TRANSFORMATION AND POST-WAR ECONOMIC RECOVERY OF UKRAINE

Edited by
Leonid Kistersky and Anatolii Zadoia

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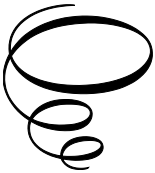

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Even now, before achieving complete victory in the war against the Russian aggressor, the process of economic recovery has begun in Ukraine.

Whenever significant reconstruction is required from devastating economic consequences (immediately after war, technological or natural disasters), world leaders often declare the need for a new "Marshall Plan". And now, more than 70 years after its implementation, the conditions for using its principles and approaches to restore the economy of Ukraine have developed again. Currently, in Ukraine there are more than enough analogues with the economic and other consequences of the World War II, only it is necessary to restore not sixteen, but one country, and the donor will not be the United States alone, but, we hope, dozens of countries, international organizations, many individual communities, cities, enterprises and wealthy individuals.

Thus, the purpose of this monograph is to explore the possibilities of the post-war revival of the main sectors of the Ukrainian economy based on positive world experience and advanced technologies. To obtain practically applicable results, highly qualified researchers from various universities and research centres of Ukraine were involved.

Until now, neither in Ukraine nor in other countries there has been a comprehensive study of a similar problem, where the possibilities of restoration and competitive development of the main sectors of the economy were analysed. Sections of the monograph contain conclusions, which will be summarized by scientific editors, discussed at special seminars and presented to the government and to the office of the President of Ukraine for decision-making and practical implementation.

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PREFACE

Russian aggression against Ukraine has been ongoing for 10 years. Thousands of Ukrainians have fallen victim to it, Ukrainian cities and villages have been destroyed, civilian infrastructure, plants and factories, and a significant portion of the country's energy infrastructure have been ruined. The colossal losses and destruction have led to a substantial reduction in the country's economic potential. However, even under these circumstances, Ukrainian society demonstrates a sufficiently high level of resilience in all spheres, which is based on various forms and mechanisms of adaptation to the consequences of military and terrorist actions. The process of economic recovery is already underway to some extent in Ukraine, but it can only be fully realized after the end of the war. From this perspective, Ukraine and its allies should already be developing conceptual foundations for the country's economic recovery in the post-war period.

The fundamental significance of the process of economic recovery in Ukraine extends far beyond the needs of our country alone, as this process must demonstrate the advantages and effectiveness of the world's democratic model of socio-economic development as a whole in the face of global authoritarian regimes axis. It must demonstrate its ability to overcome external shocks and achieve economic recovery, as well as to preserve and expand the positions of democratic countries in the global economy. Euro-Atlantic economic and military solidarity with our country is fundamentally important for the implementation of a massive and resource-intensive process of Ukraine's economic recovery. The effective combination of internal and external factors of reconstruction is a condition for the successful socio-economic recovery of the country.

Massive economic recovery in Ukraine in the post-war period will enable the creation of a new, modern material and technical base for the development of the national economy as a whole, to develop existing and become the basis for the emergence of new competitive advantages for the country in regional and global markets. At the same time, the process of recovery also opens up new opportunities for continuing reform in all areas of the country's development and its further integration into the main economic and security European and transatlantic structures - the EU and NATO. Therefore, deep conceptual analysis and practical recommendations from well-known Ukrainian economists regarding the main prerequisites,

directions, spheres, stages, mechanisms, and expected results of Ukraine's economic recovery in the post-war period are very relevant already.

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FOREWORD

Given the objective needs of the post-war transformation of the economy and society in Ukraine, and taking into account the address of the President of Ukraine Volodymyr Zelenskyy to students and heads of Ukrainian universities of 19.05.22 on their vision of the transformation processes in Ukraine after the Russian-Ukrainian war, an international scientific and practical conference "Transformation Processes in Ukraine after the Russian-Ukrainian War: Interdisciplinary Assessments" was initiated. Its objectives were primarily to clarify the theoretical and methodological prerequisites and principles for the implementation of large-scale socio-economic and humanitarian transformations of a strategic nature in post-war Ukraine. The practical part of the transformation processes can be formulated after the victorious end of the war, when the real state of the objects under study becomes more or less known.

The conceptual dimensions of socio-economic transformations are reflected in Anglo-Saxon, French and German scientific doctrines, which in the latest version are embodied, in particular, in the "Washington Consensus". The transformation processes in China have led to another model of transformation called the Beijing Consensus. Perhaps, after the war is over, thanks to the efforts of our scientists and politicians, we will get a globally recognised model of the "Ukrainian consensus", which will testify to the new quality of not only the national economy and society, but also the new architecture of the world order.

The peculiarities of the transformation process in Ukraine include the following key issues and directions. Firstly, the need to comprehensively take into account the devastating consequences of the war, which implies a phased approach to addressing them in the short, medium and long term. Secondly, an in-depth analysis of the post-war state of the economy and society as a whole, as well as of individual units and spheres. Thirdly, consideration of the internal potential, including historical heritage, mentality, institutional capacity, intellectual and natural resources, etc. Fourth, studying the external environment of transformation (the European Union, Ukraine's geo-economic and geostrategic position). Fifth, the use of the synergistic effect of the nation's cohesion and the heroic feat of the

people during the Russian-Ukrainian war. Sixth, the widespread use of the experience of post-war transformation countries.

Dr. Anton Filipenko, Professor,
President of Ukrainian Association of International Economics

INTRODUCTION

Russia's war against Ukraine fundamentally changed the world. It will never return to its pre-war state. New geostrategic realities are manifested in all spheres of social activity - in the economy, politics, culture.

To resolve the war-caused problems in Ukraine, not only new economic mechanisms are necessary, but also new approaches to the selection of personnel, which will take into account high spiritual, moral and other human values on Ukraine's path to high-tech development.

Ukraine, like the recipients of the "Marshall Plan" at one time, must take decisive action for its own reconstruction and implementation of the high-tech development strategy. The effectiveness of this approach was proven by post-war Europe. South Korea too, within the lifetime of one generation, was able to move from a poor agrarian country to leading positions among the most developed countries in the world in terms of all main indicators.

Thus, the complex, long-term work of reforming and restoring Ukraine on a market-democratic basis has already started. This process, in fact, concerns all sectors of the economy and areas of the country's life. Therefore, we need a sufficiently detailed and specific program, coordinated with donors, which will allow to rebuild Ukraine on modern European foundations and gain membership in Euro-Atlantic structures.

Modern technical and scientific progress is taking place at such a fast pace that it makes absolutely no sense to simply restore what was before the war. Therefore, in reality, the post-war process in Ukraine would be more correct not to call restoration, but the creation of a new economic and production model that would meet modern conditions.

Post-war transformations will be influenced by the solution to the problem of joining the European Union and NATO. This will affect various aspects of the activity. Ukraine will need to adhere to certain standards and criteria (for example, currency and financial convergence criteria, which limit the ratio of public debt to GDP, the inflation rate, the cost of credit resources, etc.), which will be quite difficult to do in the conditions of a destroyed economy. The inclusion of Ukraine in the European market will require changes in the structure of its production. It is already obvious that the raw material-oriented and agricultural economy of Ukraine will not find a worthy place in the European Union.

On the other hand, Ukraine's post-war reconstruction presents not only

unique challenges, but also unique opportunities. The war caused enormous damage. But it freed the "construction site" from the outdated model of the economy and gave an opportunity to build a new one that would meet all the requirements of modernity. Under these conditions, both the theoretical understanding of the uniqueness of the problems that Ukraine will have to solve, and the justification of practical steps aimed at building a new model of the Ukrainian economy become especially relevant.

The author team of the proposed monograph "**Transformation and Post-War Economic Recovery of Ukraine**", which includes leading economists of Ukraine, offers an original study, the purpose of which is to develop models of the post-war revival of Ukraine both at the level of the national economy as a whole and in individual spheres of activity. Until now, neither in Ukraine nor in other countries has there been a comprehensive study of a similar problem, which would analyze the possibilities of recovery and competitive development of the main sectors of the economy.

The monograph consists of five parts. Part 1 "**Methodological principles of post-war reconstruction**" forms the general principles of developing models of post-war reconstruction. The authors summarize the existing historical experience of both Ukraine and other countries of the world regarding post-war reconstruction, as well as formulate methodological principles that are used in further research when analyzing the problems of various sectors of the economy.

The development of the post-war model of arrangement of Ukraine requires, first of all, significant institutional transformations. Part 2 of the monograph "**Institutional and political transformations**" is devoted to these questions. It covers issues of both general institutional transformations at the level of the state as a whole, and in individual areas. The justification of the new economic policy, which will be necessary for post-war Ukraine, stands out in particular. Recommendations for managing demographic processes and institutional transformations in the de-occupied territories are extremely important from a practical point of view.

The war caused the greatest damage to the real sector of the economy. Part 3 "**Transformations of the real sector of the economy**" is devoted to transformations in those areas that require new approaches. This, in particular, concerns energy. The war destroyed part of the power plants and energy infrastructure. However, they need to be restored on a new basis that would meet European standards. This applies to renewable and green energy. Ukraine has significant potential in this area and can become a major supplier of such energy to European countries.

The agriculture of Ukraine also suffers huge losses due to the decommissioning of a large part of the land as a result of mining. It takes a

lot of time and considerable effort to bring these lands back into economic circulation. This process should be accompanied by organizational and technological changes that would allow Ukrainian agriculture to successfully integrate into the European economy.

Transformations in the financial sector, which post-war reconstruction requires, are the object of research in Part 4 "**Reconstruction of the financial system**". How to restructure the monetary and credit policy to ensure the support of enterprises and their stable development in the conditions of post-war reconstruction? How to guarantee the country's economic and financial security? What role can digitalization play in these processes? The reader will find the answers to these and other questions in the chapters that make up Part 4.

The authors of the chapters included in Part 5 "**International aspects of post-war transformation**" examine, first of all, those transformations that will allow Ukraine to confidently move from a candidate to a full member of the European Union. Of course, Ukraine does not have enough resources to carry out post-war reconstruction. It will be necessary to attract foreign investments. And this, in turn, requires the construction of a new model of the international investment position. One of the chapters of this part is dedicated to the justification of the essence and ways of forming such a model. Of course, Ukraine should earn money on international markets. International tourism can be one of the directions of such earning. The monograph substantiates the development of tourism in the post-war period.

The problems that Ukraine will have to solve are unique. But this does not exclude the possibility of using the experience of other countries. For Ukraine, the most interesting and useful can be, in particular, the experience of Poland in joining the EU and NATO. The final chapter of the monograph is devoted to summarizing this experience.

Of course, the main focus of the monograph is the study of the problems of transformation and post-war restoration of the Ukrainian economy and it is mainly intended for potential practical participants in these processes. However, the authors are convinced that it will be interesting and useful to all researchers analysing the transformations of complex economic systems. Methodological approaches and practical recommendations can be adapted to the specifics of a country that is solving the problems of transformation and building an economic model that would correspond to new geostrategic realities.

Dr. Leonid Kistersky, Professor
Dr. Anatolii Zadoia, Professor
Scientific Editors

CHAPTER 11

GREEN RECONSTRUCTION OF THE UKRAINIAN ECONOMY

ROMAN ZVARYCH

The polyparadigmatic nature of economic and theoretical knowledge from the standpoint of the existential nature of the imperatives of economic development in the context of responsibility for the global future causes certain paradigmatic shifts, and greening is the mainstream and imperative that reflects the heterodox beginning of the theoretical and methodological foundations of the post-war green reconstruction of Ukraine. A multidisciplinary epistemological perspective for the analysis of economic phenomena from the standpoint of new pragmatism in the context of the "triad" of sustainability (economic, social and ecological components), distinguishes the humanitarianism of economic science and positions "at the forefront" the role of values in the economic activity of people and society and the positioning of imperative characteristics (acceleration of the exploitation of natural resources; climate change; the formation of a new ecological order; ecological and food security) and dominants of paradigm formation (exceeding the ecological limit; the Paris Agreement; changes in the public attitudes of producers, the population and businesses regarding the use of fossil resources; global economic losses; the goals of sustainable development of the United Nations , which have a strong connection with circular practices, the participation of the WTO in supporting new technologies, minimizing waste production and promoting circular trade).

Methodological features (Krysovatyy, Zvarych, 2020) of the concept of the post-war green reconstruction of Ukraine from the standpoint of postmodernism are the strengthening of social and humanistic guidelines (they reflect its ideology and create a basis for an inclusive-oriented society); ontological non-linearity (emphasizes recycling and circularity); consensuality (the need for social consensus to achieve a goal), which is emulated using the economic-mathematical method. Also, scientific research requires: assessment of the possibility of carrying out structural

reforms for socio-ecological transformation; establishing prerequisites for the cancellation of environmentally harmful subsidies and the elimination of regulatory barriers/requirements for green investments; analysis of prospects for refocusing on "green" financial instruments and "green" bonds; establishment of ways to support environmental innovations and their market commercialization; determining the conditions for the development of green infrastructure and establishing a relationship with the measures of the "EU Green Deal".

Strengthening the position of the "green economy" (Mikhno, 2021) around the world determines the high scientific intensity of developments and the high level of technology of "green production", which ensure an accelerated transition to the new sixth technological order. This is what determines the background of the world economy and the competitiveness of national economies of the future. Green reconstruction should take place taking into account a well-thought-out, differentiated and step-by-step approach to the socio-economic, production-technological and natural-geographical specifics of the regions of Ukraine.

It is worth considering green reconstruction through the prism of the main structural and reproductive content of the economy in relation to the interrelated processes of production, exchange, distribution and consumption of products (goods, services), characterized by minimal resource intensity (especially non-renewable resources) and minimal negative impact on nature, in particular the volume of waste and (or) emissions in the process of production and consumption. Such a systematic approach allows us to perceive the post-war green reconstruction as a system that will have internal and external (regulatory) influences that will form direct, regular and irreversible changes in the sustainable ecological development of Ukraine (Reznikova, Zvarych, 2019).

It is advisable to construct an economic environment with available capital in the process of developing the concept of post-war green reconstruction. For many regional economic systems of Ukraine, territorial natural resources are such capital, on the basis of which other competitive value chains can be formed. The capitalization of such assets has decisive importance in solving the tasks of post-war spatial development and strategic planning, as it allows to formulate the goals of increasing investment attractiveness, the efficiency of using local resources and potential. At the same time, one of the key tasks for both the owners of capital and the owners of the natural resources is the optimal placement and use of existing assets in economic activities in order to maximize their value and income.

11.1. Post-war green reconstruction concept

The concept of post-war green reconstruction should focus on such areas as: sustainable construction and resource saving; implementation of renewable energy sources; sustainable development of infrastructure (transport); improvement of water resources management; implementation of a waste management system, minimization of residues; rational management of land resources and control of urbanization; conservation of existing species and control of their populations. This transition creates significant opportunities for business in the context of reducing the energy dependence of the economy (in particular due to energy efficiency), reducing the intensity of energy carbon emissions (through decarbonization) and increasing the resilience of own assets to climate change. In addition, business will face a number of environmental challenges, including air pollution by electricity, heat, transport, industry, water availability challenges (Müller, 2022).

Along with the long-term benefits of the transition to a green economy, there are certain obstacles to this development: the difficulty of promoting systemic changes; economic challenges (the green economy can be unprofitable in the short term); imperfect markets (lack of necessary products and infrastructure, competition, knowledge and/or incentives in the market); imperfect regulation (imperfect legislation and/or implementation); social factors (insufficient knowledge and skills related to recycling, circularity); difficulties in obtaining appropriate financing; lack of agreed procedures in various areas. The main prerequisites forming a green economy as a necessary business model are: resources and their pricing; growth in the number of consumers among the middle class; Big data; change in legislation and globalization of management; transition from "agreement" to "relationship".

The concept of post-war green reconstruction of Ukraine is people-oriented, and its goal is to create shared prosperity. It focuses on wealth growth, promoting well-being and includes the full spectrum of human, social, physical and natural capital. The concept is focused on prioritizing investment and access to sustainable natural systems, infrastructure, knowledge and education necessary for population prosperity. The concept could offer opportunities for ecologically decent livelihoods, entrepreneurship and jobs (Kozak, 2022).

The concept of the post-war green reconstruction of Ukraine will be based on the principle of justice, that is, the scientific development will be inclusive and non-discriminatory. It is important the fair distribution of decision-making, benefits and costs. The concepts will outline a long-term

economic vision for wealth creation and sustainability and outline measures to address the current multidimensional poverty and injustice. The study focuses on an inclusive green economy that recognizes the functional values of the provision of goods and services, as well as the cultural and ecological values of nature. It is worth establishing the attractiveness of investments in protection and safety, restoration of biodiversity, soil, water, air and natural systems. This approach to the development of the concept of recovery of Ukraine is innovative in the management of natural systems, because it is based on such properties as circularity, local inclusiveness and natural biodiversity.

The research vector aimed at supporting sustainable consumption and production is important in scientific work. An inclusive green economy is low-carbon, resource-saving, diverse and cyclical and embraces new models of economic development. There should be a certain shift in the state to reduce the consumption of natural resources to a physically sustainable level, as well as reduce the "peaks" of consumption of basic goods and services to ensure the well-being of the population of future generations. It is necessary to align prices, subsidies and incentives with real costs to society through mechanisms that regulate inclusive environmental outcomes and impose financial costs on the polluter-beneficiary (Vasylieva, 2021).

The concept of post-war reconstruction of Ukraine provides institutional support for the recovery process, which will be integrated, coordinated and coherent (horizontally between sectors and vertically at all levels of government) and will have sufficient capacity to perform its functions in an effective and accountable manner. This institutional provision requires the involvement of the public on the basis of prior informed consent, transparency, social dialogue, democratic accountability, freedom and independence from private interests. Such institutionalization will facilitate the decentralization of decision-making on the ground and provide a management function for natural systems while maintaining strong common centralized standards, procedures and compliance systems.

11.2. Decarbonization of the economy

Before the full-scale invasion of Ukraine, there was much discussion about the need for decarbonization as part of the Association Agreement between Ukraine and the EU. Thus, two-thirds of greenhouse gas emissions were accounted for by the energy sector before the war. First of all, energy transition from an economic perspective, ways, methods and resources of decarbonization were planned. However, with the beginning of a full-scale

war, and especially after the occupation and destruction of large metallurgical enterprises in the Donetsk and Luhansk regions, the balance of greenhouse gas emissions in Ukraine changed.

It is difficult to plan emissions reductions today, because it is difficult to predict the level of damage to sectors of the economy at the end of the war. At the same time, the established climate goals for Ukraine remain relevant. Ukraine does not plan to increase the volume of possible emissions, however, in modern conditions, it is difficult to ensure their reduction, since it occurred due to the curtailment of economic activity since the beginning of the war due to the migration of the population, the destruction of industry, and the closure of enterprises (Aldieri, 2018).

At the same time, the number of emissions related to the war increased. They have a negative impact on the environment: burned oil depots, destroyed forests, fires, shelling. As a result, Ukraine will try to keep the surviving infrastructure, in particular, in the energy sector: the coal and gas thermal power plants.

The recovery process involves the construction of roads, bridges, infrastructure, factories, and housing, which will also lead to an increase in greenhouse gas emissions. Therefore, it is very important to align the future recovery with the principles and priorities of decarbonization. That is, of all available technologies, it is worth choosing the most climate-friendly (Zvarych, Rivilis, 2023).

Mass mining of Ukrainian territory began back in 2014 – immediately after the Russian invasion of Ukraine. However, it reached great heights at the beginning of 2022. As a result, significant parts of the Kyiv, Chernihiv, Sumy, and Kharkiv regions remain seriously mined. Although active hostilities have not been conducted there for more than a year, with the exception of the east of the Kharkiv region. The situation is the same on the right bank of the Dnipro River in the Kherson region and part of the Mykolaiv region, from where the Ukrainian army knocked out the Russians at the end of 2022. The coast of the occupied Crimea, as well as the waters of the Black Sea, are also mined. But the problem of landmines is particularly acute for the Zaporizhzhia, Donetsk and Luhansk regions, where active hostilities are still ongoing.

About 30% of the country's territory – almost 174,000 square kilometres – is potentially mined in Ukraine. If compared with other European states, the figure of 174,000 km² mined of land seems simply incredible:

- Portugal (area of 91.5 thousand km²), Hungary (93 thousand km²), Iceland (103 thousand km²) – almost two areas of these countries;
- Latvia (64.5 thousand km²), Lithuania (65.2 thousand km²), Georgia (69.7 thousand km²), Ireland (70.3 thousand km²), Czech Republic

(78.8 thousand km²), Austria (83.8 thousand km²), Azerbaijan (86.6 thousand km²) – more than 2 areas of these countries;

- Estonia (45.2 thousand km²), Slovakia (48.8 thousand km²), Bosnia and Herzegovina (51.1 thousand km²), Croatia (56.5 thousand km²) – more than 3 areas of countries;
- Switzerland (41.3 thousand km²), the Netherlands (41.5 thousand km²), Denmark (43.1 thousand km²) – more than 4 areas of these countries;
- Moldova (33.8 thousand km²), Belgium (30.5 thousand km²) – more than 5 areas of the countries;
- Albania (28.7 thousand km²), North Macedonia (25.7 thousand km²) – more than 6 areas of the countries;
- Slovenia (20.2 thousand km²) – more than 8 areas;
- Montenegro (13.8 thousand km²) – more than 12 areas.

By the end of 2023, 40 countries and partner organizations have agreed to allocate about $300 million to special equipment and other demining purposes. Demining post-war Ukraine may become the biggest similar problem since World War II. The minefield situation in the Ukrainian area was significantly complicated by the blowing up of the Kakhovska HPP dam. The floodwaters washed away the minefields and now these mines were scattered over huge areas, and some of them could fall all the way to the Black Sea.

11.3. Sustainable agriculture

In the global context of sustainable development, agriculture plays a leading role. The agricultural sector accounts for the largest number of jobs in the world, a quarter of global greenhouse gas emissions, and impacts the security of natural ecosystems. It is critical to global food security and vulnerable to climate change.

The growth of agricultural production is characterized by a reduction in the number of farmers, especially in developed countries. This phenomenon is known as the "green revolution" (Norman Borlaug) – efforts aimed at fighting hunger, through high-yielding varieties of seeds, irrigation, modern management of farms, the use of mineral fertilizers and pesticides. The growth of food production has caused damage to the environment due to excessive use of non-renewable resources and agrochemicals (Irtyshcheva, 2022).

In Ukraine, in the territories where active hostilities took place, agricultural lands were negatively affected, the quality of which has significantly deteriorated and in the future, it will require the allocation of

significant funds for their return to active agricultural use. The significant scale of wartime pollution will lead to the withdrawal from cultivation for an indefinite period of considerable land areas, which are used for the cultivation of food products. At present, a third of Ukrainian land has become a zone of risky agriculture. The supply of agricultural enterprises with equipment has worsened, which is taking place against the background of significant physical losses of equipment as a result of hostilities or its theft by the occupiers. According to estimates, 84,200 units of machinery and equipment (11% available until February 24, 2022) are completely or partially damaged.

As a result of hostilities, some workers of agricultural enterprises and farmers were forced to stop economic activity in the agricultural sector, and to leave their own homes. Thus, more than 150,000 farmers and food workers were directly affected by the war and forced to migrate. The prospect of recovery their economic activity on their own lands is uncertain, which may lead to their withdrawal from agrarian business or to the change in specialization. Small-scale producers, who grew seasonal products, played an important role in ensuring employment and income of the rural population, found themselves in a difficult situation.

The loss of part of the infrastructure facilities for storage and primary processing of agricultural products complicates the sale of products on foreign markets. The enemy purposefully destroyed granaries, food warehouses, logistics infrastructure, and also made it difficult to export Ukrainian agricultural products, which reduced the income of agricultural producers, and in conditions of storage difficulties due to a lack of electricity, this could lead to a deterioration in quality and even to the loss of part of the harvest. As a result of the large-scale armed aggression, Russia blocked Ukrainian Black Sea ports for a long time – the main export channel for domestic agricultural products (before the invasion, more than 90% of grain and oil crops were exported by sea) (Bergmann, 2022).

As a result, in 2023, grain production in Ukraine will amount to 60.8 million tons, which is 10% more than the previous year. Growth took place thanks to favourable weather conditions, despite the decrease in the use of fertilizers, Ukrainian farmers still managed to achieve good yield indicators. However, production volumes remain 31% lower than in 2021.

In Ukraine, sugar beet production also increased to 11.7 million tons in 2023, which is 29% more than last year. This indicator exceeded the pre-war volume only due to the fact that, in contrast to grain and oil crops, sugar beet was not grown in the occupied territories and territories where hostilities are currently taking place due to unfavourable natural and climatic conditions for this crop.

The production of meat of all types increased by 3% this year – up to 3.1 million tons. The growth is mainly due to poultry meat. At the same time, production volumes remain 9% less than the 2021 figure. Milk production figures in 2023 continue to fall. 7.5 million tons of milk were produced, which is 2% less than last year. The situation is similar with chicken eggs, which were produced in 2023 by 5% less – 11 billion pieces.

As a result of hostilities, large livestock farms in Ukraine were destroyed by the aggressor. Business structures are asking for international help to restore them. In the world at this time, given the climate challenges and the new climate policy, a complete change of the food production system is taking place (reduction of areas for growing fodder for livestock, regenerative agriculture and even the production of alternative proteins for the dairy and meat industries). The creation of large livestock complexes was previously considered an outdated and dangerous way of development, and the current war in Ukraine clearly demonstrated their vulnerability. Instead, small farms, agricultural cooperatives, as well as direct cooperation between producers and consumers with shorter logistics chains turned out to be more sustainable. It is likely that these agricultural models will continue to support financial structures.

It is impossible to restore the old destroyed structures. This option should not be considered, because the economic, ecological, climatic and political conditions have changed, the inefficient and centralized model of the post-Soviet economy and infrastructure, about cheap fossil fuel, has actually been destroyed. Ukraine has chosen the course of integration into the EU, assumed a number of international obligations regarding the impact on the climate and the environment, and must adapt its legislation and practices to this course. The old system is not able to adapt, as well as fulfil the conditions of international financial institutions regarding financing, because the modern policy of international financial support includes an environmental component.

Global food production is set to increase by about 70% in the next generation. It is necessary to achieve this indicator using the same area of land and a smaller amount of water. Climate change, energy problems and degradation of agricultural soils complicate the task. However, farmers can maintain high yields while protecting the environment thanks to advanced knowledge, modern and updated farm management techniques (Matviychuk-Soskina, Krysovatyy, Zvarych, 2019). That is why agriculture must focus on producing food at a level that will ensure food security, meeting growing demand and adhering to the principles of sustainable development. Within this sector, this means that basic resources (soil, nutrients, water) must be used efficiently.

According to the generally accepted approach to sustainable development, Ukraine should focus on the following three principles in agriculture:

(1) Profitable production. Economic dimension: Agriculture should provide sufficient financial reward to farmers, provide them with a dignified life, promote efficient cultivation of crops and preservation of the environment.

(2) Environmental Protection. Ecological dimension: Agriculture minimizes the use of non-renewable resources, replenishes depleted resources, protects and improves the environment and natural resources.

(3) Thriving communities. Social dimension: Agriculture contributes to the prosperity and vitality of local communities, their economic and social development, including by providing healthy food.

11.4. Environmentally friendly production

Environmentally friendly production covers goods that have a negligible impact on the environment both in the process of their consumption and in the process of their residual utilization. High technologies determine the degree of competitiveness of both individual enterprises and countries on the world market, which is why the implementation of clean production processes is important. The process of transition to environmentally friendly production involves the reduction of waste by processing residual substances and by-products during the production cycle and their regeneration. The transition to environmentally friendly production means the replacement of production and covers those developments in which the consumption of raw materials in the production process is reduced. Reducing production costs includes innovations that replace materials that have a negative impact on the environment with safer ones. Environmentally friendly production is the implementation of energy-saving technologies, in which environmental protection is achieved by reducing energy consumption: during the production cycle or during the consumption of finished products. Environmentally friendly production focuses on the production of clean products that cause a positive impact on the environment during their use in other production processes (Krysovatyy, Zvarych, 2022).

Since March 2023, growth in industrial production has been recorded in Ukraine. According to the results of the first half of 2023, the index of industrial production was 97.1%, while last year for the same period this indicator was equal to 68.1%. In particular, in the segment of the processing industry, the index of industrial production was fixed at the level of 103.1%, in the extractive industry – 90.8%, in the sector of the supply of electricity,

gas, steam and air conditioning – 88.6%. In January-June 2023, Ukraine sold industrial products (goods and services) worth UAH 1,549,660.1 million. (+6.5% to the indicator for the indicated period of 2022).

Ukraine's defence capability largely depends on the military assistance provided by Western partners. And this applies not only to shells, which are almost the most important "waste" on the front. We are also talking about armoured vehicles, artillery systems, air defence systems and much, much more. Ukraine is simply unable to organize or restore production in all these directions from scratch in sufficient volumes. That is why Ukraine is strengthening defence cooperation with the largest arms producers of other countries: USA, Great Britain, Germany, Turkey.

Since last year, the "Drone Army" project was launched in Ukraine, as a result, the number of drones in the Armed Forces is doubling every month. FPV-drones, reconnaissance drones and electronic warfare systems are produced by dozens of companies. At first, this initiative was implemented with the help of donor funds, then already this year 40 billion hryvnias came from the state budget. In the draft state budget for 2024, the government allocated 48 billion for drones.

In particular, such developments as the Ukrainian unmanned aerial vehicle (UAV) "Leleka-100" (Stork), the Ukrainian kamikaze drone "Bober" (Beaver), the unmanned reconnaissance complex SHARK, the multi-purpose unmanned aviation complex "UJ-22 Airborne", the surface marine drone "Magura V5", above-water marine drone "SeaBaby"; underwater marine drone "Toloka (Toloka TLK-150, TLK-400, TLK-1000)" and others.

High priority is placed on the Ukrainian missile program, because the missiles will make it possible to strike deep into the territory of Russia, destroying the military potential of the occupiers much faster. Ukraine intends to create its analogues of the Russian "Kalibr" and "X-101" missiles, work on this task has already begun, and the European "Storm Shadow" and "SCALP" missiles can be the basis for new domestic missiles.

There are other important branches of the Ukrainian military-industrial complex that are developing. Ukraine manufactures armoured personnel carriers and armoured combat vehicles, although there was no production of these types in the country before. In addition, Ukraine will create a new branch of helicopter production. Ukraine is significantly increasing the production of ammunition. In the first half of 2023, the country has already produced ten times more ammunition than in the whole of 2022.

Analysing global practices and economic aspects of the green economy, it can be stated that Ukraine has unlimited potential as a leader in green technologies and sustainable development in the world. Investments in

research and development of green technologies are among the main success factors. The processing industry of Ukraine has a huge development potential, especially in the context of the green economy. Preferences and subsidies can become key tools to accelerate growth and attract investors (Misik, 2023).

Preferences for green enterprises can encourage companies to develop and implement innovative technologies that will reduce the negative impact on the environment. The development of green enterprises can increase jobs, as the demand for labour in such companies increases, which will positively affect the unemployment rate and contribute to the social welfare of the country. The development of green enterprises has a positive effect on the environment, reducing emissions and optimizing resources. Ukraine, as a green investor, can advance in the world market, because consumer awareness of environmental issues is growing, so companies that implement sustainability gain international favour and advantage. Encouraging the development of green enterprises can increase domestic production and reduce dependence on imports, which will have a positive effect on the economic stability of Ukraine.

Therefore, as a result, the introduction and development of environmentally friendly production should be ensured through the multiplication of the most effective technological cases of such production; training and retraining of specialists in this field; creation the system of state stimulation for resource-saving and environmental protection developments; development of the legislative framework of an effective economic mechanism of environmental regulation.

11.5. Energy-saving infrastructure

Nuclear power plants are the main source of electricity for Ukraine. Despite the occupation of the largest nuclear power plant in Europe – Zaporizhzhya NPP, other plants produce more than 50% of all electricity. Manoeuvring capacities for nuclear power plants are thermal power plants (TPP), combined heat and power (CHP), hydroelectric power plants (HPP), and solar and wind generation. Before the full-scale invasion, TPPs and CHPs generated about 30% of all electricity and helped cover demand during peak hours (evenings and mornings). The next important link for the power system is electric power system (switchgear). The last link of the power system is power lines. All these channels of electricity production and distribution in Ukraine were actively attacked and heavily damaged.

On October 10, 2022, the Russians began massively shelling Ukraine's energy infrastructure. A blackout occurred in a month – all power units at

the Ukrainian-controlled nuclear power plants were turned off (blocked). It was possible to restart the power system, receiving electricity from Western partners. In total, during the first year of the full-scale invasion, the Russians struck energy facilities 255 times. Donetsk, Dnipropetrovsk and Kyiv regions were the most affected. In addition to the facilities that produce electricity, distribution stations (electric power system) are also an important part of the system. According to the UN report, 42 out of 94 critical high-voltage transformers were damaged or destroyed. According to the estimates of the World Bank, the damage caused to the infrastructure of electricity, gas, heat supply and coal mining exceeds 10 billion US dollars. The explosion of the Kakhovskaya HPP caused Ukraine losses of more than $11 billion. The amount of direct damage to infrastructure and assets is $2.79 billion, and the amount of real damage is more than $11 billion. The long-term impact on the environment is the biggest problem (Reznikova, Zvarych, 2023).

The Russian invasion caused a number of challenges for the transport infrastructure and provision of Ukrainian exports. The priorities for the restoration of transport infrastructure include: increasing the capacity of railway and automobile checkpoints; development of the ports of the Danube region; rebuilding the destroyed transport infrastructure and restoring the functioning of the entire transport network of Ukraine, including sea and air transport.

The majority of logistics companies, namely 84%, are ready to resume logistics through sea routes after the unblocking of ports, and most are ready to do it in the shortest possible time. At the same time, 29% say that it will be necessary to attract additional funding, including state support. In particular, it is about the need to finance the restoration of damaged port and railway infrastructure. The most relevant investment projects in Europe and Ukraine for the logistics market were named by logistics companies as the development of highways connecting Ukraine and the EU (66%), the development of the Eurorail on the territory of Ukraine (62%), the construction of strategic universal transport hubs in Ukraine (61%).

The priority directions of development in the field of road management are identified by experts as increasing the capacity of road checkpoints at the border (78%), developing roads within the framework of the Trans-European transport network TEN-T project (73%) and implementing international standards in road construction – FIDIC (46%). FIDIC can significantly help Ukraine in infrastructure development and post-war reconstruction projects, because the use of familiar standards increases the comfort level of foreign investors and donors when working in Ukraine.

About 3.5 million tons of steel are needed to rebuild housing and social infrastructure in Ukraine, destroyed as a result of the Russian invasion. Destroyed housing throughout the country is estimated at 54 billion dollars. We are talking about the damage or destruction of almost 150,000 residential buildings, including 17,500 apartment buildings. All this can be restored quickly and cheaply, but such construction requires a lot of resources and will not be environmentally friendly and suitable for normal life in the future. Ukrainian cities have problems with infrastructure, a small number of green spaces and unsuitability for pedestrians. Such cities will not be comfortable for life in the future.

The correct implementation of recovery can change the appearance of Ukrainian cities for the better and increase the number of facilities that combine modern standards of energy saving, barrier-free, and innovative. But for this, it is necessary to review and adapt the building regulations to European standards and create a strategy that takes into account the specifics of the settlement in order to use the existing urban environment with the greatest benefit for people. That is why it is worth choosing a green urban renewal strategy that will include: environmentally friendly energy and energy efficiency; convenient inclusive public space (integrated urban planning); sustainable urban mobility; green skills and management of urban projects; circular economy and waste management (Dabyltayeva, 2019).

In addition, millennials are active decision-making layers of Ukrainian society and they pay special attention to the impact of production on the climate and quality of life. More than 75% of this generation consider a sustainable economy important. A significant part advocates the development of environmental standards and initiatives that contribute to reducing emissions and environmentally friendly technologies. World experience shows that young people are the engine of changes in attitudes towards ecology. For Ukraine, its activity can become an impetus to develop green initiatives and open new opportunities for the production of ecologically clean products. In the world, there are numerous examples of successful association of youth and business in the green direction, which indicates the prospects of this cooperation. Recycling & sustainability is a global trend, the development of which in Ukraine will contribute to the growth of the investment attractiveness of economy.

Conclusions

The energy transition process for the EU will not be cancelled by either the energy crisis or Russian aggression, they may slow it down somewhat,

but there are chances of its dynamic acceleration. That is, the reduction of carbon emissions into the atmosphere and the growth of carbon productivity of the economy through the involvement of the best practices of decarbonization will give a powerful impetus to the development of the energy industry, in particular, the direction of renewable and alternative energy sources. Along with this, the implementation of the concept of "Green reconstruction of the Ukrainian economy" is also aimed at solving the problem of waste management in Ukraine through the mechanism of implementing recycling and methodological recommendations on ways of adapting existing practices of the circular economy at the stage of restoring the stability of the system in the conditions of the pandemic, which will positively affect the development of the chemical and pharmaceutical industries. This requires the performance of certain tasks:

(1) integration of environmental and climate policy should take place in all sectors, which requires taking into account the provisions of environmental and climate policy in strategic and programmatic documents in all spheres and levels of public life. The priorities of the European Green Deal (EGD) should become the key tasks of Ukraine's post-war recovery. Such key tasks include: decarbonization and modernization of the economy, preservation of biodiversity, clean industrial production and the transition to sustainable agriculture.

(2) green reconstruction should contribute to the sustainable development of Ukraine. That is why the recovery of the economy requires that the goals of sustainable development be aligned with the investment policy. And the financing vectors should be directed primarily to the development of production chains with high added value, displacing the resource-export economy.

(3) Ukraine's green economy should be: low-carbon, energy-efficient, nature-oriented, efficient and clean production, balanced consumption. The green economy should be based on the following principles: shared responsibility, innovation, cooperation, solidarity, flexibility and interdependence. Development should empower the national economy and provide better choices through targeted and appropriate fiscal policies. Economic development should be sustainable and ecological and oriented towards climate goals, environmental protection policy and social protection policy.

(4) environmental monitoring and quality standards should define monitoring methods and corresponding requirements for the quality of soil, air, water and the environment as a whole. The ultimate goal of monitoring is a safe and desirable state of the environment. The restoration of

infrastructure and enterprises should be based on benchmarking of available technologies and management methods.

(5) compliance with European environmental planning instruments is important for the recovery of Ukraine. The basis of recovery should be compliance with environmental legislation, in particular strategic environmental assessment (SEA) of plans and programs and environmental impact assessment (EIA) of planned activities to take into account environmental priorities when planning the development and reconstruction of Ukraine. Weakening or temporary repeal of environmental legislation during wartime or during post-war reconstruction is unacceptable.

(6) an important place in the green recovery of the economy is played by the role of local self-government, its transparency, as well as the involvement of the public and communities in decision-making. The post-war reconstruction strategy and plan should be developed with the involvement of all stakeholders, including local governments and civil society organizations. Decisions, strategies and action plans should be made on a bottom-up basis, contributing to the further development of a successful decentralization reform. Local self-government bodies must lobby for the ecological interests of their communities and be involved in the processes of their restoration. The ideas of civil society, their initiatives and analytics should be taken into account when making decisions.

(7) post-war recovery and development of the green economy requires effective functioning and use of trust/donor funds. The diversity of intentions to provide financial and technical assistance to Ukraine for recovery requires a coordinated flow of funds based on efficient and transparent administration and the use of best global practices. The Recovery Fund should increase the capacity of all stakeholders to work on green recovery and development at national and local levels. The use of donor funds should be open and public under the supervision of all interested parties.

A climate-neutral and ecologically clean economy will ensure green growth and sustainable development of agriculture through an increase in the water productivity of the economy, a reduction in waste generation, and a reduction in air and water pollution. Economic development under such a scenario will mean ecologically clean post-war reconstruction achieved in an ecological way, and a green Ukraine will be part of the global climate-neutral economy. Building a base for green investments and green innovations, state assistance to green sectors in priority areas, creation of green jobs will have a positive effect on the energy industry and the development of ecological infrastructure in particular. Green post-war reconstruction requires the use of green tools to achieve the set goals,

effective mechanisms for integrating environmental issues into the decision-making process, and environmentally friendly conditions for the implementation of sectoral projects. The main function of the green post-war reconstruction of Ukraine should be the greening of this process, the prevention of long-term negative consequences of environmentally sustainable development of Ukraine and the implementation of priority green projects in this area, which justifies the use of expected results.

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