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FROM TSARIST EMPIRE TO INDEPENDENT UKRAINE: WATER MANAGEMENT IN DONBASS AND CRIMEA, AN ECONOMIC, SOCIAL, AND POLITICAL ISSUE

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The peninsula of Crimea and the Ukrainian part of the Donets basin (the Donbass, politically defined as the Donetsk and Luhansk Oblasts) have been the object of economic, political, and social challenges met by the Ukrainian state since its independence in 1991. The critical issue of water resources and shortage in the context of the political and armed conflict between Russia and Ukraine since 2014 requires further attention and historical perspective. From the 19th century's early industrial developments to the post-soviet context, the question is to know what the consequences of past policies and water managements on modern Ukraine are.

Water scarcity: Firstly, the environmental context and resulting natural water resources of Donbass and Crimea must be kept in sight. The whole Donbass and two-thirds of northern Crimea are part of a large and flat steppe land (the Pontic steppe, extending both sides of the Perekop isthmus [Vasilenko, 2017; Kent, 2016]) which low annual rainfall (300-360 mm in Crimea, 511-529 mm in Donbass from 1991 to 2020 and 416-572 mm from 1901 to 2021 [Tcheboxarov and al., 2019; World Bank]) and low annual precipitation/evaporation ratio (0,3-0,5 in Crimea [Tcheboxarov and al., 2019]) are constitutive of a semi-arid climate. The latter is defined by a dry bioclimatic region marked by irregular and insufficient rainfall, as well as a steppe vegetation in a hot climate (Dictionaries of the Académie française and Larousse). Agricultural production is therefore severely impeded without irrigation, the latter being restricted due to the regional lack of water (Marchand, 1993).

Industrial and urban developments under the Russian empire (XIXth-XXth centuries): The foundation of iron foundries on the Luhan (Lugan) river (1795), where stands today's Luhansk, and in Kerch (1845) precedes the implantation by British engineer John James Hughes of Donbass' first full-cycle metallurgy plant in Iuzovka, today's Donetsk (1869) which was soon followed by a take-off in metal production. However, the waters carried by the Kalmius river soon prove insufficient (Friedgut, 1989). Although less documented, testimonies of the Allied landing in Yevpatoria in 1854 describe the Crimean economy in the XIXth century, the region being an important grain export hub at that time. Wheat is being sown in the neighboring steppe as this specific area is known to have had decent

water reserves compared to the rest of the peninsula, where water reserves were already an issue (De Damas, 1857, quoted by Kent, 2016). As the Russian tsarist defeat in the Crimean war (1854-1856) pushes for industrial and metallurgical modernization of the empire, the metallurgy-related forests depletion in the Urals also contributes to an industrial shift towards the Donets basin and its coal reserves (Josephson, 2013; Friedgut, 1989). As Iuzovka experiences dazzling urban and industrial growth (reaching 20'000 inhabitants in 1890 and 50'000 in 1910), the whole of its water resources is obviously depleted from the 1890's and at the turn of the XXth century (Friedgut, 1989). Throughout these early developments, water-shortage is a critical issue in the whole Donbass and a major factor of sanitary crisis and epidemics. The subsequent lack of elementary hygiene in cities thus triggers or aggravates cholera epidemics, such as the catastrophic 1892 outbreak (Friedgut, 1989).

Soviet socialist development throughout industrialization (1920's and 1930's): The Bolshevik revolution of 1917 and the foundation of the USSR in 1922 open a time of further economic developments by State's centralized-planned decisions in Moscow, only owner of the all-Union natural resources, including water. The ideological framework emphasizes the machinist modernity of industrialist society, its superiority on "antic nature" and the need to tame this latest for the interests of the new homo sovieticus (Rey, 1997 plus quoting Lemechev, 1991). In this context, the coal mining industry is directly subjected to the State administration in the perspective of the rapid industrialization of the whole USSR, the first vehicle of this development being heavy industries (Walther, 2019; Zimmer, 2006). In parallel, Soviet statistics report a 74,3% urban increase in the Donbass between 1924 and 1929, pressuring even more the available water resources at the start of the first Stalinian five-year plan (Liber, 1989). The water and sanitary problematics present in Donbass since the XIXth Century emerge again at this point, the summer of 1930 in Stalino (Donetsk) being marked by a quasi-total lack of water in the city bathhouses as well as bad living conditions and the outbreaks of typhoid fever and dysentery. On this same year, it is reported that 60% of all soviet Ukrainian anti-epidemics' funds are then allocated to the Donbass (Kuromiya, 1998). In Crimea, Agriculture reconstruction (formerly devastated by 1st World War and the former empire's civil war) results in the polyculture of cereals, fruits, and wine before their collectivization (Magosci, 1983, quoted by Kent, 2016). A major step is then taken to transform the peninsula in an important lung of soviet heavy industries, through the development of the Dzhankoi metallurgical plant and the Voikov electrical powerhouse (in the context of the GOELRO plan and Stalinian five-year plans [Kent, 2016]). Following the German Hitlerian invasion of 1941 and the reconquest of Crimea in 1944, the postwar developments in the peninsula will be tremendous, through the renewal of metallurgical and chemical industries, a heavy urbanization, but also a massive

development of agriculture and resorts (Kent, 2016). The water issue was soon to become critical in both Donbass and Crimea, necessitating water supply infrastructures, such projects being studied for Donbass as early as the 1930's (Karpenko and al., 1975).

Economic development, water depletion and subsequent water infrastructure projects (1945-1991): In this respect, some articles of the soviet journal Гидротехническое строительство (hydraulic engineering) (published from 1967 to 1975) provide valuable and unique contents on the context and issues of soviet-built canals in Donbass and Crimea for water supply between the 1950's and 1970's. This Soviet technical journal was the only State's periodical specialized in hydraulic and hydro-electrical engineering and use of water resources (Гидротехническое строительство). The first major infrastructure palliating the lack of water in Donbass is the Donets-Donbass canal, built between 1954 and 1958 and supplying the central and western industrial Donbass with "drinking" and "industrial" water from the Donets (Encyclopedia of Ukraine, 1984; Bronshtein and al., 1967). This canal being internal to the water resources of the Donets basin, its construction cannot prevent the general depletion of water in the area. Indeed, the Donbass is cited first among the most water-depleted regions of the whole USSR, along with Crimea in a 1967 report on the Soviet Union's water resources (Razin and al., 1967). Furthermore, the high concentration of industries and the underdeveloped purification facilities are then reported as the two major causes of water-depletion in Central and Eastern Donbass, thus leading to the building of the new Dnieper-Donbass canal, from 1969 (completed 1981), during the ongoing eighth five-year plan (Razin and al., 1967; The Encyclopedia of Ukraine, 1984). At this point, the Donbass' water resources were approaching simple depletion according to rated river flows up to 1970 while water needs for the region's economy and cities were estimated as surpassing the existing reserves in 1975 (Karpenko and al., 1975). Interestingly, various schemes were considered as early as 1965 to divert water from Don or Dnieper as well as combinations of both diversions (Karpenko and al., 1975). Regarding Crimea, the excavation of the new North Crimea canal is then motivated by the necessary supply of fresh water to meet the needs of irrigation, cities, and health resorts (Razin and al., 1967). Moreover, the industrial pollution of ground water resources is already mentioned in these sources (Razin and al., 1967), which is a new type of water-related challenge met by the soviet State as well as will be met by the post-soviet Ukrainian State. Consequently, we can observe that the soviet-era water developments implemented a lasting scheme of Dnieper-water resources, at the heart of Ukraine, supplying water-deficient peripheral regions, the Donbass and Crimea, which would manifest autonomist or secessionist tendencies after 1991.

Concluding remarks, Ukraine since 1991: In this post-soviet context, the consequences of past water management on independent Ukraine can firstly be

described as social and environmental (both Donbass and Crimea basins' population suffering high concentrations of industrial heavy metals in water, heavy pollution and discharges related to the lack or decay of the inherited purification systems, while various epidemics resurface [Nazarov and al., 2001; Mykhnenko and al., 2010]) but also economical (necessary investments being precluded by the severe economic crisis [Nazarov et al., 2001]) and political, due to the vulnerability of the population to water-shortage in these two regions of conflict in the XXIst century.

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EDUCATION FOR SUSTAINABLE DEVELOPMENT THROUGH THE BRAND LANGUAGE

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Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs (RWCED, 1987).

SD has three dimensions: 1) environmental sustainability (protection of natural resources, reduction of pollution, protection of ecosystems, etc.); 2) economic sustainability (economic well-being, protection of job security, economic freedom, etc.); 3) social sustainability (satisfaction of basic human needs in such a way as to avoid future conflicts regarding the distribution of resources). All three dimensions must implement the principles of intergenerational justice. There is a complex interdisciplinary debate about the “right” balance of these three dimensions to achieve equity (WCED, 1990).

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to reduce poverty, protect the planet, and ensure that in 2030, all people lived in peace and prosperity (Harding-Esch, 2017: 7). The seventeen goals are interrelated and mutually reinforcing: actions in one area affect results in others. Therefore, the economic, ecological, and social components of sustainable development must be balanced.

Considerable attention should be paid to education (SDG No. 4 – Quality education) to spread knowledge about sustainable development and achieve other goals. The goal of inclusive and quality education for all reaffirms the fact that education is one of the most powerful and proven means of realizing sustainable development. In the past, major progress has been made towards increasing access to education at all levels and increasing enrolment in schools, especially for girls and women. Basic literacy has improved tremendously, but more concerted efforts are needed towards achieving universal and quality education for all by assessing the linguistic strategies adopted for quality education and evolving a viable medium of communication and education, using language (Ezeh, 2020: 256).

One of the main challenges Ukraine is facing concerning sustainable development is a lack of education and a lack of understanding of the key challenges. EU countries have joined actively the UN Decade of Education for

Sustainability (2005-2014) and Sustainable Development goals plan (2015-2030). The knowledge accumulated in the EU concerning SD creates new opportunities and offers creative solutions for achieving the goals of long-run sustainability. "Education for Sustainable Development allows every human being to acquire the knowledge, skills, attitudes, and values necessary to shape a sustainable future. ESD means including key sustainable development issues in teaching and learning. It also requires participatory teaching and learning methods that motivate and empower learners to change their behavior and act for sustainable development. ESD consequently promotes competencies like critical thinking, imagining future scenarios, and collaboratively making decisions, as well as requires far-reaching changes in the way education is often practiced today", UNESCO, 2014.

Thus, the concept of sustainability comes from the tradition of referring to economic development that almost totally overlooks other spheres of life, in particular, linguistics. In Ukraine, education for sustainable development is concentrated mostly on economic issues. As European practices prove, there are ways of transferring the procedures of sustainability to the language field and combining economic, environmental, cultural, and linguistic competencies. Thus, educational sustainability is holistically related to economic, environmental, linguistic, and cultural sustainability.

To find the bridge between economics and linguistics, specific touchpoints should be found for the synergy of ESD. These can be brands and brand language, as "the great brands don't belong to any single language – they're part of a new global tongue, the Esperanto of the check-out stand. We're all drawn together under the international lingua branda" (Nunberg, 2009:189).

Current approaches to the brand study reveal its communicative essence and indicate the possibility of linguistic analysis. In the brand communication paradigm, the brand acts as a source of information about the company or its products (sender), this transmits this information to the consumer (receiver) through the brand language – a common system of symbols or code. From a multimodal perspective, the elements of the brand language are combined into verbal, visual, auidial, and sensory modes. From an interdisciplinary perspective, sustainable brands can become the ambassadors of sustainability for ESD.

A sustainable brand has a meaning or purpose that goes beyond making money, instead seeking to increase the well-being of humanity and all life on our planet. It sees people as creativists, not consumers. And it understands the lifecycle and environmental impact of all its activities so that it can seek to continuously innovate and reduce its impact to a minimum (Sprinkle). This definition emphasizes the communicative nature of a brand to influence the target audience and thus pragmatically change their behaviour.

A language is sustainable when, despite changes in circumstances and social environment, it is still used. The most direct guarantee of sustainability is the

transmission of language from one generation to another. As long as a language is passed down from one generation to another and used every day, at least at home, a language is sustainable.

In our view, sustainable linguistics as a newly emerging branch should deal with language preservation as language is the axis around which we build our lives or the symbolic space that harbors them. This takes us to language preservation and maintenance, ethnolinguistic vitality, etc.

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INNOVATIVE DYNAMICS OF DEVELOPMENT OF THE MODERN ORGANIZATION MANAGEMENT PROCESS AND INNOVATIVE APPROACHES IN MANAGEMENT

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In the modern conditions of the economy development of Ukraine, the majority of enterprises require the creation of such a management system, which would allow more effective use of available resources, is able to find such potential (including financial and human), capable of bringing the enterprise to a new level of development based on its ability to self-organization. Problems of a social,

economic and political nature, new challenges associated with the COVID-2019 pandemic and Russia's military aggression on the territory of Ukraine, which required new skills and areas of application of entrepreneurial activity; currency and financial instability, as well as competitive challenges of the European market, etc. have made the external environment of enterprises much more complex, dynamic and uncertain. The specified conditions shifted the emphasis when forming the company's strategy to optimize economic, financial and production indicators in order to ensure flexibility, efficiency and adaptability. This necessitates the improvement of the principles of self-organization and the disclosure of the management system and, accordingly, the formation of innovative foundations for managing the dynamic development of the enterprise, which makes the topic of this work relevant and in demand by the market.

The concept of economic innovation was developed by Joseph Alois Schumpeter in the work "Business Cycle" (1934), who determined that innovations are the main source of economic growth. However, the concept of innovation was defended much earlier – in the work "Theory of Economic Development" (1912), where the term "new combinations" was used, in which the scientist personified the form and content of development [1].

Today, it is possible to clearly distinguish three main approaches to defining the essence of the term "innovations" [2]:

- innovation is the result of a creative process by means of new or improved production (technology);
- innovation is the process of introducing, mastering and using new solutions, the process of changing and improving one or another product in one or another economic area;
- innovation is considered as a change, update, occurring in a product, technology, system, method.

The essence of the innovative development of modern organizations is that it is a continuous process of adaptation of the enterprise to the rapidly changing external conditions of the present time through self-organization due to the introduction of the latest technologies and approaches to the activities of the organization with the aim of improving it and ensuring stable development, increasing profits, increasing competitiveness and as a whole to achieve the goals and objectives of the organization. The only constant value of successful organizations is their constant change. Innovative development is a process of "creative destruction" of the existing system of the organization in order to strengthen its market positions and create conditions for upward development.

Economically developed countries form the direction of development of the real sector of the economy and the corresponding infrastructure in accordance with technological conditions. Today, economically developed countries are in the sixth technological resettlement, which began in 2010. It is at this time that cognitive

science (the science of ways of knowing and thinking) is the source of new wealth and the focus of entrepreneurial attention. In modern conditions, organizations that will develop the cognitive and creative potential of a person, the ability to know oneself and the world as a manifestation of one's internal thought processes, to reveal and develop the human in a person will be relevant. We found ourselves in a post-industrial society (overproduction of goods) and a post-information society (overproduction of information). For the full deployment of the sixth technological system in the world, only one task remains to be solved - to create a mass cognitive product that will become the basis of innovative development dynamics, including the development of a management system for business entities.

There is already a Silicon Valley in the world, where start-ups provide great privileges that can attract the best specialists in the field of technology to increasingly develop technological equipment that does not require the presence of a person (driverless cars, pilotless aircraft, etc.). At the same time, technology, such as a car, becomes more and more complicated, and a person becomes simpler. A paradoxical situation is created: car control systems are programmed according to the logic of human thinking (representation of a modern car by a digital network, the use of neuromathematics in complex systems of neural networks) and at the same time the driver/person himself is maximally removed from control and performs a control function. Thus, the problem of the modern world is in the growing gap in perfection and the rapidly growing capabilities of technology against the background of lower requirements for the personal capabilities of each person. Technique improves exponentially, while human potential is not exponentially activated. And all this is happening against the backdrop of the oppression of the natural environment of man. The new carrier of higher intelligence on Earth – artificial intelligence (AI) of large language models ChatGPT - is, in fact, a non-biological being. Therefore, it evolves at a speed unthinkable for biological beings, 3,000,000 times faster than humans. We don't even try to imagine what he will be capable of by 2030.

Therefore, it is extremely necessary to create a Cognitive Valley in the world, the main goal of which will be the development of the "humanity in human" and the activation of his creative abilities. Ukraine can initiate this direction in the world economy and start building up the national economy on these foundations. And Odessa has every chance to become the Beginning of the Cognitive Valley with a focus on improving human-dimensional codes for a balance between them and AI. Because Odessa is already the world capital of humor, and humor is the highest intellectual activity that connects opposites, and this indicates the ability of thinking and the ability to remain human, and not use ready-made answers from someone else's experience.

Today, one of the most important and problematic issues that organizations face is the problem of introducing innovations into their management activities.

Most organizations come to the conclusion that at least once a year it is necessary to carry out a moderate reorganization and a radical reorganization every 2-3 years, otherwise its survival in a dynamic environment becomes impossible. Requirements for change come both internally in the form of the needs and expectations of employees, and externally, in the form of growing competition, technological innovations, new legislation, and pressure from social factors. In order for the changes to give the best result with the least amount of money, effort and nerves, the process of change in the organization must be best organized and managed.

As we can see, the new conditions of uncertainty in which the whole world, including the economy, find themselves, need new methods and forms of management processes of organizations at all levels. Therefore, we propose to consider the scientific and methodological potential of synergetic strategies in ensuring an increase in the efficiency of management decisions.

The economic world is highly complex and non-linear in nature, where everything is connected to everything. His study of the approaches and methods of exact sciences and the latest methodology of scientific research led to the concept of a synergetic economy [3].

Synergetics (gr. Syn – compatible; ergos – act): the science of the joint, coordinated behavior of many elements as one whole through a complex system of various nature. It is interdisciplinary in nature. Synergetics is interested in the general patterns of evolution (development, movement).

Synergetics is the only theory of self-organization; self-organization is a fundamental phenomenon characteristic of complex nonlinear dynamic systems without a guiding and directed “hand” (force, signal) acting from outside. It distinguishes a few (several) so-called order parameters, on which the quantities that characterize the state of the system (object) under study depend. In turn, they also affect the order parameters, their choice.

Synergetics studies the processes of transition from chaos to order and vice versa (processes of self-organization and self-disorganization) in open non-linear environments of different nature. It is precisely such systems that include objects of management – organizations, enterprises, etc.

Self-organization – processes of spontaneous putting in order (transition from chaos to order), formation and evolution of structures in an open non-linear environment.

An open system (environment) is a certain type of systems in which there is an exchange of matter (substance), energy and (or) information with the environment (there are sources and sinks).

Coherence is the behavior of elements within the system coordinated in time and space. The coherent behavior of elements is the basis for the emergence of complex ordered spatial structures of chaos.

Synergetic effects – the emergence of cooperative, coherent behavior of parts in the system.

Synergetic economics deals with the temporal and spatial processes of economic evolution, dealing with unstable, non-linear systems, focusing on such phenomena as structure variability, bifurcation, chaos and synergistic effects of the economy [3].

The synergetic economy expands the possibilities of the traditional theory of economic dynamics (business cycles, economic growth). The fundamental economic mechanisms proposed by the traditional economy (competition, cooperation, rational behavior of the subject, stability and equilibrium) are not excluded, but the synergetic economy also adheres to other provisions: the sources of complex economic evolution can also be instability and nonlinearity, the irreversible nature of processes, the open nature of processes.

It is also taken into account that small fluctuations can lead to significant changes in the behavior of a dynamical system. In other words, insignificant variations in the parameters of the system generate qualitative changes in the dynamic behavior.

Synergetic economics emphasizes the interactions of diverse variables and different levels of the system. This takes into account the principles of systems analysis, but is fundamentally different from it, because in the traditional sense, systems analysis implies sustainability.

Complex systems should not be forced to follow the path of development, but only by small actions to promote the transition to a state of greater order, taking into account the internal trends in the development of the system and in such a way as to ensure the growth and flourishing of all elements of the system.

An acute problem arose of such an economic theory that would not only explain the causes of crisis phenomena, revealing their mechanism, but would provide means of struggle, at least predict scenarios of events. In other words, one must learn to manage the situation without fighting the nature of the economy. For countries with a deep transformation of the economy, the postulates of the theory of general economic equilibrium did not materialize. Static economic analysis has been replaced by non-linear dynamics of macroeconomics (economic dynamics) as a way of understanding economic cycles and their development. To make a qualitative forecast of the evolution of the economy, tools of nonlinear analysis are required.

Self-organization in economic theory in a certain sense was also considered by I.A. Schumpeter. He believed that the economic system does not return to equilibrium, but goes into a new qualitatively different stationary equilibrium state with significantly different quantitative parameters associated with conservation, investment and changes in the base of fixed capital (its structure). There is an abrupt transition from one stationary state to another at a

qualitatively new level, which is the dynamics of the economic development of society. There is a kind of constant adaptation of the economy. Innovations (innovations) for such a transition, in particular, new combinations of more efficient use of available resources in production.

Joseph Alois Schumpeter considered the crisis and the period of depression as necessary conditions for the manifestation of entrepreneurial innovative properties of a person in the economy. Crisis as a turning point to recovery from stagnation. Right now, the world economy has found itself in such a state, and this is a challenge to the intellectual potential of a person for the manifestation of creative solutions, taking into account scientific and methodological ideas about the natural processes of the complication of economic systems.

The most common innovative approaches and practices in management are new methods and tools that can help managers achieve more effective and efficient decisions than traditional approaches. Here are some of them:

Дизайн-мислення (Design Thinking) – a method of problem solving based on a systematic approach to research and understanding the needs of customers or users, allows you to create innovative solutions and focus on customer needs. (Design Thinking in Business, Tim Brown, 2018)

Агіл-менеджмент (Agile) – is a project and team management method that allows you to quickly respond to changes and adapt to new requirements through an iterative development process that adjusts tasks and priorities within the team and interaction with the customer. (Агіл-менеджмент и управление командами, Юрген Аппело, 2018)

Лінія малої серії (Lean Startup) – it is an innovative approach to business development that minimizes risks and costs for maximum results. The main focus is on creating a minimum viable product (MVP) that allows you to quickly get feedback from potential customers. (The Lean Startup. How Constant Innovation Creates Radially Successful Businesses, Eric Rise, 2011)

Бізнес-модель Canvas – it is a tool that allows you to describe the business model of an organization in a clear and understandable way. It helps managers create and test new business models and identify innovation opportunities. (Построение бизнес-моделей: Настольная книга стратега и новатора, Александр Остервальдер, Ив Пинье, 2020)

Strategy "Blue Ocean" – This is an approach to the formation of a business development strategy that allows the company to create a new market and avoid competition in already occupied markets. It is based on researching the needs of clients and creating competitive advantages that are different from those offered by competitors.

("Strategy Blue Ocean", Harvard Business Review Press, расширенная версия, 2015, В. Чан Ким и Рене Мауборн)

Innovation leadership is an approach to leadership focused on stimulating creativity and innovation in an organization, developing a culture of innovation and supporting talented employees.

Knowing and being able to synergistically combine these approaches can help you meet challenges and achieve better results and management efficiency.

Conclusions. The innovative dynamics of the development of the management process arouses the interest of the scientific community in solving the problems of synthesizing the laws of management that determine the management structure of the organization, which would ensure the expected nature of the processes in socio-economic systems, which are companies, firms, organizations. The dynamics of these systems may be accompanied by chaotic phenomena caused by the specific impact of the market environment on them. The effectiveness of management largely depends on the speed of adaptation of the organization to new conditions. A successful company is one that does not wait for crises in order to change, but manages changes in its internal structure in advance in such a way that when unpredictable circumstances come, it is ready for them ahead of time.

Recently, many scientific results in the field of systems theory have been associated with synergetics, considering it as a theory of self-organization and self-development of open systems of various nature, including organizations, companies, firms, as a new approach to understanding crises in these systems and creating means to manage them. It is extremely necessary to create a new understanding and attitude to management, which, along with traditional management, includes innovative self-organization as the basis for entrepreneurship in the field of intellectual product transfer, recognition of the imbalance of any innovation system, and the emergence of translucent boundaries between partners in innovation.

The main task in the innovative management of an organization is the formation of a culture of value for the person himself. In the case of today's dynamic world, companies must learn to unlock the potential of their employees and reduce the degree of bureaucracy, gather an effective staff and educate leaders who will serve the people [4]. Replacing bureaucracy with passion and creativity (a machine cannot create, but only works according to a program), you need to learn how to build effective organizations, create a working environment in which everyone will have a chance to flourish.

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INDUSTRIES 4.0 AND 5.0 AND SUSTAINABLE DEVELOPMENT

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Industries 4.0 and 5.0 are two buzzwords that have gained significant attention recently[1-3,7,9-14,16-17]. The fourth industrial revolution has enabled the digitization of manufacturing processes, leading to the development of smart factories and automated systems. On the other hand, Industry 5.0 bridges the gap between humans and machines, creating a collaborative and sustainable work environment. This paper will explore the relationship between Industries 4.0 and 5.0 and sustainable development, highlighting the potential benefits and challenges.

Industries 4.0 and 5.0 have the potential to drive sustainable development by optimizing resource utilization, reducing waste, and enhancing efficiency. Smart factories enabled by Industry 4.0 technologies can use renewable energy sources and predictive maintenance systems[4-6,8,15,18-20]. By leveraging the data from IoT sensors, these smart factories can optimize their production processes, reduce energy consumption, minimize waste, and enhance operational efficiency, resulting in cost savings and improved profitability. Industry 4.0 technologies can also create new business models that promote sustainable development. For example, the sharing economy model can facilitate the more efficient utilization of resources by sharing assets such as cars or industrial equipment.

Moreover, Industry 5.0 aims to create a sustainable and collaborative work environment by combining the strengths of humans and machines. This approach acknowledges the importance of human expertise, creativity, and problem-solving abilities. Industry 5.0 can promote sustainable development by providing

employment opportunities, promoting diversity and inclusion, and enhancing workers' health and safety.

Collaborative robots (cobots) can work alongside humans to perform repetitive or physically demanding tasks, reducing the risk of injuries and improving workers' well-being. Using cobots can also enhance the quality of work and increase productivity.

However, implementing Industries 4.0 and 5.0 also presents challenges to sustainable development. Adopting new technologies requires significant investment, and small and medium-sized enterprises may need more financial resources to implement them. The high cost of new technology may lead to a digital divide between large corporations and small businesses, resulting in unequal access to the benefits of Industry 4.0 and 5.0. Additionally, implementing Industry 4.0 technologies may require retraining workers, which can be time-consuming and expensive in countries with large workforces requiring more technical skills. Industry 5.0 also presents challenges, including developing new work practices that promote collaboration and mutual learning between humans and machines. Creating such practices requires changes in organizational culture, which can be challenging to implement.

Despite these challenges, the benefits of Industries 4.0 and 5.0 are too significant to ignore. Governments, businesses, and civil society should adopt sustainable technologies and practices while addressing the challenges associated with their implementation. This requires a coordinated effort to provide financial support to small and medium-sized enterprises to facilitate the adoption of new technology.

Governments can also create favorable policies that incentivize adopting sustainable technologies, such as tax incentives or subsidies. Additionally, the retraining of workers must be prioritized to work in the new work environment created by Industries 4.0 and 5.0. This can be achieved through vocational training programs, apprenticeships, and other forms of skills development. Furthermore, collaboration between academia and industry can facilitate sustainable development. This can include research on renewable energy, circular economy, and sustainable supply chain management.

Industry 4.0 and 5.0 should be used to ensure that they do not have negatives on human rights, privacy, and social justice. The development of ethical guidelines and standards can help ensure that new technologies and practices are used responsibly and transparently. This requires a multi-stakeholder approach that involves civil society organizations, academia, industry, and government.

Furthermore, the role of Industry 4.0 and 5.0 in achieving the Sustainable Development Goals (SDGs) must be recognized. The SDGs include economic, social, and environmental dimensions. Industry 4.0 and 5.0 have the potential to contribute to poverty reduction, gender equality, and climate action. Renewable

energy sources in smart factories can contribute to SDG 7 (affordable and clean energy), while the promotion of collaborative work practices can contribute to SDG 8.

Conclusion. In conclusion, Industries 4.0 and 5.0 have the potential to drive sustainable development by optimizing resource utilization, reducing waste, and enhancing efficiency. Adopting new technologies and practices presents challenges that must be addressed by large, small and medium-sized enterprises, workers, and marginalized communities. The ethical implications of Industry 4.0 and 5.0 must also be considered. Governments should work in an environment that promotes the adoption of sustainable technologies and practices while addressing the challenges associated with their implementation.

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SOCIAL ENTREPRENEURSHIP IN UKRAINE: PUBLIC IMPACT AND POTENTIAL FOR SUSTAINABLE DEVELOPMENT

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Today, Ukrainian society faces the trials of wartime, which causes problems in various spheres of the economy. The low level of material security, high unemployment and a large number of vulnerable groups lead to the search for alternative ways to solve social problems. Social enterprises are one of the innovative tools for solving these problems.

The concept of social entrepreneurship is not new for Ukraine, and in recent years, many representatives of government, business, scientists, professionals and public figures explore the theoretical provisions and practical experience of social entrepreneurship. In today's world, social entrepreneurship is one of the fastest growing sectors of the economy. Many countries have proven that social entrepreneurship can be an effective tool for solving social problems and promoting social values.

Social entrepreneurship at its core is defined as a mechanism for creating social change through entrepreneurial activity. Social enterprise differs from other businesses in that the social effect is a direct and immediate result of its activities, rather than an accidental by-product [1]. Social enterprises generate profits and direct them primarily to solve social problems, rather than to enrich its owners. In the context of public administration, social entrepreneurship can be seen as a tool to promote social values and solve social problems, because the state can use social entrepreneurs to achieve its goals, such as improving the quality of life of citizens, fighting poverty, increasing equality, etc.

However, despite numerous studies on social entrepreneurship, questions remain about the effectiveness of using this tool in public administration, as well as about what conditions are necessary for its successful use.

In Ukraine, as in other countries, social enterprises use a variety of business models to achieve their goals, which include: providing jobs for vulnerable populations; generating profits that are channeled into solving social and environmental problems; producing goods and services that have significant social and environmental value; development of economically depressed areas; the use of mixed (integrated) business models.

In Ukraine, social enterprises actively apply these business models to help people in need and achieve positive changes in society and the environment. Social entrepreneurship is a business model aimed at achieving social goals and solving social problems within the framework of market mechanisms. Social entrepreneurs create and develop organizations that work in the social sphere, such as philanthropy, helping the underprivileged, protecting the environment, and so on.

Social entrepreneurship has significant potential to improve the quality of life of citizens and achieve social goals. It can play an important role in public administration, solving problems that the government cannot solve on its own and increasing the effectiveness of achieving public policy goals.

According to a report by the International Telecommunications Union (ITU), in 2022 approximately 5.3 billion of the world's 8 billion people, or some 66 percent of the world's population, will use the Internet. And three-quarters of the population age 10 and older own a cell phone. On average, in almost all regions, the percentage of individuals with a cell phone is higher than the percentage of Internet users, but the gap is narrowing, allowing social entrepreneurs to reach more people through various digital channels [2].

In addition, according to the European Commission, social entrepreneurs create more than 11 million jobs in Europe and contribute more than 500 billion euros to the economy [3].

Currently, social entrepreneurship is becoming increasingly popular around the world, as it allows to overcome social problems in a more efficient and innovative way. This is a new type of business that combines commercial goals with social goals. It aims to solve social problems and improve people's lives rather than to maximize profits. Most social entrepreneurs try to solve such problems as poverty, unemployment, health care, education, and ecology.

In Ukraine, social entrepreneurship also contributes significantly to the creation of new jobs and the improvement of social conditions. According to the European Commission Enterprise and Industry report, the social enterprise sector in Ukraine accounts for about 2% of the total number of businesses in the country and covers various areas of activity, including education, health care, ecology, social services, tourism, and others. Overall, social entrepreneurs in Ukraine

continue to expand their activities, attracting investment, creating new jobs and making an important contribution to the country's economy.

The peculiarity of social entrepreneurship is that it uses business principles to solve social problems, and this makes it a unique and effective management tool for the state.

The state can support social entrepreneurs through various forms of financing, such as grants, loans, and tax incentives. This helps create a favorable environment for the development of social entrepreneurship and the improvement of people's lives.

In Ukraine this direction is also actively developing and becoming more and more popular. Only in 2019 about 5 thousand social enterprises were registered in Ukraine, as well as more than 500 non-profit organizations engaged in social entrepreneurship. This proves the growing interest in social entrepreneurship in the country. After the approval of the Concept of State Policy on Social Entrepreneurship Development in Ukraine, it is necessary to revise the current state documents, including strategic and program documents, as well as action plans to update or discontinue their implementation. The National Economic Strategy - 2030 is one of such documents. [4] This will ensure a more effective development of social entrepreneurship in Ukraine and achieve better results in this area.

Social entrepreneurship in Ukraine has great potential for development and makes it possible to create not only profitable businesses, but also to solve social problems in the country.

After the end of the war, Ukraine could face huge economic problems. Many regions of the country suffered, industry was destroyed, businesses ceased their activities and as a result many people were left without jobs and means of livelihood.

Social entrepreneurship is one of the directions of development that can help to restore the economy of Ukraine. The main advantage of using this particular business model is the fact that it is based on solving social problems and not only on making a profit as in classical entrepreneurship. Using the model of social entrepreneurship allows primarily to solve social problems such as unemployment, poverty, environmental problems, social and economic inequalities. The choice in favor of this direction of development of the country can become a serious driver for the recovery of both the affected regions, and the economy of Ukraine.

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THE COMPETENCE POTENTIAL OF EMBODIED LABOR AS A DOMINANT FACTOR IN THE ADAPTATION OF BUSINESS PROCESS MANAGEMENT UNDER THE INFLUENCE OF CYBER-PHYSICAL SYSTEMS

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Researchers increasingly define the economy of developed countries as industrial, and the current stage of its development is characterized as new industrialization. At the same time, new industrialization is defined as a necessary development model for the transformational economy of Ukraine. The meaning of the new industrialization is associated with the processes of significant, radical changes in the productive forces, which accelerated in the last decade.

Among the features that characterize the development of productive forces, the main one is considered a radical change in technology. Such a change requires first significant resources invested in basic and applied science, and then huge investments in new fixed capital. Those manufacturers, economies and countries that manage to adapt their business processes in a timely manner under the influence of changes in cyber-physical systems will win the competition.

The rapid development of digital technologies indicates the onset of a new stage of the industrial revolution, which changes the meaning of work, human life and endows the means of production with new properties and capabilities, significantly increasing their labor productivity. The large-scale implementation of such technologies creates favorable conditions for the general automation and robotization processes of production. It is quite natural to expect fundamental

changes in the competence potential of embodied labor under the influence of the digital revolution, because the emergence of electronic productive forces will inevitably change the nature and content of social industrial relations.

Today, there is a powerful and dynamic process of transformation of the modern world under the influence of information and communication technologies. The development of the Internet and other information and communication technologies, stable communication channels, cloud technologies and digital platforms, as well as the information "explosion" – all this contributed to the emergence of open information systems and global industrial networks that go beyond the boundaries of a single enterprise and interact with each other. Such systems and networks had a transformative impact on all sectors of modern society, economy and business and fundamentally transformed the vector of development of the basic component of today's economy – industrial automation. Humanity is on the threshold of a technological revolution that will fundamentally change the conditions of its existence. The speed with which new discoveries are made and technological breakthroughs occur has no historical precedent. Almost all sectors of the economy are being reformatted in almost every country, and the breadth and depth of the changes themselves lead to the transformation of entire systems of production, administration and management. In terms of scale, scope and complexity, the transformation itself will be completely unlike anything humanity has experienced before.

A feature of the technological breakthrough in the XXI century there is rapid progress, which is not taking place in any one local field of science and technology, but is a convergence and hybrid-technological clustering in almost all areas of scientific, technical and technological development. Therefore, it is necessary to define approaches to the implementation of digital transformation of markets and sectors of the economy; formation of conditions for the creation, development and dynamic development of the infrastructure of the digital economy, which will ensure the collection, storage, processing and transmission of data; formation of research and technical potential for the development of the digital economy and the creation of a single digital space.

G. Press analysts from Forbes identified five factors that are considered as the driving force for rapid business growth in the digital economy:

1) Intelligent agents – artificial intelligence products that can interact with users, study their behavior and understand their needs, as well as choose decisions on their behalf, increasing productivity, customer loyalty and reducing costs;

2) Augmented and virtual reality, which creates a new interactive digital environment that radically changes the quality of customer service and equipment;

3) The Internet of Things as a way of doing business, o provides companies with constant information about what is happening with their equipment, products, operations and customers;

4) Cognitive technologies for the development of artificial intelligence – imitating natural human cognitive functions, create unique, differentiated customer value and significantly improve internal production processes;

5) Hybrid wireless technologies as interfaces and software that provide devices with the ability to simultaneously use and transmit information between two or different wireless providers, protocols and frequency bands (Vishnevsky et al., 2020).

Changes in the competence potential of embodied labor under the influence of digitalization of the economy:

1. Automation and robotization of production, as a result of which a new field of automation is emerging. It has all kinds of manifestations and directions, namely: development and implementation of artificial intelligence; overcoming the physical capabilities of a person; optimization of material and technical processes; the emergence of self-driving machines and automatic adjustment of production; implementation of automatic control over equipment, product quality and personnel.

2. The emergence of digital means of production and the Internet of Things, that is, the emergence of electronic productive forces that will inevitably change the nature and content of social industrial relations, namely: the emergence of new electronic productive forces that are the basis of the formation of a new economic system; transfer of market relations to virtual space; changing the structure of reproduction under the influence of cyber-physical systems.

3. Big Data is a new generation of technologies and architecture designed to obtain economic benefits from a very large volume of a wide range of information by means of its rapid capture, search and/or analysis, which allows: optimization of operations and product flows in the enterprise and the formation of "e-infrastructure" – innovative acquisition and storage of data for the purpose of their further analysis.

4. The emergence of global digital platforms thanks to the intensive development of information and communication technologies in order to improve coordination and increase the active participation of all partners, namely: value added chains are formed; there is a monopoly resource that gives rent-premium income; the spread of global inequality and disproportionality.

5. There is a transition from labor to capital, namely: an increase in the share of capital in the gross benefit; the growth of the organic structure of capital, which is manifested in the increase in the technology of production; aggravation of problems in the field of employment; income differentiation and emergence of non-technical competences.

Thus, the conducted research made it possible to draw the following conclusions:

1. Creation of new opportunities for business development based on the use of the latest technologies (mobile networks, social technologies, big data analysis, "cloud" computing), which increase the potential for forming new business values of enterprises and organizations, attracting new customers, etc. Thus, the level of sales of small and medium-sized enterprises that used the Internet as a distribution channel in their activities was 22% higher for three years than that of companies that did not use the Internet (McKinsey, 2020).

2. Increasing the competitiveness of the national economy through the introduction and development of new business models and technologies (analytics of large data sets, digital platforms, robotics, 3D printing, the Internet of Things, neural networks, artificial intelligence, blockchain, etc.).

3. Increasing the transparency of the process of interaction between the corporate sector and the population with the state and, as a result, improving the business climate in the country (simplifying the procedures for providing public services: tax declaration, obtaining permits, registering a legal entity, developing a system of electronic services for business and online services).

4. Today, the digital economy determines the vector of development of various economic systems and determines the global competitiveness of individual enterprises, countries and regions. Increasing the efficiency of the mentioned transformations in Ukraine requires an effective state policy aimed at improving the regulatory and legal regulation of the field of information and communication technologies; active digital transformation of the real and financial sectors on the basis of Industry 4.0; creation of high-quality and accessible digital infrastructure; overcoming digital inequality and increasing digital literacy of citizens, entrepreneurs, and officials; harmonization of the Ukrainian institutional environment with the EU institutional space; introduction of the best global experience in the field of cyber security.

5. The technology of "big data" is the most promising direction of the nearest development not only of commercial structures. These technologies should find their application first in the field of social development - in the field of public administration. "Big data" in the public administration system will allow solving the task of effective management of the country, ensuring all kinds of security of citizens at a new technological level. The use of "big data" opens up new opportunities for researching the dynamics of macroeconomic changes, promotes the development of online trade, expands the scope of cooperation with economists for conducting various kinds of experiments, and allows the government and enterprises to respond more quickly to changes in economic conditions. However, the effect of "big data" will largely depend on the efficiency of management and use of resources. Countries with larger enterprises, global connections, and a developed infrastructure of information and communication technologies will be able to benefit significantly more than those that lag behind in these areas. Thus,

the consequences of the use of "big data" will be more noticeable in Northern Europe, while in most countries of the new Europe and Southern Europe the result will be much smaller.

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ENVIRONMENTAL RESPONSIBILITY OF BUSINESS IN THE RESORT ECONOMY: THE POST-WAR CONTEXT

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Today, the importance of the population's health and development, the quality of its life, requires the availability of the most important recreational and resort services from certain sanatorium-resort and recreational facilities, as well as the availability of natural healing and recreational resources for self-organization of rest, development, and travel.

As can be seen from the State Agency for Tourism Development of Ukraine data, the recreational, tourist and resort infrastructure suffered significant losses: the total number of taxpayers engaged in tourism and related activities decreased by 17% over the year. Also, the number of legal entities decreased by 14%, and the number of individuals – by 18%. In the economic aspect, it should be noted the increase of the paid tax by 46% from the activities of guesthouses and hostels, which were used as temporary shelter for temporary replaced people due to the war. And a 57% reduction in the share of tax paid from the activities of camping sites, camping sites, and children's recreation camps compared to 2021. Hotels paid the significant share of state budget revenues last year among temporary accommodation facilities – UAH 898 million, which is 30% less than in 2021 (State Agency for Tourism Development of Ukraine, 2023).

The Recovery Plan of Ukraine presented in 2022 in Lugano is based on 5 main principles: quick start and systematic development; increasing fair welfare; integration into the EU; reconstruction according to the "build back better"

principle at all levels; stimulation of private investments. We believe that post-war reconstruction efforts should be focused not simply on reconstruction of the destroyed infrastructure elements, but rather on investing in the future – investments that should be transformative and sustainable, fit for the future in line with international standards and nature-friendly, climate-smart and inclusive reconstruction. The result of reconstruction can have 2 options: 1. Ukraine, which rebuilds what was destroyed during the war, with the aim of returning the country to its potential before the war; 2. A principal other state that looks and acts like an EU member state, which may become a member state when a political decision is made.

The realization of the Recovery Plan tasks and projects will ensure the implementation of the business ecological vector in accordance with the Ukrainian course on European integration and the European Green Deal, as well as the projects integration for the country recovery in accordance with the European course and principles of sustainable development. The implementation of the Recovery Plan main principles will bring Ukraine's regulatory framework closer to EU norms, improve the health of the population, promote the development of small businesses, etc. This will provide an opportunity to build the country's strategic development, focusing on the regions' strengths and investing in their weaknesses. Supporting small and medium-sized businesses is an important part of the new economic model (Ukraine Recovery Conference, 2022).

It is appropriate to consider the introduction of environmental responsibility of business on the basis of inclusiveness as a trend of socio-economic and ecological development of sanatorium-resort and recreational activities in the conditions of post-war recovery. Its conceptual principles correspond to the modern needs for the environment and its components protection (healing resources), and should also serve to form directions for the resort economy development of Ukraine (recreation, restoration of psychophysical condition, comprehensive cultural development of the personality, etc.); at the basis of sanatorium-resort, health, rehabilitation and recreational activities are social values formed by social needs for restoration, recreation and rehabilitation; the organization of resort, health or other related activities involves the use of natural healing resources of public, not individual level of use. In particular, geographical features (comfortable climatic conditions) and a unique set of natural healing resources contributed to the formation and development of large resorts with a developed network of sanatoriums and health facilities, which are located mainly on the coast of the sea and estuaries (Cherchyk, L. et al, 2021; Cherchyk, L. &Khumarova, N., 2022).

In authors opinion, since the consumer is interested in ensuring that his environment remains safe and ecological, the guidelines for the further development of socially responsible business in Ukraine (in particular, its

environmental component) in the conditions of post-war recovery should be its systematic implementation and full information of society based on digitalization about advantages of such a "build back better" model. The systematic nature of the proceedings means its popularization at all levels – among large, medium and small businesses with the help of a motivation system. It is necessary to inform society about successful companies that are socially oriented in their activities in order to stimulate the demand for environmentally responsible business.

Among the areas of ecologically responsible business activity that correlate with the European Green Deal and the Recovery Plan are the fight against climate change, resource conservation and quality water resources. These areas are key to preserving resources for a sustainable future. Many resorts and closely related businesses such as hotels and serviced apartments are now looking to improve their environmental performance.

In the resort economy, one of the areas of ecological responsibility can be the implementation of wastewater reclamation and recycling systems as an alternative source of water supply, the effects of which will be aimed at ensuring the population social protection, increasing the investments economic efficiency in the drainage of resort facilities; reduction of energy consumption related to the intake, purification and distribution of water for health and rehabilitation needs, etc.; preservation of fresh water sources; avoiding excessive exploitation of water resources; climate change mitigation, etc. (Khumarova, N. &Mahats, N., 2022).

The introduction of information awareness about the environmentally responsible aspect of the resort business contributes to the positive image formation of their establishments and popularization. For example, in the work «Understanding the Global Spa Industry: Spa Management» (Cohen M. &Bodeker G., 2008) were formed several directed messages of "Green resorts", which create a vision of an ecologically responsible resort area among the population. Though, Green resorts are:

- good business – although the investment costs of some greening initiatives are high, they usually pay for themselves and provide savings within a year or two;
- more relaxing – offering a more relaxing and balanced experience by removing the stressors of our modern lives such as pollution, noise, sense of unsafe etc.;
- contribute to the harmonization of the human body with nature;
- procedures are more effective – artificial and chemical products can cause harm during wellness or rehabilitation activities, while procedures using natural products are gentler.

Large resort health, rehabilitation and recreational facilities may have more opportunities for immediate implementation of environmentally responsible measures. However, smaller facilities may lack the resources to plan and implement short-term environmental solutions. The first priority will be to conduct

an environmental audit, and then to prepare a plan to achieve sustainable development.

The expected demand growth in the post-war period for the resort sector services (rehabilitation, recovery, restorative treatment, etc.) is a prerequisite for the implementation of the "build back better" principle of the Recovery Plan in the development of health and wellness and other resort infrastructure, as also the positive image formation of environmentally responsible business among the population and possible investors. Thus, restoration projects plan not only the creation of new modern medical, rehabilitation and restorative centers, wellness complexes, but also the restoration of tourist routes and resort destinations.

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PROMOTING THE EU BEST PRACTICES OF LCA TO ENSURE SUSTAINABLE DEVELOPMENT IN UKRAINE

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Life cycle thinking and life cycle management are essential to ensure sustainable development. This allows for considering possible consequences at all elements of the product system and avoiding suboptimal decisions. Life cycle assessment (LCA) is one of the main tools for implementing life cycle thinking and management practices (it was recognised by the UN in 2002). Today, the European Community demonstrates leadership in implementing LCA practices: through informing and disseminating knowledge, defining the primary method of conducting assessment in the EU and elaborating policies that contribute to the broadest possible spread of LCA practices when making decisions (Koblianska, 2022b). The implementation of life cycle assessment practices in Ukraine is at the infant stage, which is characterised by individual non-systematic studies conducted, as a rule, within the chemical, technical, and agricultural sciences (Koblianska, 2022a). The potential of LCA use in making business and political decisions has yet to be fully realised. At the same time, the existing ecological problems of the country make the implementation of the LCA toolkit an urgent task. The relevance of LCA implementation increases given the progress of European integration and the need to comply existing management practices with European ones.

This publication aims to highlight the trends of LCA development in the European space, as well as to share the experience of implementing domestic initiatives regarding the promotion of LCA. The presentation of the project results to the general public, among other things, will stimulate a discussion on ways of increasing awareness and implementation of the LCA practices among scientists, practitioners, and representatives of the public sector.

The LCA practices were first introduced in developed countries in the 60s of the last century. Since that, the perception of LCA has evolved: from individual business cases to the recognition as the basis of a sound environmental policy that favours achieving sustainable development goals. This became possible due to the following: the involvement of the public sector in relevant research and promotion, standardisation, dissemination of knowledge through virtual platforms, and LCA promotion via appropriate regulations (Koblianska, 2022a). Nowadays, LCA is the basis of a significant number of policies (and regulations) in the EU: Integrated Product Policy; Action Plan for Sustainable Consumption and Production and Sustainable Industrial Policy; Green Public Procurement; Environmental Labelling; Eco-management and eco-audit schemes; A Thematic Strategy on the

Prevention and Recycling of Waste; Thematic Strategy on Sustainable Use of Natural Resources; The EU Environmental Technologies Action Plan[7-26].

The current stage of LCA development in the EU is associated with the implementation of relevant practices in the construction and public procurement sectors, which should further contribute to the realisation of the “domino” effect spreading LCA in other sectors with the active involvement of the financial industry. In particular, the latest data shows that LCA-based decisions are encouraged and stimulated in every way in the EU within the framework of the green public procurement program (Hofbauer et al., 2021). In addition to product and process solutions, LCA is becoming an increasingly popular tool for making decisions on community development at the local level. It can form an appropriate information base for decision-making regarding the territorial and agro-food system's performance through the so-called territorial LCA (TLCA) (Borghino et al., 2021).

The project "EU best practice of life cycle assessment, social, environmental accounting and sustainability reporting", co-funded by the European Commission within the framework of the ERASMUS+ Jean Monnet Actions program, is dedicated to the dissemination of EU best practices in LCA (among other issues). The project is being implemented in 2022-2025 by a team of scholars from the Sumy National Agrarian University (EULasting, 2023).

The experience of project implementation (a training course for Ukrainian postgraduate students and young scientists in spring 2022, a training course for masters of agricultural higher education institutions in autumn 2022, a “Spring School” for masters, postgraduate students, and young scientists in spring 2023) reveals the lack of knowledge about LCA concept and methodology in Ukraine.

Another problem restricting the implementation of LCA practices in Ukraine lies in the absence of relevant tools and data to conduct LCA. The databases and datasets for LCA are created in many countries. These databases are constantly updated and improved. Although there are 1,392 datasets listed in OpenLCA Nexus for Ukraine (as of April 25, 2023) (OpenLCA Nexus, 2023), many still need to be completed. For example, some datasets for agricultural products contain only a few elements of the product system (waste management stage or particular substances), which only allows for a partial-fledged analysis making it impossible to compare domestic products with those made in other countries.

To sum up, the following problem issues must be resolved to promote LCA practices in Ukraine:

1) use of appropriate tools to popularise and disseminate knowledge about LCA (What tools should be used? Who should be the target audience? What format and communication is the most effective?);

2) informational and methodological support of the LCA implementation (What could be done to improve the content of datasets on LCA regarding the domestic products, processes, and systems? How can this work be made systematic?);

3) support of LCA practising (What difficulties do companies see in the LCA implementation? What is needed to overcome them?).

These questions should form the basis of the professional discussion concerning the LCA implementation in Ukraine and could form the research agenda in this field.

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DIGITALIZATION OF ARCHITECTURAL AND CONSTRUCTION CONTROL: THEORETICAL ASPECT

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Digital transformation is the process of using digital technologies in order to change the business model and provide new opportunities to increase the efficiency of the company's activities in order to obtain profit. Digital transformation can give an enterprise a competitive advantage due to better, faster and cheaper organization of processes compared to its competitors.

A feature of digital transformation processes is their strengthening due to the emergence of a combinatorial effect or the effect of accelerated development due to the possibility of simultaneous application of a significant number of new technologies. Thus, the concept of digital transformation implies the maximum possible use of high-tech solutions and their combination in order to automate simplify and simultaneously increase the efficiency of absolutely all processes inherent in digitalization objects. That is, digital transformation covers not only projects for the implementation of breakthrough technologies in the processes of operational and production activities, such as Smart-factory technologies (smart production, digital modernization of operational and business processes) and its logical continuation as the concept of Industry 4.0 (updating business processes

with the use of the latest cyber systems), but also a complete review of the existing management model, value creation chains and methods and channels of interaction with customers, suppliers, and other stakeholders (ICT, 2022).

In the field of architectural and construction control services, breakthrough technologies have led to the emergence of higher quality and client-oriented products and services, improvement of the system of interaction with clients and availability of financial services, modernization of electronic banking processes. It is clear that under the influence of the COVID19 pandemic, the structure of this list has undergone significant changes, intensifying the course of transformations in those industries that were on the outer circles of the digital funnel. Thus, for objective reasons, the health care market has become more active, the use of digital technologies in which allows expanding the range of opportunities for providing medical services, forming medical networks, and achieving a personalized approach to service.

Given the need to urgently limit the level of staff presence at workplaces, the manufacturing sector is forced to accelerate the synchronization of business processes and make the transition to the use of smart production and operational technologies in order to maximally satisfy the needs of consumers and at the same time reduce costs, and companies providing transport services have focused on the implementation of technologies for the optimization of logistic movements in real time, and therefore received additional guarantees of their effective activity.

Digitalization involves the use of electronic and digital devices, tools, systems, as well as the establishment of electronic communication exchange between them, which actually enables the integrated interaction of the virtual and physical, i.e., creates a cyber-physical space (Kolomiiets et al., 2017).

Digitization refers to the process of using, transferring and converting information into a digital format; system of data collection, storage, analysis, application of artificial intelligence; transformation of the penetration of digital technologies to optimize business processes. That is, digitalization is the process of systematization, use, and processing of information in a digital format, with the aim of improving customer service in the business environment (Lihonenko et al., 2018).

Specialists offer many approaches to understanding the essence and content of the concept of "digitalization". In a general sense, digitalization can be understood as certain uses of digital technologies to optimize and automate public administration, business, and the social sphere to increase the level of labor productivity and improve the quality of communication with recipients of products and services. On the other hand, digitalization is considered as a process of using digital technologies, improving the quality of customer service.

Digitalization also means the process of creating a specialized system for collecting, storing and analyzing information, optimizing its search, including

using the Internet, processing large volumes of data, using artificial intelligence and online services in the production process. This category should take into account the transition of the organization to new ways of thinking and working, based on the use of social, mobile and other digital technologies; change of management style, use of motivation systems and new business models. Digitization in the field of public administration is a continuous process. It is necessary to understand that the software that will be used by the enterprise must be renewed and improved in accordance with new trends in the market of technological developments.

It should be noted that digitalization in the field of architectural and construction control is of crucial importance in the era of digital technologies. The implementation of automated software in many subsystems of the architectural and construction control system is the first step towards the digitization of this subsystem of the construction industry and a complete digital transformation. Important steps in this direction are:

- choosing a digital management strategy;
- implementation of digital management of individual processes;
- implementation of digital management of all processes;
- creation of a digital platform.

Therefore, in modern conditions, the process of digitalization of the field of architectural and construction control can be considered an effective direction of development of the construction industry only under the condition of the additional spread of digital development to other areas of this industry, as well as the possibility of real use of its results. This means that the final results of the digitalization of the provision of public services in the field of architectural and construction control should be simultaneously available to end users who have the skills to work with the latest digital technologies. Increasing the level of digitization in this area also means the opening of new opportunities for enterprises and citizens, since stored digital information can be used not only in the field of architectural and construction control, but also in other areas of public life. In addition, digitalization will improve the quality of service provision in the construction industry and labor productivity, while reducing the level of costs of the economic entity.

The implementation of these measures significantly accelerates the digitization of both the construction industry as a whole and the sphere of state architectural and construction control. This opens up significant prospects for increasing the sustainability of the domestic construction industry, and significantly increases the opportunities of our state to join the "Digital Europe" program. Preparation of the regulatory and legal environment for relevant changes will contribute to the attraction of investment resources from international donor countries to restore the construction industry of Ukraine.

Despite the fact that Ukraine is currently in a state of war, the digitalization process in the field of architectural and construction control will continue to develop thanks to the deepening of close cooperation between public authorities and IT companies. Yes, there are new digital reserves and methods that allow improving such cooperation. Therefore, digitalization in domestic conditions is an integral element of the administrative reform of the field of architectural and construction control, its separate stage, and at the same time an important lever for changes within the country, which confirms its importance.

Therefore, the problem of legalization of state institutions and management processes in the field of architectural and construction control leads to the need to transform these institutions, and also presents society and the state with new tasks, the solution of which is no longer possible with proven and well-known methods and tools. The success of digitalization in the field of architectural and construction control will depend on how quickly such a transformation will be carried out and on what scale it will reach.

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MANAGEMENT OF MODERN ENTERPRISE EFFICIENCY

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Modern trends in the development of the economy, caused by the action of industrial revolutions "3.0", "4.0" and "5.0", are directly related to the term efficiency [7-26].

The term "efficiency" refers to the maximum level of productivity achieved while utilizing the minimum amount of resources to achieve the highest volume of output. Efficiency requires reducing the amount of unnecessary resources used to produce a certain volume of output, including personal time and energy [1].

Management efficiency is the ability of professionals to utilize available resources, time, and money to achieve company goals. Effective team members focus on saving time and resources while delivering the best results. You can measure your effectiveness within a company by tracking how your contributions impact changes in the company's revenue and inventory turnover speed. Effective team members can help the company reduce costs and maximize profits by executing quality projects [2-3].

A business that employs general efficiency improvement measures and leverages efficiency-enhancing methods can reduce waste within its organization, often leading to increased profitability, a happier and more productive workforce, and more satisfied customers [4-6].

Key points:

- ✓ Enterprises can measure their efficiency by evaluating their finances, operations, energy usage, labor processes, etc.

- ✓ Simple changes can significantly alter the situation, including process automation and restructuring how employees perform their work.

- ✓ Improving efficiency is not a one-size-fits-all solution and should align with the specific needs of the company; proper tracking and analysis are crucial for maximizing long-term efficiency.

In the modern business environment, ensuring, supporting, and enhancing the efficiency of managing a modern enterprise becomes particularly important.

Here are a few tips for improving enterprise management efficiency:

1. Automate tasks wherever possible.
2. Encourage face-to-face communication among employees.
3. Limit interruptions.
4. Conduct daily 10-minute company meetings.
5. Embrace "single-tasking" to accomplish more.
6. Avoid impromptu meetings of the "Do you have a minute?" variety.
7. Stick to established processes.
8. Utilize task management software.
9. Foster a culture of open communication.
10. Know when to stop.

Therefore, efficiency management practices evolve with changes in the business environment and modern technologies, necessitating the integration of various enterprise efficiency management initiatives and the integration of initiatives for managing individual employee efficiency separately. Only the comprehensive and complementary application of alternative efficiency

improvement sources can have a positive long-term impact on enterprise productivity.

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IMPLEMENTATION OF EU SUSTAINABLE DEVELOPMENT GOALS IN THE ECONOMY OF UKRAINE

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In September 2015, within the framework of the 70th session of the UN General Assembly, the UN Summit on Sustainable Development was held in New York and the adoption of the Post-2015 Development Agenda, at which new development guidelines were approved. The final document of the Summit "Transforming our world: the agenda in the field of sustainable development until 2030" approved 17 Sustainable Development Goals and 169 tasks. Ukraine, like other UN member states, has joined the global process of ensuring sustainable development. In order to establish the strategic framework of the national development of Ukraine for the period until 2030, based on the principle of "leaving no one behind", an inclusive process of adaptation of the Central Development Strategy was launched (DU et al., 2021).

In order to ensure the national interests of Ukraine with regard to the sustainable development of the economy, civil society and the state in order to achieve an increase in the level and quality of life of the population, the observance of the constitutional rights and freedoms of man and citizen, the Decree of the President of Ukraine "On the Goals of the Sustainable Development of Ukraine for the Period Until 2030" was adopted (National Report SDG: Ukraine et al., 2021). The implementation of the Sustainable Development Goals (SDGs) is of great importance for Ukraine, as it allows achieving noticeable results in priority areas - people's health and well-being, peace and security, the future of children, economic development, social protection and justice, a stable state, community development and other.

The Sustainable Development Goals (SDGs), also known as the Global Goals, are a universal call to action to end poverty, protect the planet, and ensure peace and prosperity for all people around the world. The 17 Goals are a development of the success of the Millennium Development Goals; moreover, among other priorities, they also cover new areas such as climate change, economic inequality, innovation, sustainable consumption, peace and justice. The goals are interrelated - the key to success in one of them is solving issues that are generally related to the others. The 17 Sustainable Development Goals (SDGs), which include 169 targets, aim to address the causes of poverty and meet the universal need for development that exists for all people.

The goals cover three aspects of sustainable development: economic growth, social integration and environmental protection. The Global Goals cover many areas, with ambitions to tackle inequality, promote economic growth, create decent jobs, cities and towns, industrialisation, oceans, ecosystems, energy, climate change, sustainable consumption and production, peace and justice. They are universal and apply to all countries. A key feature of the SDGs is their clear focus on implementation pathways, namely the mobilization of financial resources, capacity building and use of technology, as well as giving a key role to information and institutions.

The Government of Ukraine has repeatedly presented the National Report "Sustainable Development Goals: Ukraine", which defines the basic indicators for achieving the Sustainable Development Goals (SDGs). The report presented the results of adaptation of 17 global SDGs taking into account the specifics of national development. In Ukraine, in the process of defining the Goals of sustainable development, relevant tasks and long-term indicators, global development guidelines, principles of sustainable development and public opinion regarding the vision of future development were taken into account. The goals of sustainable development in Ukraine constitute a new system of coordinated management measures in economic, social and ecological (nature protection) dimensions, aimed at the formation of social relations on the basis of trust, solidarity, equality of generations, and a safe environment.

Implementation of the SDGs should ensure the integration of efforts towards economic growth, striving for social justice and rational use of nature, which requires deep socio-economic transformations in Ukraine and new approaches to global partnership opportunities.

World experience shows that social progress largely depends on maintaining a balance between the goals of supporting economic growth, business competitiveness, ensuring environmental safety and reducing social inequality. In order to achieve long-term goals, it is necessary to consistently perform defined short- and medium-term tasks. The prerequisites for achieving all development goals without exception are quality management, eradication of corruption, and public support. Accordingly, proper management, honest and transparent government, public participation in decision-making and monitoring of their implementation should be taken into account when formulating strategic goals. We will determine by which SDGs Ukraine and regions are approaching the target indicator.

Ukraine has made the most progress in goal 11 "Sustainable development of cities and communities". Currently, progress towards this goal can be measured by 5 indicators at the national level. Out of 5 indicators, 3 reached the target benchmark. These are "the share of regions that have approved and are implementing regional strategies developed with the participation of the public",

"the number of monuments included in the State Register of Immovable Monuments of Ukraine", "the level of implementation of local automated systems of centralized notification of the population". The indicator of "number of objects of cultural and natural heritage included in UNESCO" remains unchanged for 5 years, and "areas of nature reserve fund of national importance" is only on the way to the goal. In second place in terms of progress is Goal 16 "Peace, justice and strong institutions". Currently, progress towards this goal can only be measured in three of the 24 indicators for which the government has set a benchmark. These are "financial support of regional programs to combat human trafficking", "number of criminal proceedings regarding confiscated weapons" and "level of citizens' trust in the court". The values of all these indicators in 2019 came close to the target benchmarks (although in 2020, the indicators of trust in the court deteriorated again). Administrators do not calculate or disseminate the necessary data to assess progress toward this goal across regions.

Note that the war on the territory of our country made adjustments not only in our lives, but also in the ways of achieving goals. Goal number 16 "Peace, justice and strong institutions" is under threat, but despite all the circumstances that have developed in our country, we are confidently taking steps towards its achievement. After the victory, Ukraine will appear before the world as a powerful, peaceful country. In third place in terms of progress is Goal 2 - "Overcoming hunger, development of agriculture".

Note that the achievement of the goals of sustainable development must be based on the criteria of reasonable specialization, because it allows taking into account local factors and distinguishing the strengths, competitive advantages and the level of the country's possible potential. Smart specialization strategies are integrated programs of economic transformation, developed taking into account local conditions. The ambitious goals of smart specialization are: Employment, Innovation, Education, Social integration and climate, Energy. All these aspects are supported by the development of national and regional research and innovation strategies for smart specialization (RIS3) which are aimed at: More targeted mobilization and support of structural funds. A strategic and comprehensive approach to promote smart growth and the spread of economic knowledge throughout Europe (Lajko OI, Kapitanets' SV and Chekhovych ZV et al., 2018).

The main steps for the development of national / regional RIS3: Analysis of the national / regional context and potential for innovation Establishment of a reliable and inclusive governance structure Development of a common vision for the future of the country / region Selection of a limited number of national / regional development priorities Creation of an appropriate mix of policies Integration of monitoring and evaluation mechanisms. These steps will allow our country to achieve the goals of sustainable development as quickly as possible, and most importantly, better quality, and become a developed European country. Now

let's look at examples of smart specialization in developed countries: Bavaria is one of the largest economies in Europe and only 20 countries in the world have a higher GDP. Some major companies have located their headquarters in Bavaria including BMW, Siemens, Rohde & Schwarz, Audi, Munich Re, Allianz, Infineon, MAN, WackerChemie, Puma, Adidas, and Ruf.

Compared to EU member states, Bavaria ranks 7th-8th in terms of absolute economic power. The specific weight of the export of industrial products is very high - about 50%, the level of self-employment - 12%, according to the number of patent applications per 100,000 inhabitants, Bavaria is the second in Germany. Bavaria is one of the most knowledge-intensive places in the world, with a wide range of university and non-university research institutes and a highly developed technology transfer infrastructure. So, summing up, we note that the transition to the principles of sustainable development requires deep structural changes in management and new methods of work in various areas of economic, social and political life. The implementation of the principles of sustainable development requires the formation of a strategic vision of development directions based on a new philosophy of thinking and new aspects of political activity. The sustainable development management system should be based on the model of public governance, which involves the constructive interaction of state, public and private structures. And the experience of developed countries will help our state to achieve the goals of sustainable development as soon as possible, taking into account the criteria of reasonable specialization.

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TRENDS IN INVESTMENT PROVISION OF ENVIRONMENTALLY RESPONSIBLE BUSINESS IN UKRAINE

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In the context of the systemic crisis, the implementation of adaptive measures and mechanisms of interaction between business, the state and society significantly enhance the role of environmentally responsible business (*hereinafter referred to as ERB*) in these processes. Implementation of the European Green Deal and ensuring sustainable development of Ukraine in the context of security risks necessitate a paradigm shift at all levels. Modern management principles are based on the dominance of the ERB to stakeholders to ensure sustainable economic development.

Adequate investment provision is a prerequisite for the development of ERB in the country. The analysis of environmental investment trends in the pre-war period and the determination of its expected trends in the wartime and post-war periods forms the analytical basis for the state policy of stimulating the development of ERB in Ukraine, and therefore is an important element of the management process.

According to statistics, in 2020, the volume of capital investments in environmental protection in Ukraine reached UAH 13,24 billion, which amounted to only 3,15 % of total capital investment in the economy and 0,31 % of GDP. The total expenditures on environmental protection in 2020 amounted to UAH 41,33 billion, an increase of 68,1 % compared to 2015 (Table 1).

In the reporting year, budget expenditures for the protection of natural environment (*hereinafter referred to as NE*) reached UAH 9,06 billion, having increased by 63,8 % compared to the base period, while their share in the total amount of budget expenditures decreased for 2015-2020 from 0,8 to 0,6%, respectively (see Table 1). In 2020, the share of budget expenditures in total costs for the protection of NE amounted to 21,9%, decreasing compared to 2015 by 0,6%. It should be noted that in 2020, for the first time during the researched period, budget expenditures for the protection of the natural environment decreased by 7 % compared to 2020.

In Ukraine, the main investors in environmental protection measures are ERB entities, which provide 91 % of costs for the protection of natural resources. The share of budget funds is 8 %, other sources of financing – 0,9 %. Such a structure indicates a weakening of the degree of state participation in the processes of ecologically responsible production, as an investor and as a regulator.

Table 1

**Dynamic-structural changes in total costs for the protection of NE in Ukraine
and budget expenditures***

Indicators	Years				2020 in % to 2015
	2015	2018	2019	2020	
1. Total expenditures on NE protection, UAH million	24591,1	34392	43735,9	41332,2	168,1
<i>in % to GDP</i>	<i>1,24</i>	<i>0,97</i>	<i>1,10</i>	<i>0,98</i>	<i>X</i>
1.1. Capital investments	7675,6	10074	16255,7	13239,6	172,5
<i>in % to total costs</i>	<i>31,2</i>	<i>29,3</i>	<i>37,2</i>	<i>32,0</i>	<i>X</i>
1.2. Current costs	16915,5	24318	27480,2	28092,6	166,1
<i>in % to total costs</i>	<i>68,8</i>	<i>70,7</i>	<i>62,8</i>	<i>68,0</i>	<i>X</i>
2. Budget expenditures for the protection of the NE, UAH million	5529,7	8242,1	9731,1	9056,6	163,8
3. Share of budget expenditures on NE protection in total budget expenditures, %	0,8	0,7	0,7	0,6	X
4. Share of budget expenditures for the protection of NE in the total expenditures on NE, %	22,49	23,96	22,25	21,91	X

*Calculated according to the data of the State Statistics Service of Ukraine (Official website, 2023).

The structure of capital investments for the protection of natural resources in Ukraine by types of nature protection measures is unstable, it changes every year, reflecting certain priorities of the ERB. In 2020, according to the structure, the largest share of capital investments was directed mainly to the protection of atmospheric air (42,2%), waste management (21,9%), protection and rehabilitation of soil, underground and surface water (19,3%).

Investment support for NE protection has certain sectoral features. In Ukraine, the largest share of environmental investments falls on the processing industry – 29,4% in 2020 (of which 18,8 % is metallurgical production), extractive industry and quarry development – 27,32 % (of which 26,13 % accounts for the extraction of metal ores) and the water supply sector – 24,09 %. The specific weight of the electricity supply sector decreased from 21,6 % in 2019 to 5,7 % in 2020. The shares of other sectors of the national economy are insignificant and reach 0,9 % for agriculture, 1,9% for transport, 0,2% for trade, 2,81% for public administration and defense.

In 2015-2020, there were structural changes in the sectoral structure of total costs for the protection of the natural environment. The most significant of them was the decrease in the share of the electricity supply sector (by 16,3%). Instead, the shares of the extractive and processing industry (by 6,08 and 4,37%, respectively), the water supply sector (by 4,5%), including areas of waste collection, processing and disposal (by 4,53%). In 2020, the share of wholesale and retail trade decreased (by 4,74 %), a slight decrease was also characteristic of agriculture (by 0,48 %).

The periodization and content of trends in investment provision of ERB in Ukraine are shown in Table 2.

Table 2

Periodization of trends in investment provision of ERB*

<i>Pre-war period</i>	<i>War period**</i>	<i>Post-war period**</i>
<ol style="list-style-type: none"> 1. Reduction in 2015-2020 of the share of capital and aggregate investments for the protection of NE in GDP (to 0,31% and 0,98%, respectively) 2. Reduction of the share of budget expenditures for the protection of NE in their total volume (from 0,7 to 0,6%) 3. Changes in the structure of costs for the protection of NE by sources of financing in the direction of increasing the share of own funds of enterprises (from 68% to 91%). 4. Reduction of the share of eco-investments in capital investments of economic sectors 5. Growth in the structure of capital investments for NE protection in the share of atmospheric air protection costs (up to 42,2%) and reduction of radiation safety costs (up to 1,1%) 6. Reduction of the share of the electricity supply sector from 22,1% to 5,7% in the sectoral structure of total costs for the protection of NE. 7. Low level of state participation as an investor and regulator of nature management processes 	<ol style="list-style-type: none"> 1. Strengthening of the trends of the pre-war period in the direction of reducing the volume of environmental investment 2. Reduction of the share of state funding in the structure of expenses for the protection of the NE 3. Further changes in the type and sectoral structure of investments for the protection of NE in accordance with the priorities of state policy in the wartime period 	<ol style="list-style-type: none"> 1. Moderate growth of environmental investment volumes as economic sectors recover 2. An increase in the share of other sources of funding (in particular, assistance from international funds) in the structure of costs for the protection of NE 3. Structural changes in the composition of capital and current investments in the direction of increasing the share of costs in the field of waste management 4. Strengthening the role of the state as an investor and regulator of nature management processes. 5. Activation of the «green» transformation of the economy in accordance with the directions of the ERB

* Author's development;

**Expected (possible) trends.

An important indicator for evaluating the investment support of ERB is the share of capital investments for the protection of NE in the total capital investments of economic sectors. The performed calculations indicate a tendency to decrease the share of environmental capital investments in the aggregate capital investments of some sectors of the national economy for the period 2015-2020. Thus, in industry, the specific weight of environmental capital investments decreased from 8,2% to 7,6%, in the electricity supply sector – from 21,1% to 3,1%, water supply – from 38,1% to 33%. At the same time, the specific weight of eco-investments has doubled in the processing and mining industry (from 3,9 to 8,1% and from 3,2 to 8,4 %), which is evidence of the priority of financing environmental protection measures and the significant role of ERB in the sustainable development of these sectors economy.

During the war period, it is expected that the trends of the pre-war period in the direction of reducing the volume of environmental investments will increase, therefore, there will be a downward trend in the specific weight of capital and aggregate investments for the protection of natural resources in GDP, the share of state funding in the structure of costs for the protection of the natural environment (Burkynskiy, B., Nikishyna, O., 2022).

In the post-war period, as economic sectors recover, we can expect a moderate increase in the volume of environmental investment, as well as structural changes in the composition of capital and current investments in accordance with the strategic priorities of post-war development, in particular, in the direction of an increase in the share of costs in the field of waste management (taking into account the priority of its development, declared by program documents).

Most likely, the structure of sources of funding for the protection of the NE will change in the direction of increasing the share of other sources of funding, in particular, international aid. Provided that the mobilization model of development with planning of sustainable and spatial development is implemented in the post-war period, the coordinating role of the state as a regulator and investor in the processes of rational nature management will increase. We should also expect the activation of the «green» transformation of the economy, the implementation of the provisions of the European Green Course into domestic practice, the implementation of norms and standards of circular production in accordance with the strategic priorities of the post-war development of Ukraine.

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THE AGGRAVATION OF GEOPOLITICAL RISKS IN UKRAINE AS A RESULT OF RUSSIAN AGGRESSION AND THEIR IMPACT ON GLOBAL COMPETITION

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In 2022, the world was filled with optimism as the previous year had shown a rapid recovery of leading countries and the global economy despite new waves of the pandemic. However, all the positive expectations and trends were shattered by the Russian invasion on February 24, 2022. The full-scale invasion of Ukraine by the Russian Federation intensified a range of geopolitical risks and their impact on global competition.

Article objective: To analyze the new geopolitical risks arising from the Russian invasion of Ukraine and assess their impact on global competition.

– The full-scale invasion of Ukraine by Russia in February 2022 has indeed altered the geopolitical landscape and has a significant impact on global competition. The key risks and their consequences include:

– Geopolitical instability: The Russian invasion in Ukraine has created significant geopolitical instability in the region and sparked serious disputes and tensions between Russia, Ukraine, and other countries. This can have long-term consequences for international relations, investments, and economic cooperation.

– Energy security: Ukraine serves as a transit country for transporting Russian natural gas to Europe. Russia's invasion has led to gas supply restrictions and increased gas prices for importing countries. This has created instability in the energy market and impacts global competition in the energy sector.

– Trade barriers: The conflict has resulted in the imposition of trade restrictions and sanctions against Russia, leading to a decline in international trade and creating uncertainty for businesses. Restricted market access and changes in trade agreements can affect the global competitiveness of countries and companies.

– Financial instability: Russian aggression has caused financial instability in the region. Significant declines in currency markets, rising costs of debt instruments, and credit rating downgrades for some countries highlight the vulnerability of the financial system. This can have an impact on global financial markets and disrupt the investment climate.

– Geopolitical power redistribution: The Russian invasion in Ukraine has disrupted the balance of power and influence in the region and may impact the global geopolitical order. This can lead to changes in alliances, increased tensions between states, and a reassessment of relationship strategies.

– *Refugee crisis*: The Russian invasion in Ukraine has led to a significant increase in the number of refugees and internally displaced persons. As of May 16, 2023, there are 5,124,000 registered refugees from Ukraine under temporary protection or similar national protection schemes in Europe, with the total number of refugees across Europe reaching approximately 8,240,000 [1]. This creates a humanitarian crisis and poses challenges for countries receiving refugees. It can also have an impact on global stability and socio-economic dynamics.

The geopolitical risks, along with others, following Russia's invasion of Ukraine, create significant uncertainty, security threats, and have a negative impact on global competitiveness.

Geopolitical risks, such as conflicts, sanctions, trade wars, and political instability, can have a direct impact on inflation. They can alter the cost of imported goods, lead to significant currency fluctuations, affect energy prices, and cause financial instability. In the EU, inflation in April 2023 stood at 8.1%, which was 1.9% lower than at the beginning of the year, with inflation reaching 10.0% in January. The highest inflation rate in the EU since February 2022 was 11.5% in October 2022 [2]. Thus, a decrease in inflation may indicate a slowdown in the rate of price increases in the EU. Increasing inflation due to geopolitical risks can have a negative impact on the economy, raise the cost of living, and affect consumer spending. Therefore, it is important to carefully analyze the geopolitical situation and develop appropriate strategies to mitigate risks and ensure stability in the economic environment.

Russian aggression on Ukrainian territory has led to an increase in geopolitical risks such as economic instability, threats to energy security, and financial instability. These risks have the potential to impact global competition and economic stability. Based on this, it is necessary to address these issues by taking measures to ensure financial and energy stability and by developing strategies to mitigate geopolitical risks in international relations.

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SPECIFIC HR PRACTICES FOR SUSTAINABLE EMPLOYABILITY

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Sustainable employability is the ability of workers to remain productive and employable throughout their working lives. As the workforce ages, companies need to maintain or increase the sustainable employability of their workforce. The HR practice of sustainable employability focuses on the long-term goal of contributing to sustainable careers for employees to thrive within and outside the company.

Most companies implement a range of HR practices to improve employee health, motivation, skills and knowledge. The effectiveness of these practices depends on the number of HR practices implemented, their use by employees, and their involvement in the design. Implementation of HR practices is also associated with higher satisfaction with current employee employability and increased organizational productivity (Ybema et al., 2017).

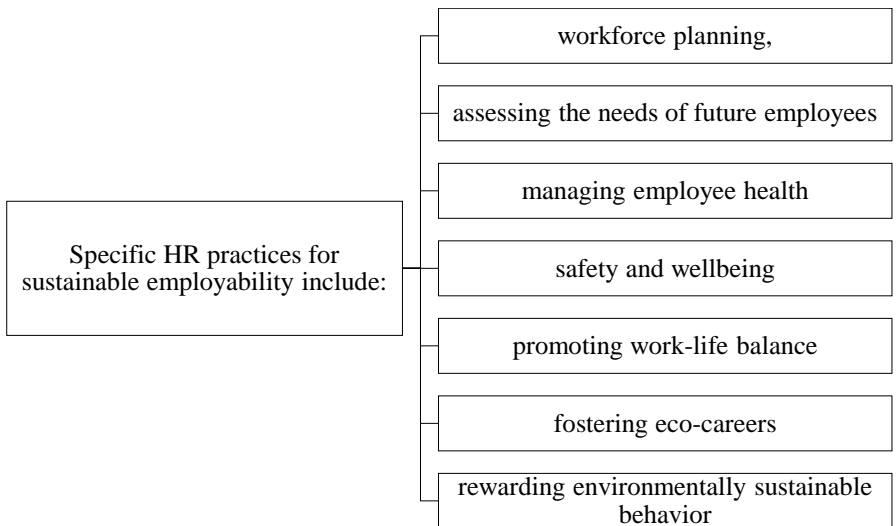


Figure 1. Specific HR practices for sustainable employability

Source: compiled by the authors on Ybema et al. (2017)

Organizations are encouraged to develop evidence-based HR practices that support the sustainable employability of their workforce. Implementation of HR practices is also associated with higher satisfaction with current employee employability and increased organizational productivity. HR practices for sustainable employability focus on the long-term goal of contributing to sustainable careers for employees. These practices can include power saving, using power-saving appliances or alternative energy sources, saving paper, applying the 3R's rule, checking for leaking water sources, promoting teleconferencing, and mandating employees to meet a specific green score (Ybema et al., 2017). HR can help create a sustainable company culture by being a proactive culture consultant, defining and communicating, including employees in the process, incorporating sustainability into the brand, enabling strategic alignment, following the company strategy, focusing on how the culture feels, and identifying areas of focus.

In addition, managing employee health is an important aspect of human resource management. Companies can reduce worker burnout and turnover by redesigning work in ways that promote employee well-being and health. There are several strategies that companies can adopt to improve their employees' health and well-being. For instance, giving workers more control over how they do their work can improve their mental health and reduce the risk of heart disease (Kelly et al., 2021). Allowing employees more flexibility about when and where they work is another approach.

There are several benefits to managing employee health. Healthy employees can reduce company tangible and intangible costs in several ways. For instance, healthier employees are more focused and aware, which can reduce accidents. Better fitness can decrease stress and boost immunity in most employees, lessening the chances of stress and communicable illnesses at the workplace. Healthier employees also get sick less often, which can save companies money lost to sick pay and lessened productivity.

Additionally, strategically altering working conditions to promote employee well-being can improve employee health and lead to positive business outcomes, such as improved job performance (including higher productivity) and reduced risk of employee burnout (Kelly et al., 2021). Promoting employee well-being benefits both individuals and companies. Promoting well-being can help prevent stress and create a positive work environment where individuals and organizations can thrive. Health and wellbeing can be a key driver of employee engagement and organizational performance.

Green HR practices are HR policies that help protect and preserve natural resources. Ways to implement green HR practices include optimizing room temperature to save electricity, using latest low-power appliances or alternative energy sources, saving paper by using note-taking devices, applying the 3Rs rule (Recycle, Reuse, Reduce) and checking every leaking water source to save water,

encourage conference calls and require employees to meet certain environmental values (Anthonypillai et al., 2015).

There are many companies that have successfully implemented green HR practices. Green HR practices help employers and manufacturers build their brand image and make an impact in society (Atreya, 2020). In addition, it raises awareness among employees and members of society about the use of natural resources and promotes more economical and environmentally friendly products. There are several benefits to implementing Green HR practices. These practices can help companies save costs by reducing energy consumption and waste. They can also help companies build a positive brand image and create influence in society by demonstrating their commitment to sustainability. Green HR practices can also make employees and society members more aware of natural resource usage and encourage the use of more economical and eco-friendly products.

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ANTI-CRISIS MANAGEMENT TO ENSURE SUSTAINABLE DEVELOPMENT OF THE ENTERPRISE

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Today the problem of anti-crisis business management is important and relevant. A crisis can arise in any enterprise, and for many owners, it can be an

unexpected obstacle because of the unpredictability of global events enterprises are trying to determine potential crises to their onset.

The purpose of this work is the study anti-crisis management and its functions to ensure the sustainable development of the enterprise.

A crisis in the enterprise is an event or series of events that caused severe disruption to the business. The crisis disrupts the stable work of the organization. In recent years, the economy of Ukraine has indicated fluctuations in the number of enterprises on the market (Figure 1).

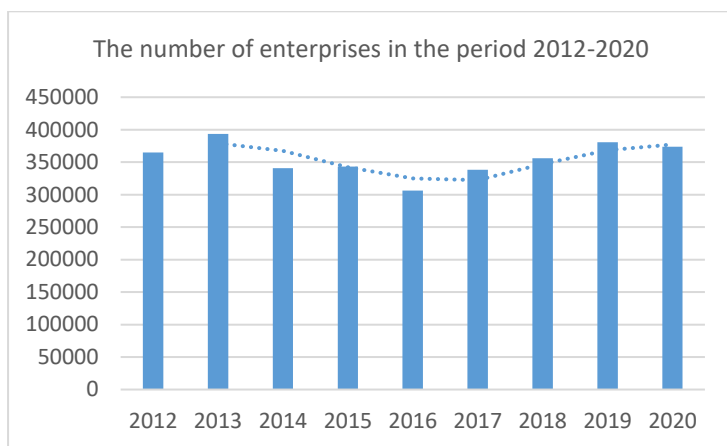


Figure 1 – The number of enterprises in the period 2012-2020 [21]

Anti-crisis management makes necessary conditions for stabilization, further development and activation of enterprise activity on the domestic market and overseas markets. The main goal of anti-crisis management is to get the company out of a crisis state. Enterprises should have a crisis management system management because – it helps not only to overcome the crisis but also to predict its emergence. During the development of the anti-crisis management mechanism, priority is first given to such issues as motivation, focused on saving resources, detailed analysis of the situation; corporatism; implementation of innovations; implementation according to the values of professionalism. Crisis management involves determining the best response when an incident occurs. Thus, risk management is essential to crisis management, but crisis management encompasses incident response, whereas risk management usually does not. The anti-crisis management plan consists of the following stages:

1) Identifying the crisis. Impact factors, causes, and risks must be assessed, and moreover the risks have to be ranged from the most severe to the modest ones.

2) Development of a plan to overcome the crisis. Optimizing the number of employees, ensuring information and documentation flow. The development of a plan procedure is have to be detailed enough to guaranty its next implementation and has to include the most important pillars and indicators of achievements.

3) Implementation of the developed plan. Support of innovations, adjustment of work, and continuous control. This stage of plan implementation is have to combine approaches including the creative fulfillment of planned activities related with following the expected indicators of achievements.

4) Elimination of the main crisis. This stage is related to the mitigation or deleting/ clearing/ firing the main crisis forming factors.

5) Eliminating the consequences of the crisis. On that stage all negative consequences are to be cleared up in order to force business to operate in a normal mode [22]

6) Exit to the normal, stable functioning of the enterprise. This is the last stage to guaranty that the vulnerability level is reduced to acceptable rates and the sustainability level is high enough to guaranty the long run operational activity of a firm.

Therefore, anti-crisis management is necessary to ensure the sustainable development of the enterprise [1-20]. Anti-crisis management helps not only to overcome a crisis but also to predict its occurrence. During a crisis, the company must mobilize all efforts to overcome it and ensure the fastest possible further development.

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THE DEVELOPMENT OF THE BIOECONOMY IN UKRAINE AS AN ELEMENT OF ENSURING THE SUSTAINABILITY OF DEVELOPMENT

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In the 21st century humanity is directly confronted with a number of global environmental problems related to ecological degradation, inefficient use of energy, climate change, depletion of natural resources and others. According to the natural problems that arise as a result of the negligent attitude of human to the environment, the research of the current state of the natural environment and the development of technologies based on renewable resources become relevant. In this way, bioeconomy should ensure efficient use of natural resources and minimize the negative impact on the environment and harmonize human and nature.

Many domestic and foreign scientists were engaged in the study of development bioeconomy. Among them: Baidal, V. Butenko, V. Klymenko, O. Litvak, I. Martusenko, M. Geogkehan, G. Makedon, F. Fischler, M. Maciejczak, K. Hofreiter, and others. However, due to the lack of a bioeconomic strategy in Ukraine and the slow development of biotechnology, further research in this area becomes necessary.

The bioeconomy is a sustainable economic system based on the production of goods and services from biological resources that are continuously replenished. This economy uses biological natural resources obtained from the depths of the earth or ocean, waste from the production of food and animal feed for energy production and industrial creation of products. Agriculture, fishery, forestry, food, and biotechnology are the diverse industries that make up the bioeconomy.

In 2021, a study was conducted in Ukraine "The field of biotechnologies in the world and in Ukraine", which was conducted by the Center for Economic Strategy. According to the analyzed data, Ukraine ranks 46th, out of 156 studied countries, in terms of the number of biochemistry publications, ahead of

neighboring countries, but loses to all the countries of the European Union in terms of the share of funding, having reduced research and development costs by almost two times (from 0,75% to 0,43% of GDP) over the last ten years (The field, 2021).

According to Yevhen Groza, head of the UNDP/GEF project “Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine”, biomass has become one of the most promising renewable energy sources. In Ukraine, there is a limited use of this resource, but despite this, in 2017, biofuels and waste accounted for 80% of the total structure of energy production from renewable sources. The rate of development of bioenergy grows every year: production of biofuel and waste by 43% and the total supply of primary energy from biofuel and waste by 33%.

Ukraine's energy sector, on the contrary, depends on the import of natural resources such as natural gas, coal (50% of consumption) and oil (83% of consumption). In 2017, the cost of imported energy resources amounted to 11 billion US dollars. This indicates a high level of risk for the energy security of Ukraine and the need to apply measures regarding the extraction of energy resources in Ukraine and the development of its own bases of renewable energy sources.

Table 1. Bioenergy growth in Ukraine.

Indicator		Year			
		2015	2016	2017	2018
Production of biofuels and waste, ktoe		2606	3348	3618	3726
Absolute increase	base	-	+742	+1012	+1120
	chain	-	+742	+270	+108
Growth rate, %	base	-	+28,5	+38,8	+43
	chain	-	+28,5	+8	+3

Calculated by the author (Bioenergy, 2020)

According to a research by the Bioenergy Association of Ukraine, the share of biofuel in the total volume of primary energy supply amounted to 3.2 million tons in 2018, which is 3.4% of OPPE (Bioenergy, 2020). According to the data in table 1, it can be concluded that the production of biofuel and waste increased between 2015 and 2018. The largest chain absolute increase was observed in 2016 and amounted to 742 ktoe. Production rates began to decline significantly in 2017 and 2018, which indicates a gradual decline in the development of the bioeconomy in Ukraine.

To date, the bioeconomic strategy in Ukraine has not been formed yet, and the application of biotechnology is sporadic. The main industries where biotechnologies are used include pharmaceuticals, food industry, bioenergy and agriculture.

Despite the rather slow development of the bioeconomy, Ukraine has significant potential for the development of the biological sphere. Ukraine has large areas of fertile land, a favorable climate for livestock and crop production, and the necessary human resources. Also, the high level of productivity of Ukrainian chernozem provides a stable resource base necessary for further use and processing of the material.

The biggest barriers to the development of biotechnology in Ukraine are bureaucracy, regulatory obstacles, and the slow functioning of the permit system.

The development of the bioeconomy, primarily the introduction of new technologies and their use by society, requires mandatory support from the state. State regulation should be implemented through financial and technical support. The mechanism of state regulation can be provided by the following stages:

1. determination of specific objects that require regulation and setting goals that must be implemented through the regulation process.

2. formation of optimal methods of influence on objects of regulation.

3. analysis of regulatory tools that determine the impact on the elements of the regulatory object and their interrelationships

4. determination of necessary resources for implementation of regulation (Butenko, 2018).

In order to further develop the bioeconomy in Ukraine, it is recommended to:

- create favorable conditions for the domestic economy based on biological methods;

- develop and implement the Bioeconomy Development Strategy in Ukraine;

- carry out training and retraining of human resources in the field of biotechnology and bioeconomics;

- create a system of measures to ensure rapid promotion of biotechnological products on the market;

- create a system of measures to stimulate enterprises to use the latest technologies based on the use of renewable resources;

- develop international cooperation regarding the exchange of knowledge and technologies in the field of bioeconomy.

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PROSPECTS OF FEED-IN TARIFF AND PROSUMERISM DEVELOPMENT IN UKRAINE'S HOUSEHOLDS

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Since 2009, renewable energy (RE) has been a priority direction for the electricity sector development in Ukraine in the context of achieving Sustainable Development Goals [6-25]. Since 2015, along with the business sector, domestic households have been approved to install facilities on renewable energy sources (RES) and generate green electricity, consuming it for their own needs or selling it to the state at the feed-in tariff, which at the time of introduction could exceed the current electricity price more than 5 times depending on the type of RES (sun or wind) [5]. A significant relief and incentive for households, compared to legal entities, was the opportunity to produce electricity from RES without obtaining a state license, provided that the installed capacity of household power plants did not exceed those determined by current legislation.

Having been the highest in Europe until recently, feed-in tariffs have ensured tremendous growth in RE installed capacity and electricity generation by the household sector in 2016-2021 [1; 2; 3]. Even the coronavirus pandemic in 2020-2021 did not significantly impede the increment in home RE capacities, which demonstrated the prevailing pace of development compared to the business sector during that period. However, due to the highest levels of the feed-in tariff for small solar power plants (SPPs) and the lack of state regulation of the types of RE technologies, solar power generation has become almost the only technology for use in the residential sector.

In addition to the financial benefits in the context of the feed-in tariff, the installation of solar modules is characterized by great flexibility, as they can be

differentiated by power and maximally adapted to the needs of a particular household. SPP is easy to maintain; it requires minimal operating costs compared to, for example, wind turbines. Solar modules can be compactly placed on the roofs and facades of buildings, without involving large land plots. In addition, solar modules can be added, increasing the capacity of the SPP over time. This is especially relevant due to the limited incomes of Ukrainians, most of whom cannot accumulate savings sufficient to invest in even small-capacity SPPs. Therefore, the possibility of expanding the capacity of such power plants over time is a good argument in favor of choosing this RE technology.

Due to both industrial and residential SPPs, the increase in the share of solar electricity generation in the electricity mix of Ukraine became noticeable in 2018-2021. However, it caused many technical, organizational, and economic problems in the electricity industry operating. In particular, the discreteness and unpredictability of solar power generation rose the need for balancing the national energy system, which was already experiencing a shortage of balancing energy capacities. The negative consequence was the emerging “green-coal” paradox during the COVID-19 pandemic. Green electricity generation growth multiplicatively increased the amounts of payments connected to the feed-in tariff. As the latter was compensated from the state budget, it caused the accumulation of debts of the state enterprise "Guaranteed Buyer" to the SPPs owners in 2020-2022 and discouraged investors from further development of the industry. In addition, since the southern and eastern regions of Ukraine have the most favorable conditions for solar power generation, most of the new SPPs were built there. Thus, the western and central regions could experience a deficit in electricity, while the eastern and southern regions had a surplus at certain hours of the day against the background of worsening energy imbalances.

Russia's full-scale invasion of Ukraine on February 24, 2022, wreaked havoc on the household solar energy sector. Since primarily the eastern and southern regions of the country were under long-term occupation or in the zone of active hostilities, a large part of small SPPs was destroyed or seriously damaged. Today, due to the unavailability of statistical data on the industry's real losses, it is impossible to estimate the amount of the lost capacities of residential and industrial SPPs in Ukraine. However, experts say about the destruction of 40% of SPPs in these regions [1]. So, once again, Ukraine steps on the same rake as in 2014, when due to the lack of state regulation of the spatial placement of industrial SPPs, 35% of them were lost due to the occupation of Crimea. Then, in 2015-2017, this loss was fully compensated by the construction of new RE facilities, including the household SPPs. Considering the rapid growth of the industry in 2018-2021 and the concentration of SPPs in the areas of current hostilities, the reconstruction of destroyed RE plants after the end of the war will require much more time and money.

In general, along with the tremendous impact of the war on losses in the solar energy industry, the defects of state regulation also significantly worsened the situation in the sector and must be corrected in the process of post-war reconstruction. Today, taking into account the large-scale destruction of the energy infrastructure in the country, it is clear that Ukrainians will experience several waves of increasing prices for electricity and other energy carriers, which may lead to higher energy poverty among the population. This questions the expediency of further feed-in tariff use as the main lever of RE development. First, due to rising prices, the hryvnia devaluation, and the general destabilization of the economy caused by the war, the state will not be able to continue compensating the high rates of feed-in tariffs to all green power producers. Second, when feed-in tariff levels are being reduced and electricity prices are going to rise, it will be more profitable for households to consume the generated electricity for their own needs, rather than sell it at the feed-in tariff and lend this electricity to the state with unclear payment terms [4]. Therefore, the prospect of transformation of small green energy producers into prosumers becomes more real. This, in turn, will contribute to the decentralization of electricity supply processes, the increase of energy independence of individual consumers and regions of Ukraine as a whole, the formation of a competitive environment in the power industry and, ultimately, the reduction of electricity prices.

At the same time, the prosumerism transition requires developing storage technologies to correct the main shortcoming of SPPs, namely, the discreteness of electricity generation. Since the cost of these technologies is high in today's world market, from the point of view of government regulation, the feed-in tariff can be replaced by benefits for investments in storage technologies, tax holidays for companies that provide system storage services and other tools that can directly or indirectly encourage even small players in the energy market - households - to produce and consume green electricity on the prosumerism basis. In addition, the population of Ukraine, impoverished due to the war, cannot invest in green energy technologies on a pre-war scale, so state investment support for small prosumer projects is critically important. Given the problems with balancing the national energy system and the presence of an aggressive northern neighbor, the state must regulate the spatial distribution of RE facilities and their technology types, which will allow for achieving the goals of decarbonization and increasing the energy independence of the national economy.

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INDUSTRY 4.0 AND ITS INFLUENCE ON THE SUSTAINABLE DEVELOPMENT

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Industry 4.0 is revolutionizing the way companies manufacture, improve and distribute their products. Manufacturers are integrating new technologies, including Internet of Things (IoT), cloud computing and analytics, and AI and machine learning into their production facilities and throughout their operations.

This digital technologies lead to increased automation, predictive maintenance, self-optimization of process improvements and, above all, a new level of efficiencies and responsiveness to customers not previously possible.

Developing smart factories provides an incredible opportunity for the manufacturing industry to enter the fourth industrial revolution. Analyzing the large amounts of big data collected from sensors on the factory floor ensures real-time visibility of manufacturing assets and can provide tools for performing predictive maintenance in order to minimize equipment downtime.

Internet of Things (IoT)

The Internet of Things (IoT) is a key component of smart factories. Machines on the factory floor are equipped with sensors that feature an IP address that allows the machines to connect with other web-enabled devices. This mechanization and connectivity make it possible for large amounts of valuable data to be collected, analyzed and exchanged.

Cloud computing

Cloud computing is a cornerstone of any Industry 4.0 strategy. Full realization of smart manufacturing demands connectivity and integration of engineering, supply chain, production, sales and distribution, and service. Cloud helps make that possible. In addition, the typically large amount of data being stored and analyzed can be processed more efficiently and cost-effectively with cloud. Cloud computing can also reduce startup costs for small- and medium-sized manufacturers who can right-size their needs and scale as their business grows.

AI and machine learning

AI and machine learning allow manufacturing companies to take full advantage of the volume of information generated not just on the factory floor, but

across their business units, and even from partners and third-party sources. AI and machine learning can create insights providing visibility, predictability and automation of operations and business processes. For instance: Industrial machines are prone to breaking down during the production process. Using data collected from these assets can help businesses perform predictive maintenance based on machine learning algorithms, resulting in more uptime and higher efficiency.

Edge computing

The demands of real-time production operations mean that some data analysis must be done at the «edge»—that is, where the data is created. This minimizes latency time from when data is produced to when a response is required. For instance, the detection of a safety or quality issue may require near-real-time action with the equipment. The time needed to send data to the enterprise cloud and then back to the factory floor may be too lengthy and depends on the reliability of the network. Using edge computing also means that data stays near its source, reducing security risks.

Cybersecurity

Manufacturing companies have not always considered the importance of cybersecurity or cyber-physical systems. However, the same connectivity of operational equipment in the factory or field (OT) that enables more efficient manufacturing processes also exposes new entry paths for malicious attacks and malware. When undergoing a digital transformation to Industry 4.0, it is essential to consider a cybersecurity approach that encompasses IT and OT equipment.

Digital twin

The digital transformation offered by Industry 4.0 has allowed manufacturers to create digital twins that are virtual replicas of processes, production lines, factories and supply chains. A digital twin is created by pulling data from IoT sensors, devices, PLCs and other objects connected to the internet. Manufacturers can use digital twins to help increase productivity, improve workflows and design new products. By simulating a production process, for example, manufacturers can test changes to the process to find ways to minimize downtime or improve capacity.

Today, it is no longer possible to determine the state and directions of development of the capital market without taking into account the impact of digital transformations. The processes of internationalization and globalization in the world economy have created the basis for the formation of a stable network of interconnections and communication channels that provide access to financing through the active involvement of business angels, venture capital investors and funds, development programs initiated, among other things, by corporations. Such resources, due to technology, have become more accessible to all countries of the world. However, Industry 4.0 is characterized by risks associated with increased instability and the level of possible chaos. Changes in production processes are not

only technological innovations, but also political reforms. Continuing the «digital» revolution, the world system will feel the impact of a new stage at which technological innovations are changing the organic structure of the capital of transnational companies.

This trend can change the lifestyle of people, socially stratify society. The emergence of automated solutions for complex problems reduces the value of low- and medium-skilled labor of the population. This will affect the material condition of the middle class of countries. Without the possible investment of financial resources by transnational companies in the development of human capital in countries, there will be peculiar barriers to the entry of highly skilled labor into the world market. Reducing the cost of low-skilled human labor will lead to the loss of developing countries, the benefits of cheap labor and the ability to develop, and this will further stratify society.

The Fourth Industrial Revolution and global transformations are not taking place simultaneously around the world. As a rule, leading industries and countries appear that bear the greatest risks and costs for the initial development of a new technological cycle, and they also receive the maximum level of innovative super-profits. According to a study conducted by Ukrainian scientists, the leaders of Industry 4.0 today are the USA, Germany, Japan, France, China, South Korea, the Netherlands. The path of innovation is picked up, developing industries and countries where there is a "copying" of existing technologies, which is associated with less risk, but also brings less profit. Underdeveloped countries do not have the resources to master new technologies, use generations of technology of bygone technological cycles.

The processes of integration and testing of Industry 4.0's achievements into economic practice taking place in the modern world also concern Ukraine.

For further innovative development of the national economy, additional financial resources, technological transfer and testing of innovations used by structures of transnational type of entrepreneurship are needed. Factors of *positive* influence include: attractive geopolitical position; availability of skilled labor at a relatively low cost; the presence of a significant material and raw material base (powerful resource potential); Ukraine's participation in many international organizations, illustrating its desire to develop international business; the existing economic potential of the national consumer market. The factors of *negative* impact include the following: low level of solvency of the population; unfavorable business climate; a significant share of the shadow economic component, an unstable legislative and regulatory framework, especially in matters of protection of intellectual property rights (often a decisive factor influencing the decision of TNCs to work in Ukraine); frequent changes in the regulatory environment and political instability; general information backwardness of the country.

THE ESSENTIALITY OF INFORMATIONAL ECONOMY

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Informational economy is developing as a branch of economy in which information is the central resource and determining factor for the creation, processing, transfer, and use of products and services. Informational technologies have become a key factor in the development of informational economy, providing quick access to information, automation of processes, and increased production efficiency. In today's world, informational technologies across all spheres of economy, from business and finance to education and medicine, provide new opportunities for development and innovation.

Informational economy causes changes in the structure of production, increasing the emphasis on material resources on informational resources, in particular on knowledge, intellectual property, and informational services. The development of informational economy leads to the emergence of new types of business, such as e-commerce, Internet platforms, online services, etc., which change the ways of interaction between businesses and consumers. Increasing the availability of information and the speed of its exchange contributes to increasing the efficiency of enterprises and organizations, reducing costs, and increasing competitiveness. The development of informational economy requires constant updating and development of the informational infrastructure, including communication networks, computing resources, software, and informational protection.

Important aspects of informational economy are:

- the quality of information. Inaccurate or incorrect information can lead to negative consequences, such as errors in decision-making or loss of business;
- speed of informational transfer. Thanks to fast communication and access to information, quick and efficient operations can be detected, react to changes, and take advantage of the competitive market;
- availability of information. Ensuring access to information for all stakeholders, including consumers, business, and government, promoting transparency, innovation, and development;
- informational protection. Ensuring data security and privacy is essential to maintaining trust and interoperability in the digital environment;
- innovations in informational processing. Artificial intelligence, machine learning, data analytics, natural language processing, and other innovative technologies contribute to the automation of informational collection, processing, and analysis processes;

- personalized informational. Enables us to provide better service, facilitate more accurate decisions, and improve user interaction;
- saving time and resources. Automation of processes and use of artificial intelligence and robotics help increase productivity and work efficiency, reduce the number of human errors and redundant operations;
- impact on decision-making. Analytical tools and data-driven forecasting help identify trends, predict risks, and program development strategies;
- development of new informational services and products. The introduction of new technologies allows the creation of new digital platforms, online services, and tools that satisfy the needs of consumers in access to informational, entertainment, and cultural knowledge;
- stimulation of innovative potential. Creating a favorable environment for the development and support of innovation leads to the emergence of new ideas, products, and services in the cultural sphere.

Therefore, informational economy is an essential factor of modern society that affects all aspects of economic development. Development depends on technological innovations, availability of information, and effective use of informational resources. The transition to informational economy requires constant improvement of the infrastructure and the development of personnel with digital skills. Informational economy opens up new opportunities for innovation, the development of new products and services, productivity, and competitiveness.

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NEW WAYS OF GREENING THE ECONOMY

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The green economy presents significant growth opportunities for local governments. While all industries have been hit by the recession, investments in green technology, including federal and state funding, have fared better than conventional sectors. And between 1998 and 2007, green jobs grew at a faster rate than overall job growth.

Economies can only grow sustainably if they simultaneously manage the growing urgency of environmental degradation and climate change. Aside from the catastrophic impact on the lived environment — such as depletion of natural resources, frequent and intense drought and extreme weather events — failure to tackle these threats will heighten health and social inequalities, and push millions of people into extreme poverty. It will also undermine countries' resilience to future shocks.

A green economy represents the confluence of economic development, workforce development, and environmental stewardship. Green economic practices are unique in that they encourage city and county development and workforce departments to account for the environmental impacts of their decision-making, while environmental departments are encouraged to account for the way their policies affect economic growth and job creation. A green economy is mutually beneficial to both economic prosperity and environmentalism.

Ways of implementing greening of the economy include:

1. Reducing the use of resources. This can be achieved through the use of more efficient technologies and the transition to the use of renewable energy sources.

2. Improving the quality of products and services. This can be achieved by introducing new technologies and materials that reduce the negative impact on the environment.

3. Implementation of environmental standards and certification. This gives consumers the opportunity to choose greener products and encourages producers to use greener technologies.

4. Increasing investments in environmental projects. This can be achieved by increasing environmental taxes and stimulating investments in enterprises engaged in the development of environmental technology.

There are various programs and initiatives for greening the economy, both at the national and international levels. Here are a few examples:

1) Paris Agreement: The Paris Agreement is an international treaty signed by almost all countries in the world to combat climate change. It aims to limit global warming to well below 2°C above pre-industrial levels, and pursue efforts to limit the temperature increase to 1.5°C. The agreement also calls for countries to develop and communicate their climate action plans, known as Nationally Determined Contributions (NDCs).

2) Green New Deal: The Green New Deal is a proposed set of economic stimulus programs in the United States that aims to address climate change and economic inequality. It includes investments in renewable energy, energy efficiency, and green infrastructure, as well as job training programs and social safety nets for workers affected by the transition to a low-carbon economy.

3) Sustainable Development Goals (SDGs): The SDGs are a set of 17 goals adopted by the United Nations to achieve sustainable development and end poverty, hunger, and inequality by 2030. The goals include targets related to climate action, sustainable energy, sustainable cities and communities, responsible consumption and production, and life on land and below water.

4) Carbon pricing: Carbon pricing is a policy tool that puts a price on greenhouse gas emissions to incentivize businesses and consumers to reduce their carbon footprint. There are two main types of carbon pricing: carbon taxes and emissions trading schemes.

5) Renewable energy targets: Many countries and regions have set targets for the share of renewable energy in their energy mix, such as the European Union's target of achieving at least 32% of renewable energy by 2030.

6) Circular economy initiatives: A circular economy is an economic system that is regenerative by design and aims to keep products, components, and materials at their highest value and utility at all times. This includes initiatives such as reducing waste and increasing recycling, designing products for longevity and repairability, and promoting sharing and rental models.

These are just a few examples of the programs and initiatives for greening the economy. The effectiveness of these initiatives may vary depending on factors such as political will, funding, and public support.

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WAYS OF GREENING THE ECONOMY

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The green economy presents significant growth opportunities for local governments. While all industries have been hit by the recession, investments in green technology, including federal and state funding, have fared better than conventional sectors. And between 1998 and 2007, green jobs grew at a faster rate than overall job growth.

Economies can only grow sustainably if they simultaneously manage the growing urgency of environmental degradation and climate change. Aside from the catastrophic impact on the lived environment — such as depletion of natural resources, frequent and intense drought and extreme weather events — failure to tackle these threats will heighten health and social inequalities, and push millions of people into extreme poverty. It will also undermine countries' resilience to future shocks.

A green economy represents the confluence of economic development, workforce development, and environmental stewardship. Green economic practices are unique in that they encourage city and county development and workforce departments to account for the environmental impacts of their decision-making, while environmental departments are encouraged to account for the way their policies affect economic growth and job creation. A green economy is mutually beneficial to both economic prosperity and environmentalism.

Ways of implementing greening of the economy include:

1. Reducing the use of resources. This can be achieved through the use of more efficient technologies and the transition to the use of renewable energy sources.

2. Improving the quality of products and services. This can be achieved by introducing new technologies and materials that reduce the negative impact on the environment.

3. Implementation of environmental standards and certification. This gives consumers the opportunity to choose greener products and encourages producers to use greener technologies.

4. Increasing investments in environmental projects. This can be achieved by increasing environmental taxes and stimulating investments in enterprises engaged in the development of environmental technology.

There are various programs and initiatives for greening the economy, both at the national and international levels. Here are a few examples:

1) Paris Agreement: The Paris Agreement is an international treaty signed by almost all countries in the world to combat climate change. It aims to limit global warming to well below 2°C above pre-industrial levels, and pursue efforts to limit the temperature increase to 1.5°C. The agreement also calls for countries to develop and communicate their climate action plans, known as Nationally Determined Contributions (NDCs).

2) Green New Deal: The Green New Deal is a proposed set of economic stimulus programs in the United States that aims to address climate change and economic inequality. It includes investments in renewable energy, energy efficiency, and green infrastructure, as well as job training programs and social safety nets for workers affected by the transition to a low-carbon economy.

3) Sustainable Development Goals (SDGs): The SDGs are a set of 17 goals adopted by the United Nations to achieve sustainable development and end poverty, hunger, and inequality by 2030. The goals include targets related to climate action, sustainable energy, sustainable cities and communities, responsible consumption and production, and life on land and below water.

4) Carbon pricing: Carbon pricing is a policy tool that puts a price on greenhouse gas emissions to incentivize businesses and consumers to reduce their carbon footprint. There are two main types of carbon pricing: carbon taxes and emissions trading schemes.

5) Renewable energy targets: Many countries and regions have set targets for the share of renewable energy in their energy mix, such as the European Union's target of achieving at least 32% of renewable energy by 2030.

6) Circular economy initiatives: A circular economy is an economic system that is regenerative by design and aims to keep products, components, and materials at their highest value and utility at all times. This includes initiatives such as reducing waste and increasing recycling, designing products for longevity and repairability, and promoting sharing and rental models.

These are just a few examples of the programs and initiatives for greening the economy. The effectiveness of these initiatives may vary depending on factors such as political will, funding, and public support.

THE ROLE OF ARTIFICIAL INTELLIGENCE IN THE ECONOMIC SECTOR

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Artificial Intelligence (AI) is an innovative technology that operates with the purpose of self-organization, learning, and making intelligent decisions similar to those made by humans. It is a key factor in the Industrial Revolution 4.0, opening up possibilities for economic development in enterprises by implementing digitized processes in production and management [1] (Table 1).

Table 1 - The Impact of Artificial Intelligence on the Economic Sector

Aspects	Explanation
Improving the quality of decision-making	Artificial Intelligence provides significant analytical power for processing large volumes of data and uncovering complex dependencies. This enables economists to make more accurate forecasts, assess risks, and make well-informed decisions. The use of machine learning algorithms allows for quicker identification of trends, facilitating strategic planning and management processes [2].
Increase in productivity	Artificial Intelligence allows for the automation of routine and monotonous tasks, leading to increased labor productivity. Algorithms help optimize production processes, forecast demand for goods and services, and manage inventory and supply chains more efficiently [2].
Improving interaction with customers	Artificial Intelligence can support the personalization of customer interactions. AI is capable of analyzing large volumes of customer data, their previous experiences, and behaviors to offer individualized solutions and personalized recommendations. This helps businesses improve the process of meeting consumer needs.
Development new products and services	Artificial Intelligence opens up new opportunities for creating innovative products and services. It enables the development of autonomous systems, robots, virtual assistants, and other technological solutions that contribute to the improvement of economic processes.

Continuation of Table 1

<p>Development new products and services</p>	<p>Artificial Intelligence opens up new opportunities for creating innovative products and services. It enables the development of autonomous systems, robots, virtual assistants, and other technological solutions that contribute to the improvement of economic processes. Such products and services can have a significant impact on the market, creating new opportunities for businesses and consumers.</p>
<p>Increasing competitiveness</p>	<p>Artificial Intelligence helps businesses become more competitive in the market. It enables faster responsiveness to changing consumer demands and adaptation to new market conditions. Companies utilizing AI can offer innovative solutions and services, giving them an advantage over competitors [3].</p>
<p>Creation new jobs</p>	<p>The implementation of artificial intelligence contributes to the creation of new jobs in the technology sector. The growing popularity of AI requires professionals who can develop, implement, and maintain artificial intelligence systems. This opens up new opportunities for the development of information technology and the job market.</p>
<p>Support sustainable development</p>	<p>The use of artificial intelligence can contribute to sustainable economic development. AI helps reduce energy costs, resource consumption, and environmental impact. It can be utilized to optimize energy efficiency in manufacturing, route transportation to minimize CO₂ emissions and analyze environmental data for decision-making aimed at conserving natural resources. This enhances the environmental responsibility of businesses and promotes sustainable development in society as a whole [3].</p>

Artificial intelligence in economics also has its drawbacks. Among them, it is worth noting the high costs of development and implementation, lack of transparency in decision-making and complexity in explaining them, ethical concerns and security issues, as well as the potential negative impact on the job market, increased unemployment, and devaluation of certain types of work.

Artificial intelligence has become an essential component of the global economy, penetrating various industries and transforming the market into a more powerful structure. The United States is one of the leading countries in the

development and utilization of AI in the economy. They have significant potential in the field of artificial intelligence due to the presence of leading technology companies such as Google, Microsoft, IBM, Facebook, and Tesla, actively advancing innovative solutions. China has also made significant progress in the development and application of artificial intelligence. Chinese companies like Alibaba, Baidu, and Tencent are actively applying AI in various sectors, including e-commerce, finance, transportation, and healthcare. The Chinese government is actively supporting the development of AI, including the creation of a national strategy for "New Generation AI" [4]. In addition to the countries mentioned earlier, the United Kingdom has many companies engaged in the development and application of artificial intelligence. For example, BenevolentAI focuses on developing pharmaceuticals using AI, Oxbotica specializes in software development for autonomous vehicles, and Darktrace develops AI-based cybersecurity systems, actively utilizing artificial intelligence to tackle complex tasks [5]. Furthermore, France has a strong presence in the field of artificial intelligence. Companies like Criteo, a personalized advertising platform that leverages AI, Dataiku, a platform for developing and managing machine learning models, and Inria, the French National Institute for Research in Computer Science and Automation, are actively involved in the development and application of AI in various domains [5].

These examples of leading countries demonstrate the diversity of approaches to the use of artificial intelligence in the economy. Each of them has its own strengths and strategies that help them maintain a competitive advantage and stimulate innovative development. Comparing global practices of AI implementation with the practice in Ukraine, it can be noted that the development of AI is somewhat lagging behind. However, one of the factors limiting the rapid development of AI in Ukraine is the insufficient level of investment and research efforts in this field. While there are many large technology companies and startups worldwide actively investing in the development and application of AI, the sector in Ukraine still requires more attention and support. Additionally, there is an issue with the acceptance of new technologies and a delay in the implementation of innovative solutions. Some companies may be conservative and resistant to change, which slows down the adoption of AI. However, it is worth noting that Ukrainian AI professionals have great potential and high qualifications. Many Ukrainian specialists hold leading positions in global companies and are also working on their own startups and projects in the field of AI. Nevertheless, Ukraine is already achieving certain accomplishments in the application of artificial intelligence, and some large companies are successfully utilizing these technologies. Here are some of them:

1. PrivatBank – a Ukrainian bank that utilizes artificial intelligence to enhance its financial analytics and data processing. They implement machine

learning algorithms for fraud detection, risk transactions, and improved personalized customer service. As a result, their customers actively utilize the Privat24 application. [7]

2.Epicentr – one of the largest trading platforms in Ukraine, leverages artificial intelligence to improve its services. They employ machine learning algorithms for product recommendation personalization, demand forecasting, and inventory management, ensuring efficient trading and customer satisfaction. [8]

3.Kernel – a Ukrainian producer and exporter of sunflower oil, uses artificial intelligence to optimize its production processes. They apply data analytics and machine learning for crop yield prediction, quality control, and production line optimization, resulting in increased productivity and efficiency. [6]

Therefore, artificial intelligence plays a significant role in the economic sector [9-28]. It influences productivity improvement, process optimization, decision-making enhancement, and increased competitiveness of companies. The implementation of artificial intelligence allows businesses to unlock new opportunities, enhance the quality of products and services, and attract and retain customers. Ukraine is also actively utilizing artificial intelligence in the economic sphere, with large companies successfully integrating AI to improve their operational efficiency and gain a competitive edge. This demonstrates the powerful potential of artificial intelligence for economic development and achieving positive outcomes.

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INDUSTRIES 4.0, 5.0 AND SUSTAINABLE DEVELOPMENT: ENVIRONMENTAL RESPONSIBILITY

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The industrial revolution that has led to the emergence of Industry 4.0, as well as the potential future Industry 5.0 (which aims to effectively coexist, cooperate with humans and technology), will certainly bring many benefits and positive changes to humanity. However, in the race of technological innovation and the pursuit of continuous development, we may forget about ecology and the consequences of such activities for the environment. It is worth emphasizing that this may lead to an environmental catastrophe.

Industry 4.0 is characterized by automation of all production processes, digitalization of all spheres of our lives, and the use of technologies such as the Internet of Things (IoT), robotics, Artificial Intelligence (AI), data analytics, etc. While the advantages of using smart machines and robots are the actual continuity of the process and high accuracy (which reduces the need for human labor), the disadvantages are increased consumption of electricity and resources. This, in turn, will lead to changes in ecosystems, depletion of natural resources, loss of biodiversity, increased greenhouse gas emissions and air pollution, and may also lead to an increase in production waste and problems with its disposal, as many of them contain harmful substances. I think it's already clear that this will affect the quality of people's lives, or rather deteriorate it, and cause climate change. And this is only part of the problems that await us.

The introduction of Industry 5.0 in the future may further exacerbate the environmental issues of our planet, environmental problems will become even more widespread, and this is an inevitable environmental disaster.

To prevent negative consequences or at least reduce them as a result of the implementation of Industry 4.0 and Industry 5.0, it is time to pay special and much-needed attention to the environment, to develop an environmental policy that will balance the use of technology, the environmental management system and ensure the environmental safety of people.

The concept of sustainable development states that development should meet the needs of the present generation without compromising the future. One of the key components of this concept is environmental protection, which includes preservation of biodiversity, ecosystems and natural resources, energy efficiency and renewable energy sources, reduction of harmful emissions and ensuring environmental balance in general [1].

The main measures that will contribute to this include:

— developing a proper environmental policy. Establishing environmental standards that all businesses, organizations, and firms must adhere to, monitoring compliance with the established standards, and imposing severe penalties in case of violation;

— forming and raising people's environmental awareness. Educating citizens who are environmentally responsible by developing and implementing educational programs in educational institutions and conducting information campaigns. This means spreading knowledge about environmental issues and ways to prevent the environmental crisis and reduce the negative impact of technology. This also includes stimulating and supporting "green" initiatives;

— introduction of "green" production. This means the use of energy-efficient equipment and technologies, recyclable materials and safe waste disposal, and the development of renewable energy sources;

— conducting research and stimulating innovation. Development of environmentally friendly technologies and solutions aimed at reducing the negative impact on the environment.

In 2015, the UN Sustainable Development Summit approved the Sustainable Development Goals [2]. Those related to the environment and ecology are as follows:

1. Clean water and proper sanitation.
2. Affordable and clean energy.
3. Sustainable development of cities and communities.
4. Appropriate consumption and production.
5. Mitigating the effects of climate change.
6. Conservation of marine resources.
7. Protection and restoration of terrestrial ecosystems.

The vision of Ukraine's SDG achievement benchmarks, taking into account the specifics of national development, is set out in the National Report «Цілі Сталого Розвитку: Україна» [3].

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MODERN TRENDS IN THE DEVELOPMENT OF AUTOMOTIVE CONGLOMERATIVES

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Industrial revolutions have had a significant impact on the development of automotive companies [1-20]. Since the beginning of the 20th century, when the first car was invented, automotive companies have become one of the most important players in the global market.

The first cars were handmade and expensive, making them accessible only to wealthy customers. However, with the onset of the industrial revolution, automotive companies were able to introduce new technologies and increase production efficiency. Car production became more automated and mass-produced, which reduced production costs and allowed automakers to lower the price of their products.

In addition, the development of industrial revolutions allowed automotive companies to respond quickly to changes in market conditions and adapt to consumer needs. Car manufacturers began to focus on increasing the efficiency of engines, improving the quality of materials and providing a more comfortable ride for passengers.

In the 21st century, automotive companies continue to introduce new technologies and innovations, such as electric and hybrid engines, automatic control systems and internet connectivity. Industry 3.0, Industry 4.0 continue to influence the development of the automotive industry and allow automotive companies to remain competitive in the global market.

One of the current trends in the development of automotive concerns is the transition to electric and hybrid cars. According to the International Energy Agency (IEA), sales of electric vehicles in the world are growing every year. In 2016, more than 750,000 electric vehicles were sold, and in 2020, more than 3 million. It is predicted that by 2030, sales of electric vehicles could reach 70 million units annually.

Another trend is the development of autonomous technologies. Companies such as Tesla, Google, Apple, and Uber are investing in the development and production of autonomous vehicles. According to Allied Market Research, the autonomous car market grew from \$54 billion in 2019 to \$556 billion in 2026, indicating the rapid development of this sector.

In addition, carsharing and carpooling, the collective use of cars through special applications, are becoming increasingly popular around the world. According to Frost & Sullivan, the global car-sharing market could grow from \$1.5 billion in 2017 to \$2.2 billion in 2025.

Finally, modern automotive companies are actively exploring the possibilities of using blockchain technologies in their business. For example, in 2020, the MOBI (Mobility Open Blockchain Initiative) blockchain platform was launched, which included such companies as BMW, Ford, GM, Renault, and others. The aim of this initiative is to create a single standard for blockchain technologies.

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ASSESSMENT OF THE ENVIRONMENTAL STATE OF UKRAINIAN SOILS: IMPACT OF RUSSIA'S WAR AGAINST UKRAINE ON THE QUALITY OF THE SOIL ENVIRONMENT AND WAYS OF ITS RESTORATION

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Ukraine is a country with extraordinary opportunities. The soil's uniqueness allows the agricultural sector to develop and make it competitive. The country has a huge potential to become a world leader in the agricultural industry and to be number one in the sales of some goods.

For several decades now, the Ukrainian agro-industrial complex has held a leading position among the world's exporters. Thus, in 2021, 40% of the country's total exports were agricultural products. Which, in turn, occupies 15% of the structure of Ukraine's GDP [1].

The soil cover of Ukraine is predominantly chernozem in nature - among the agricultural lands, the share of chernozems and similar chernozem-like soils is 71%. The share of Ukrainian chernozems among European ones is 30%, and 9% of world ones (Figure 1).

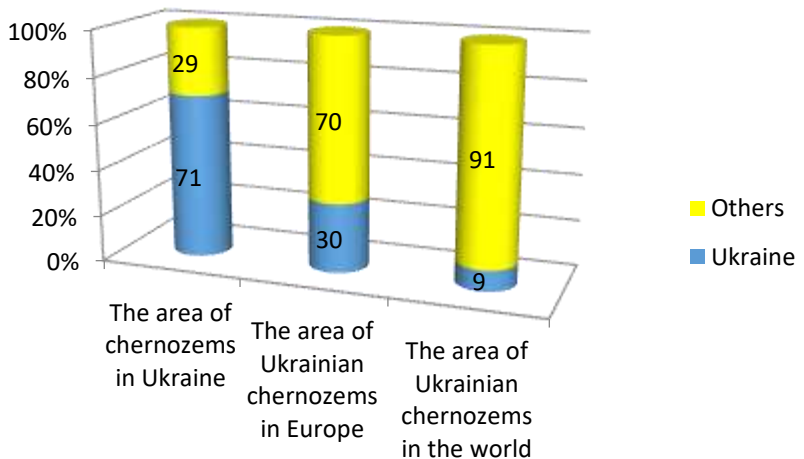


Figure 1 – Share of Ukrainian soils in different parts of the world, % (created by the author)

Since the beginning of the war, the situation has changed significantly. The war not only stopped the process of agriculture but also made it impossible for several years ahead. The consequences were that in 2022, about 8.5 thousand hectares of land were not sown and more than 12 thousand hectares came under hostilities.

As you know, before the start of the war, Ukrainian soils were not in the best condition. For more than 3 decades, independent Ukraine has been one of the main exporters of agricultural products and therefore has to satisfy a huge demand. Because of this, genetically modified products, pesticides and other chemicals began to be used [2].

The anthropogenic and man-made impact on the environment constantly increased and reached critical values, affecting soil cover degradation. As a result, problems with soil's physical and chemical properties began. Areas of land polluted by atmospheric emissions and sewage, chemicals and radionuclides are also growing.

There is a strong possibility that by 2030 the use of chemicals will increase dramatically, and it will be one of the biggest threats to the environment and human health in the coming decades [3].

But with the beginning of the war, the situation became even worse. As a result of military operations, forest areas were destroyed, and more than 200,000 hectares of territory were filled with shells, mines and ammunition fragments. The so-called ecocide began.

As of November 2022, as a result of the aggression of the Russian Federation, 291,826,950 m² of Ukrainian land was polluted, and 8,099,793,440 m² of soil was littered. The amount of damage is 488.9 billion hryvnias.

Since the start of the full-scale invasion, environmental damage from the war has amounted to 38 billion euros [4].

Ukrainian land has been turned into a terrible testing ground for various weapons, such as phosphorus bombs and rockets. The destruction of the upper fertile layer of the earth, which has been formed for centuries, occurs due to missiles, projectiles of all kinds, aerial bombs, drones, «vacuum» bombs, etc. And although over the past 100 years, the soil lost about 30% of the humus, the war accelerated this process many times. The land has lost its fertility.

As a result of the explosion of a projectile of any type, many toxic compounds fall into the soil. According to the experts of the Ecodia NGO, carbon monoxide, carbon dioxide, water vapor, nitrous oxide, nitrogen dioxide, formaldehyde, cyanic acid vapors, nitrogen, as well as a large amount of toxic organics are formed during the explosion of rockets.

According to Anastasia Sploditel, an expert in geomorphology, increased content of copper, nickel, lead, phosphorus and barium was recorded at the shelling site. Such soil results in the impossibility of growing products for a long time. An

example is the events of the First World War. After 1918, the cultivated land area in Europe decreased by 22.6%.

One of the dangerous consequences of the penetration of ammunition into the ground is the presence of heavy metals. In war zones, they can exceed background values by 30 times [5].

More than 80,000 square kilometers of the territories of Ukraine need to be cleared of mines and explosive objects. According to UN estimates, it will take approximately five to seven years to clear the territory of Ukraine using the latest satellite mine identification system. After World War II, it took Poland about 12 years to demine its territory [6].

Based on all the above-mentioned concepts, the following ways of solving the environmental crisis were developed and proposed:

- Zero soil treatment. This method eliminates the need to plow the soil or use any heavy agricultural machinery. No-tillage also improves the rate of carbon uptake by the soil. Overall, this green method of farming helps reduce the amount of greenhouse gases entering the atmosphere while simultaneously reducing costs for farmers.

- Organic agriculture. Organic farming is the process of using environmentally friendly farming methods to improve soil and human health. This method has a lower need for fertilizers and pesticides, the production of which requires a lot of fossil fuels. Instead, he uses crop rotation and compost to control pests, weeds and diseases. Using organic technologies mitigates the effects of global warming by sequestering carbon in the soil.

- Vertical agriculture. Vertical farming is the process of growing crops in vertically laid layers rather than traditional horizontal farming. It means that farmers can grow much more food on the same amount of land. Another significant advantage is that large areas of agricultural land have become unsuitable for growing crops due to armed aggression. Therefore, in this context, the application of vertical agriculture can compensate for the need for planting areas due to vertically laid layers [7].

- Hydroponics and aquaponics. These innovative farming methods involve growing plants without soil and feeding the plants with special nutrients that are added to the water.

- Crop rotation is based on the cultivation of a number of different types of crops on the same territory during successive seasons. It is one of the most effective agricultural control strategies used to prevent soil fertility loss. And since Ukrainian is exhausted by the perennial planting of sunflowers, this method will come in handy [8].

Therefore, with the beginning of the full-scale invasion of Russia into Ukraine, the losses of the agricultural sector are estimated at 40 billion dollars. The USA is suffering not only from destroyed warehouses and blocked sea routes, but

also indirect losses from soil pollution and burned forests. It should also be taken into account that the lands mined and contaminated with explosive substances, which are no longer suitable for growing crops, which make up more than 200,000 m² of land.

In connection with hostilities, the country's soils have suffered significant losses, and the only salvation for Ukraine may be the introduction of green technologies into the agricultural complex: vertical agriculture, hydroponics and aquaponics, organic farming, and crop rotation[9-28]. Implementing and applying these technologies will help restore land and make production more efficient.

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BUSINESS DEVELOPMENT UNDER MARTIAL LAW IN UKRAINE

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The topic of business development in the context of the war in Ukraine is very relevant, as the armed conflict directly impacts the country's economy and business environment.

On the one hand, the war has led to a drop in exports, a reduction in foreign trade, and a more difficult environment for attracting investment. On the other hand, the war creates new business opportunities, particularly in areas related to meeting the needs of the military, restoring damaged facilities and infrastructure, and developing infrastructure in areas not affected by the fighting.

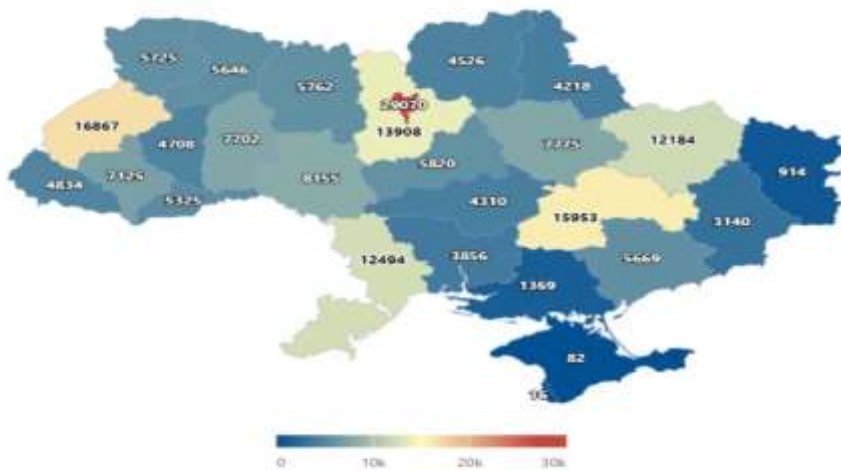
Since the outbreak of full-scale war, the Ukrainian economy has suffered heavy losses. In 2022, the economy fell by 14.9% in the first quarter. It was the

result of the critical situation after 02/24/2022. In the second quarter, the gross domestic product decreased by 36.9%. Implementing anti-crisis measures by the NBU with the support of international partners and military successes helped to stabilize the economy gradually. Initial signs of economic activity emerged in the spring as the territories were liberated, businesses were relocated, and logistics were restored. As a result, GDP fell to 30.6% in the third quarter. By the end of the year, the economic recovery was interrupted by hostile attacks on critical infrastructure. Some companies could adapt to the conditions, but production was reduced. Due to the electricity shortage, GDP fell by 31.4% in the fourth quarter [2].

The economic downturn has led to unemployment, rising prices, partial suspension of production or closure of enterprises. The main reason for unemployment was the economic downturn and the corresponding decline in the financial results of production. Two and half million people have lost their jobs since the start of the full-scale invasion.

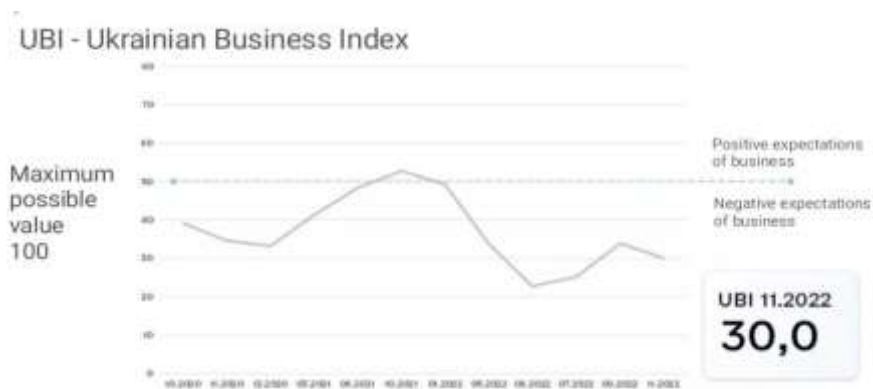
After the start of the full-scale invasion, private entrepreneurs could not be registered due to the lack of registers. When work resumed, it became possible to register on the Diia portal.

After February 24, 2022, new individual entrepreneurs were registered in Ukraine. The highest number of sole proprietor registrations was in September 2022. The top three regions are Kyiv (29070), Lviv (16867), and Dnipro (15953). Regarding popularity, trade-related activities ranked first, followed by IT technologies and car sales (Picture 1) [1].



Picture 1 – Number of registered businesses from 02/24/2022

The UIA (Ukrainian Activity Index) shows businesses' activity and ability to increase sales and create jobs. The UBI (Ukrainian Business Index) is 30 (out of 100). The index fell slightly in November compared to September, but it is higher than in June-July. The decline in the index in November indicates a deterioration in business expectations for a rapid improvement in the economic situation. The decline is observed in virtually all indicators measured by the UBI: the number of orders, inventories, hiring, and output/volume of services provided (Picture 2).



Picture 2 – Ukrainian Business Index

In November, 31.7% of enterprises had entirely or almost completely stopped working since February 24. This is the lowest figure since the surveys began in March, with 55.9% of enterprises partially or entirely out of business in April, 46.8% in June, and 33.8% in September.

In November, 9.4% of enterprises reported an increase in the volume of work compared to the pre-war period, the highest figure since the surveys began in March. The share of such enterprises is gradually increasing [3].

The paper provides examples of how the economic downturn has affected business development since the beginning of the war, including the temporary or complete closure of enterprises and unemployment. It also identifies where in Ukraine there were the most business registrations during the war. The largest number of registrations was recorded in the city of Kyiv. The business activity index was determined, which shows 30 and is lower than in September but higher than in June-July. And it was noted that 9.4% of entrepreneurs increased their workload after the war started.

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