерацій, адже саме вони виступають концентраторами та каталізаторами розвитку. Багато країн світу має досвід відновлення після масштабних бойових дій, успішні практики відновлення яких мають бути вивчені та можуть бути імплементовані для ефективного відновлення та повоєнного розвитку міст та міських агломерацій України. У дослідженні втілено спробу визначення ключових характеристик наслідків війни, проблем та перспектив поствоєнного відновлення для міських агломерацій України з огляду на успішні світові практики та з урахуванням цілей стійкого розвитку. Дослідження спрямоване на розробку гнучкої моделі відновлення, яка враховує економічні, соціальні та екологічні аспекти, адаптовані до сучасних викликів України. У дослідженні висвітлено багатовимірний вплив війни на українські міста, зокрема фізичне руйнування інфраструктури, соціально-економічну дезінтеграцію та екологічні виклики. На основі аналізу міжнародного досвіду повоєнного відновлення Німеччини, Японії, Південної Кореї та ін., виділено ефективні кейси, які включають модернізацію інфраструктури, індустріальне відновлення, соціальну інтеграцію внутрішньо переміщених осіб, відновлення земель та територій, проаналізовано міські агломерації світу, які зазнавали потужних руйнувань (Варшава, Берлін, Токіо, тощо) та особливості їх реконструкції. В роботі акцентовано увагу на важливості відновлення України відповідно до засад та цілей Концепції стійкого розвитку відповідно до вимоги «відновити краще, ніж було», зокрема відносно повторного використання «post-war brownfields», залучення інноваційних технологій та участі місцевих громад у процесах відновлення. Відповідно до 17 цілей стійкого розвитку в роботі представлено можливості відновлення міських агломерацій України, наведено комплекс заходів та практичні рекомендації щодо відновлення міст, міських агломерацій та постраждалих регіонів України.

Ключові слова: міські агломерації, поствоєнне відновлення, стійкий розвиток, поствоєнні покинуті території, урбіцид.

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